

April 12, 2005

# **Assessment of the Impact of Panama Canal Transit Cost Changes on the Chinese Economy**

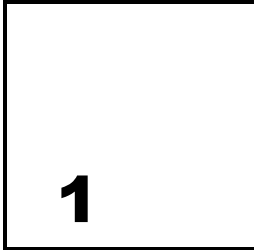


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## **Executive Summary**

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 Chinese 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 Chinese economy, representing approximately 70 percent of total volume that trades through the Canal to and from China. For each commodity, the analysis examines the relevance of Canal-based traffic to overall Chinese imports and exports and the impact of transit cost increases on overall landed costs and the Chinese economy.

### **Chinese Waterborne Trade**

In 2003, with a GDP of US\$1,412 billion, mainland China's economy was the seventh largest in the world. In the last decade, China has taken important steps to open its economy to foreign nations and integrate itself into the world trading system. Mainland Chinese exports have been growing by 21 percent a year recently, more than twice as fast as GDP. Exports now represent a third of GDP and total trade nearly two-thirds of GDP. In 2003, China transported around 89 percent of its international trade volume by sea.

To ensure a thorough analysis of China's trade, the ACP also analyzed international trade for Hong Kong, which became a Special Administrative Region (SAR) of China in 1997. During the last decade, Hong Kong's merchandise domestic exports declined by 4 percent annually while its merchandise imports grew by 6 percent. Re-exportation represents nearly all of Hong Kong's international trade; as part of China, Hong Kong's contribution to total<sup>1</sup> Chinese domestic exports is only 3 percent. Hong Kong's key role is primarily as a source for advanced services and a provider of modern maritime transportation infrastructure. Hong Kong transports about 59 percent of its trade volume by sea.

In 2003, mainland China's main trade partners were Japan, the United States, the European Union, Hong Kong, and the Republic of Korea. Those five regions/countries represent about 62 percent of China's merchandise trade. Hong Kong's main trading partners are mainland China, the United States, and the European Union.

Mainland China is expected to continue to primarily produce consumer goods with imported components; thus the manufacturing industry is a main driver for exports and imports. Top export commodities by value include office and telecommunications equipment, textiles, electrical machinery and computer equipment, and toys. Mineral products, however, make up 45 percent of China's seaborne exports by weight. Hong Kong's main domestic exports are clothing and accessories, which represent 40 percent of total domestic exports.

### **Chinese Trade Through the Panama Canal**

The majority of mainland Chinese and Hong trade that passes through the Panama Canal travels to/from the East Coast US, with smaller trades to East Coast South America, East Coast Canada, and the West Indies. In 2003, mainland Chinese trade transiting the Canal represented 5 percent of Chinese sea trade. Total Chinese trade (mainland China and Hong Kong) represented 19 percent of the total tonnage transiting the Panama Canal.

During the last five years, total Chinese export Canal traffic grew by an average of 22 percent annually. Mainland China imports more than it exports through the Canal in tonnage terms, however. Key exports transiting the Canal include natural coke, ores, iron and steel, furniture, and a range of containerized commodities. Soybeans, misc. fertilizers, and phosphates make up more than half of mainland China's Canal-relevant import commodities.

Hong Kong exports and imports mainly containerized merchandise through the Canal. It should be noted, however, that Hong Kong's domestic exports transiting the Canal represent only 0.15 percent of total Chinese exports. Thus it does not appear that an increase in the Canal transit cost for Hong Kong's domestic exports would have a significant impact on the Chinese economy as a whole. Therefore, this study did not

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<sup>1</sup> Hong Kong and mainland China.

further directly analyze domestic Hong Kong production or the impact of a potential increase in the Canal toll for Hong Kong trade, but focused on analyzing mainland Chinese trade and its impact on the Chinese economy.

### **Methodology for Canal-Relevant Commodity Analysis**

For the purposes of this study, the ACP analyzed key Chinese export commodities and import commodities, representing 70 percent of Chinese 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 Chinese trade and China's 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 China was determined.
2. For those commodities deemed relevant to China's overall trade, Mercer then determined the fraction of total landed cost (CIF) represented by Canal costs (toll and other maritime services) as a share of total landed freight cost (CIF).
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 Chinese imports and GDP.

### **Export Commodities Analysis**

Overall, Panama Canal-relevant Chinese exports, including all containerized cargo, make up only 3.1 percent<sup>2</sup> of total Chinese exports. The analyzed export commodities represented approximately 66 percent of total Chinese export value in 2003; approximately 5 percent of this value transited the Panama Canal (Exhibit 1-1).

For 13 of the 14 commodities, the portion of exports that transit the Canal represents less than one-fifth of each commodity's total export value. Only one commodity has slightly more than a fifth of export value moving through the Canal: toys, games & sports requisites (21.5 percent of exports by value).

In 2003, no Chinese export commodity constituted more than 1 percent of total Chinese exports. Of the fourteen Canal-relevant commodities analyzed, only three accounted for

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<sup>2</sup> 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.

## Assessment of the Impact of Panama Canal Transit Cost Changes on the Chinese Economy

0.5 percent or more of Chinese exports: toys, games & sports requisites, furniture and light fittings, and machinery and mechanical appliances. The small volume of each commodity's exports that transit the Canal, however, reduces the impact of any transit cost changes on the Chinese economy as a whole.

For all of the analyzed commodities, the total Canal transit cost represents less than 2.0 percent of the commodity's CIF. Therefore, even with a 200 percent increase in the Panama Canal toll, none of these commodities would experience an increase in total landed cost of more than 2.5 percent.

Exhibit 1-1  
**Canal-Relevant Chinese 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 China Exports	5. Canal Transit Cost Share of CIF	6. 200% Toll Increase Impact on CIF
Natural coke	\$ 169	10%	\$ 1,675	0.4%	1.4%	2.3%
Iron & Steel: Bulk	\$ 92	1%	\$ 12,863	2.9%	1.0%	1.5%
Misc. Ores	\$ 107	19%	\$ 568	0.1%	1.2%	1.9%
Petroleum products (incl. gasoline)	\$ 147	3%	\$ 5,401	1.2%	0.9%	1.4%
Misc. Fertilizers	\$ 23	3%	\$ 738	0.2%	1.3%	2.1%
Coke Petroleum	\$ 16	19%	\$ 88	0.02%	1.6%	2.5%
<i>Containerized cargo</i>						
Furniture & Lighting Fittings	\$ 2,435	19%	\$ 12,899	2.94%	0.4%	0.5%
Toys, Games & Sports Requisites	\$ 2,852	21%	\$ 13,282	3.03%	0.2%	0.3%
Plastics & Plastics Products	\$ 861	9%	\$ 9,990	2.28%	0.2%	0.4%
Machinery & Mechanical Appliances	\$ 2,383	3%	\$ 83,406	19.02%	0.1%	0.2%
Electrical Machinery & Equipment	\$ 1,935	2%	\$ 89,040	20.31%	0.1%	0.2%
Footwear	\$ 1,007	8%	\$ 12,957	2.96%	0.1%	0.2%
Paper & Paperboard Articles	\$ 145	8%	\$ 1,709	0.39%	0.2%	0.3%
Articles of Apparel & Clothing Accessories	\$ 628	1%	\$ 45,772	10.44%	0.1%	0.1%
Iron and steel: Containerized cargo	\$ 602	5%	\$ 12,864	2.93%	0.2%	0.3%

Source: ACP, US Waterborne Databank, UN COMTRADE.

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 Chinese exports of each commodity, regardless of transportation mode or route
- 4 The percent of total Chinese exports FOB 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, Chinese imports transiting the Panama Canal accounted for 0.7 percent of total merchandise imports (valued in CIF terms). Additionally, Chinese imports transiting the Panama Canal represented only 0.3 percent of Chinese GDP in 2003. Thus, the Canal (and associated toll increases) are relevant for only a small portion of Chinese imports, which represent an even smaller contribution to China's GDP.

In 2003, China's current account surplus was US\$60.1 billion, or 3.8 percent of GDP. The analysis determined that an increase in import prices, due to an increase in Canal tolls, would have a very small impact – even if Canal tolls were increased by 200 percent for all Chinese imports that transit the Canal, the cost of total goods imports would grow by 0.007 percent, the current account would remain at 3.8 percent of GDP, and national income would drop by about 0.003 percent, with a negligible impact on inflation.

Exhibit 1-2  
**Canal-Relevant Chinese Imports Analyzed**

<b>Commodity</b>	<b>Canal Share</b>	<b>Canal Transit Tons 2003 (millions)</b>	<b>CIF/Ton</b>	<b>CIF Value of Canal Transit Tons (US\$M)</b>
Soybeans	27%	3.92	\$ 261	\$ 1,023.07
Fertilizers, misc.	15%	2.19	\$ 194	\$ 424.87
Scrap metal	4%	0.60	\$ 258	\$ 154.74
Iron & steel	3%	0.39	\$ 535	\$ 205.92
Chemicals	3%	0.41	\$ 1,631	\$ 661.17
Petroleum coke	1%	0.09	\$ 56	\$ 5.09
Container cargo	18%	2.67	\$ 790	\$ 2,110.81
Other	30%	2.19		
<b>Total CIF Value of Panama Canal Transit Tons (US\$M)</b>				<b>\$ 4,585.67</b>

Source: Mercer analysis, UN COMTRADE and US Waterborne Commerce 2003 database.

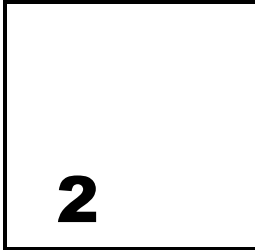
## **Conclusions**

The analyses in this study 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 China, nor on the principal industries that provide Canal-relevant export commodities.

Finally, the larger question facing the Chinese 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 Chinese 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 Chinese economy, rather than the essentially negligible impact of the transit cost increases examined in this study.



## **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 China's 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 Chinese economy.

The overall objectives of this study were as follows:

- Generate a clear understanding of Chinese maritime trade

- Review historical Canal transit data to determine principal imported and exported commodities for China
- Determine the relevance of this Canal-based traffic to Chinese 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 Canal cost increases on the Chinese economy
- Appraise the ability of different industries within China 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 Chinese economy, this report focuses on the highest-volume and highest-value imported and exported commodities that transit the Canal. The report assesses Chinese 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 China.

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 Chinese maritime trade:* Development of a high-level description of current China sea trade, including commodities and main partners. This overview allowed the ACP to understand China's principal and alternative trade routes, the overall impact of the Panama Canal on shipping, and the impact of key commodity trades on the Chinese 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 Chinese 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 China:* Determined the possible economic impact of potential toll increases for China, based on the previous analyses, and assessed whether toll increases would have a significant impact on the Chinese 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 China Sea Trade**

### **3.1 Imports and Exports**

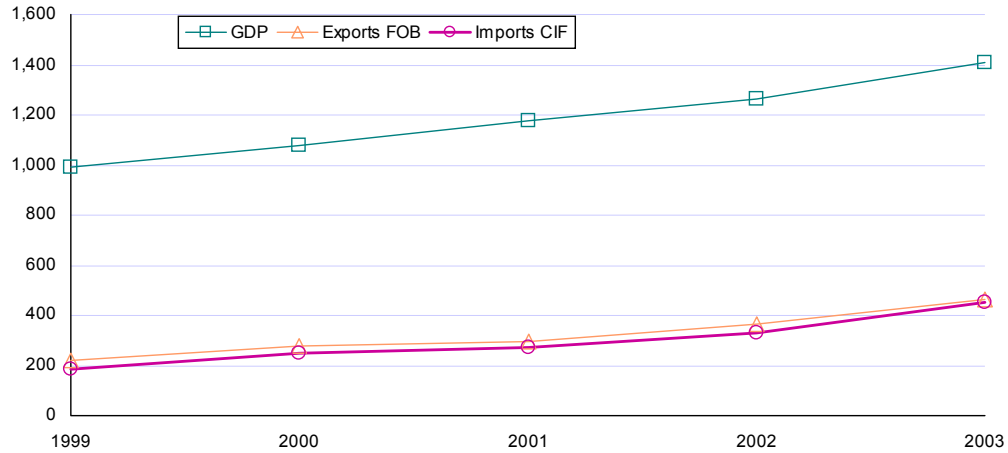
#### **3.1.1 Mainland China**

The inclusion of mainland China in the G-7 meeting in 2004 is illustrative of its growing importance in the world economy. In 2003, with a GDP of US\$1,412 billion, mainland China's economy was the seventh largest in the world. In the last decade, China has taken important steps to open its economy to foreign nations and integrate itself into the world trading system. For example, in 1991, China joined the Asia-Pacific Economic Cooperation (APEC) group and, in 2001, the World Trade Organization (WTO). Also, as part of these extensive trade liberalization agreements, China has agreed to lower tariffs and eliminate market barriers.

As a result, during the 1999 and 2003 period, mainland Chinese exports grew at a more accelerated pace than GDP: nominal GDP grew by 9 percent annually while its exports grew by 21 percent. With its growing assembly and manufacturing industries, China is a net exporter, although imports play an important role in its economy as well (Exhibit 3-1).

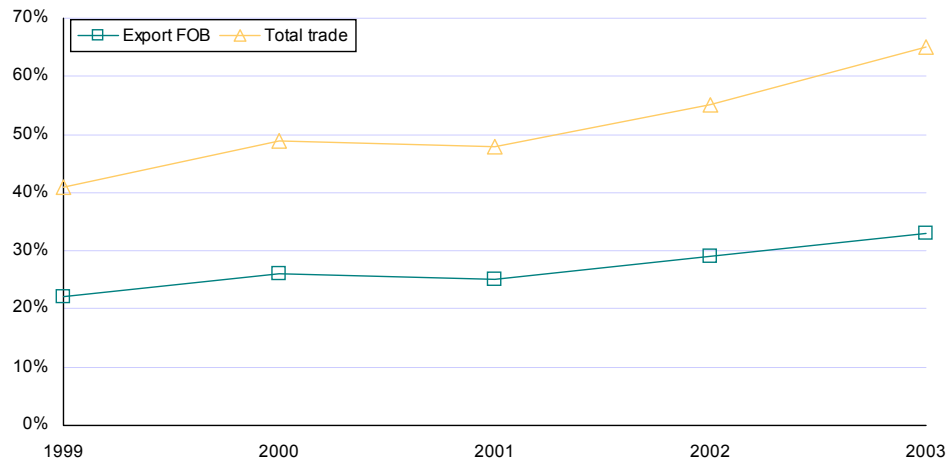
Mainland China exports represent 33 percent of its GDP, while total trade accounts for approximately 65 percent of GDP (Exhibit 3-2). The main economic driver behind trade is the import of raw materials for the assembly of consumer goods, which are then exported.

Exhibit 3-1  
**Mainland China Trade and GDP: 1999-2003**  
 (US\$ billions, current prices)



Source: World Development Indicators database.

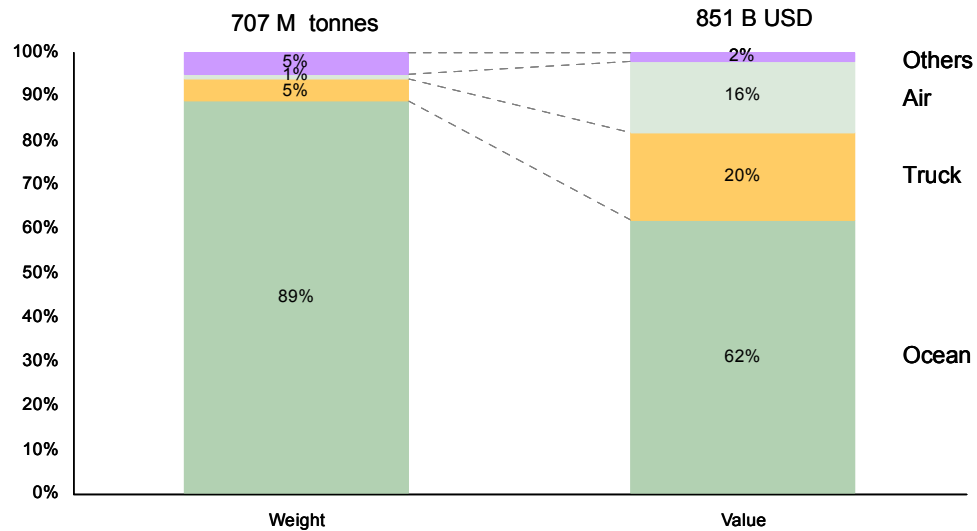
Exhibit 3-2  
**Mainland China Trade as a Percentage of China GDP: 1999-2003**  
 (percentage based on value)



Source: World Development Indicators database.

Mainland China sea trade routes include the Yellow Sea, the East China Sea, and the South China Sea. The South China Sea is one of the world's busiest international sea lanes, due to the number of countries bordering its shores: Mainland China, Hong Kong, Taiwan, the Philippines, Malaysia, Brunei, Indonesia, Singapore, Thailand, Cambodia, and Vietnam. It is estimated that more than half of the world's supertanker traffic passes through the region's waters to support the large and growing oil demands of the region. In 2003, China transported around 89 percent of its international trade volume by sea, representing 632 million metric tons (Exhibit 3-3).

Exhibit 3-3  
**Mainland China Trade by Mode of Transportation: 2003**  
 (percent of weight/percent of value)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003.

### 3.1.2 Hong Kong, China

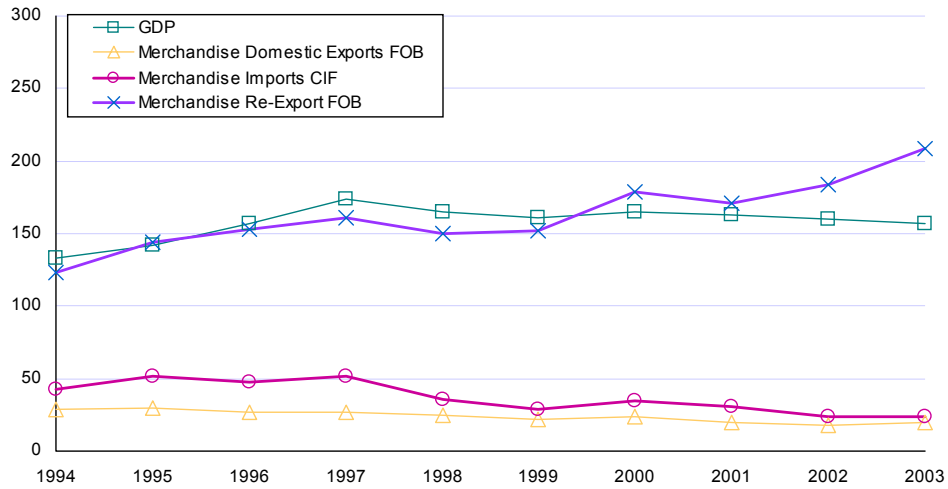
In 1997, China resumed sovereignty over Hong Kong, ending more than 150 years of British colonial rule. Hong Kong became a Special Administrative Region of the People's Republic of China with a high degree of autonomy in all matters except foreign affairs and defense. According to the Sino-British Joint Declaration (1984) and the Basic Law, Hong Kong will retain its political, economic and judicial systems as well as its unique way of life for 50 years after reversion, and will continue to participate in international agreements and organizations under the name, "Hong Kong, China."

Hong Kong is one of the world's most open and dynamic economies, due to its high level of international trade. Hong Kong focuses mainly on re-exportation, which is the process of importing products from one country and exporting them to other countries without having performed any processing that would permanently change their shape, nature, form, or utility. This trade pattern causes total import and export value, including re-exports, to exceed GDP (Exhibit 3-4). During the last decade, Hong Kong's nominal GDP expanded by 2 percent; its merchandise domestic exports declined by 4 percent annually while its merchandise imports grew by 6 percent.

Hong Kong has been impacted in recent years by several crises, including the Asian financial crisis in 1998, global recession in 2001-2002, and the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003. These difficulties have negatively impacted Hong Kong's GDP and domestic exports; over the same period, however, Hong Kong increased its merchandise re-exports, mainly due to high growth in mainland Chinese exports. In

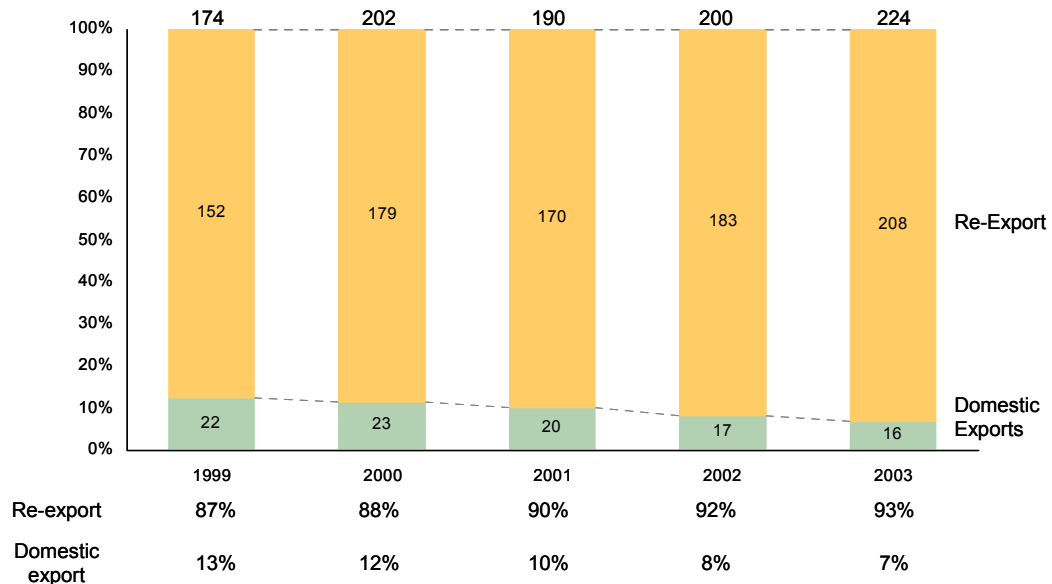
2003, Hong Kong's re-exports represented 93 percent of its international trade (Exhibit 3-5).<sup>3</sup>

Exhibit 3-4  
**Hong Kong, China Trade and GDP: 1994-2003**  
 (US\$ billions, current prices)



Source: World Development Indicators database, International Monetary Fund.

Exhibit 3-5  
**Hong Kong Exports: 1999-2003**  
 (US\$ billions, current prices)



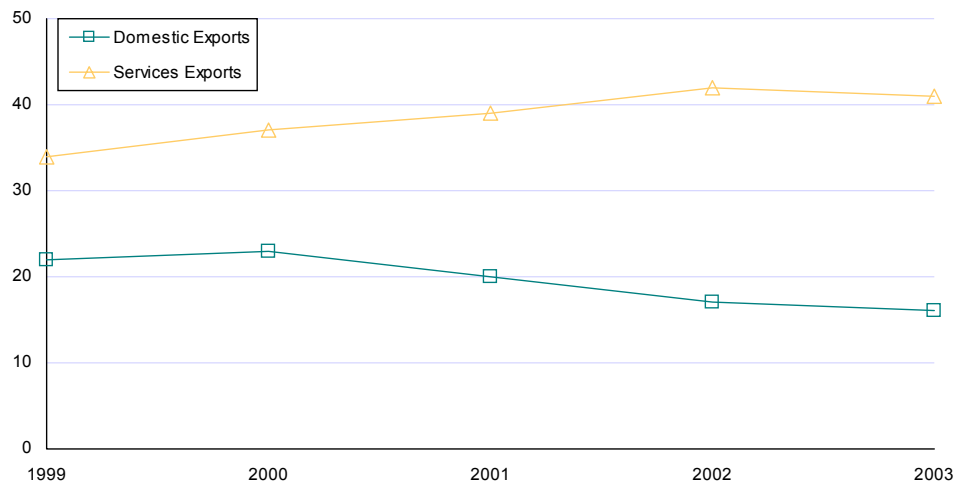
Source: Census and Statistics Department, Government of Hong Kong, China.

<sup>3</sup> Hong Kong, China Census and Statistics Department.



Hong Kong has a sophisticated services economy, accounting for 85 percent of its GDP, which occupies 80 percent of its labor force.<sup>4</sup> It is a renowned financial center and has the second largest stock market in Asia. This explains the fact that Hong Kong's services exports exceed domestic merchandise exports (Exhibit 3-6). The major components of Hong Kong's services trade are shipping, civil aviation, tourism, and financial services.

Exhibit 3-6  
**Hong Kong, China Merchandise and Service Domestic Exports: 1999-2003**  
(US\$ billions, current prices)

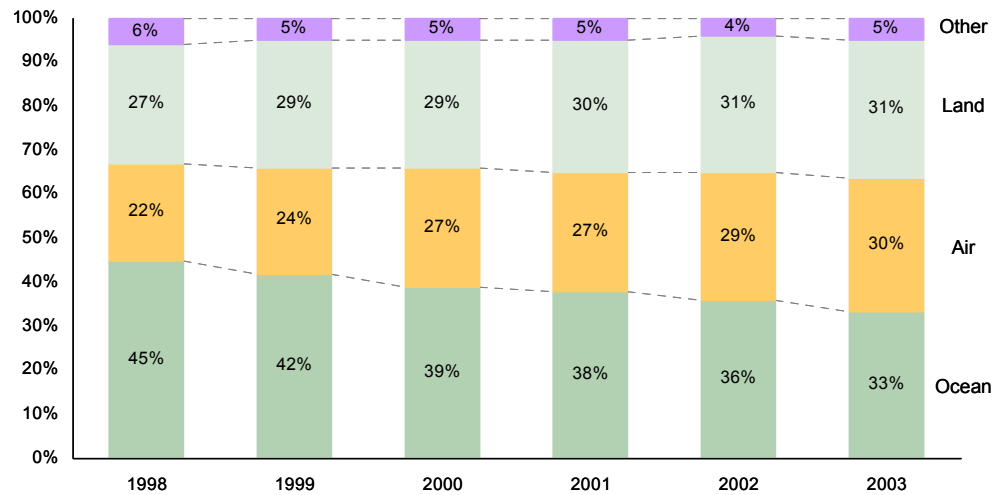


Source: World Bank database and Hong Kong, China Census and Statistics Department.

Hong Kong's location and strong trade relationship with mainland China has led to the development of a sophisticated transport services industry. Hong Kong is positioned in the Greater Pearl River Delta and the South China Sea. The majority of trade to and from mainland China is by river or road, with trade between Hong Kong and other destinations moving by air or sea. Hong Kong's sea trade represented 33 percent of its total trade by value and 59 percent of its trade by weight in 2003 (Exhibits 3-7 and 3-8).

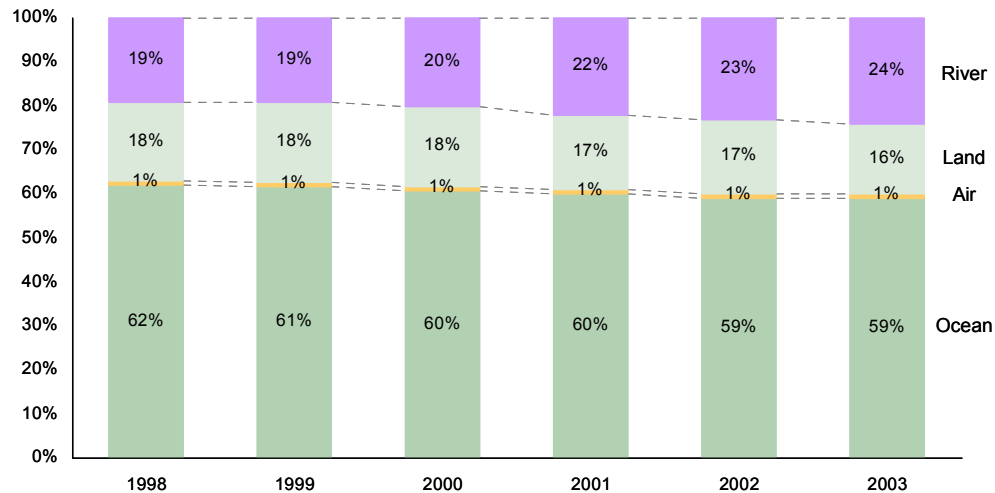
<sup>4</sup> Census and Statistics Department, Government of Hong Kong, China.

Exhibit 3-7  
**Hong Kong, China Trade by Value: 1998-2003**  
 (percentage of trade value)



Source: Hong Kong, China Census and Statistics Department.

Exhibit 3-8  
**Hong Kong, China Trade by Weight: 1998-2003**  
 (percentage of trade metric tons)

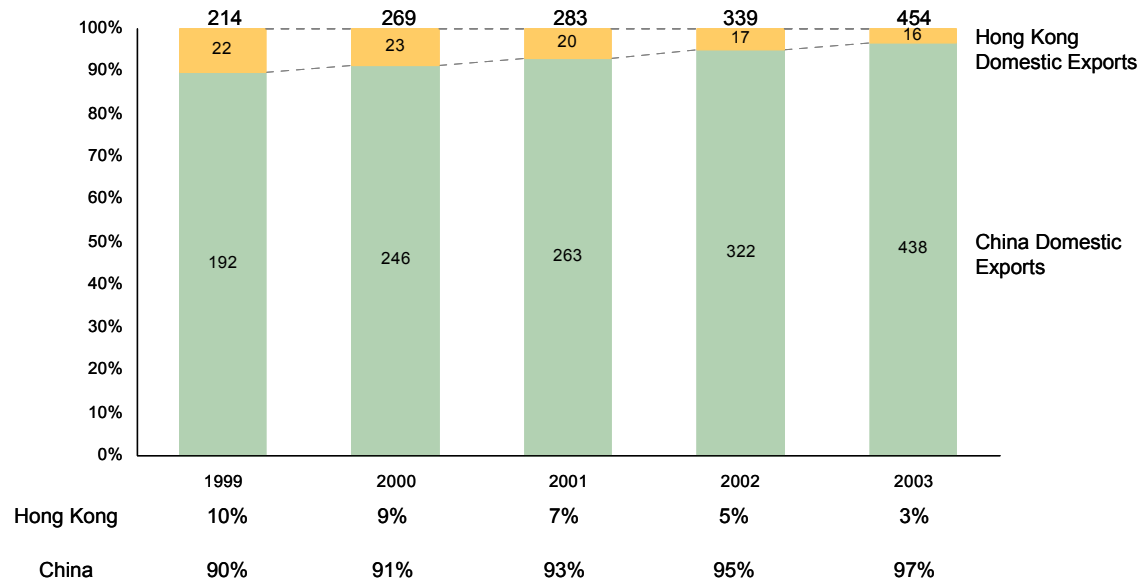


Source: Summary Statistics on Port Traffic of Hong Kong, Port, Maritime and Logistics Development Unit.

As part of China, Hong Kong's contribution to total<sup>5</sup> Chinese domestic exports is 3 percent (Exhibit 3-9). Hong Kong's key role in China's economy is not as a domestic producer and exporter, but as a source for advanced services and a provider of modern maritime transportation infrastructure. Hong Kong has always been a Chinese export and import gateway; however, its role has been reinforced recently with the signing of a free trade agreement with China, the Closer Economic Partnership Arrangement (CEPA).

<sup>5</sup> Hong Kong and mainland China.

Exhibit 3-9  
**Mainland China & Hong Kong Domestic Exports: 1999-2003**  
 (percent of total exports)



Source: Census and Statistics Department and Government of Hong Kong, China, International Trade Center.

## 3.2 Key Trade Partners

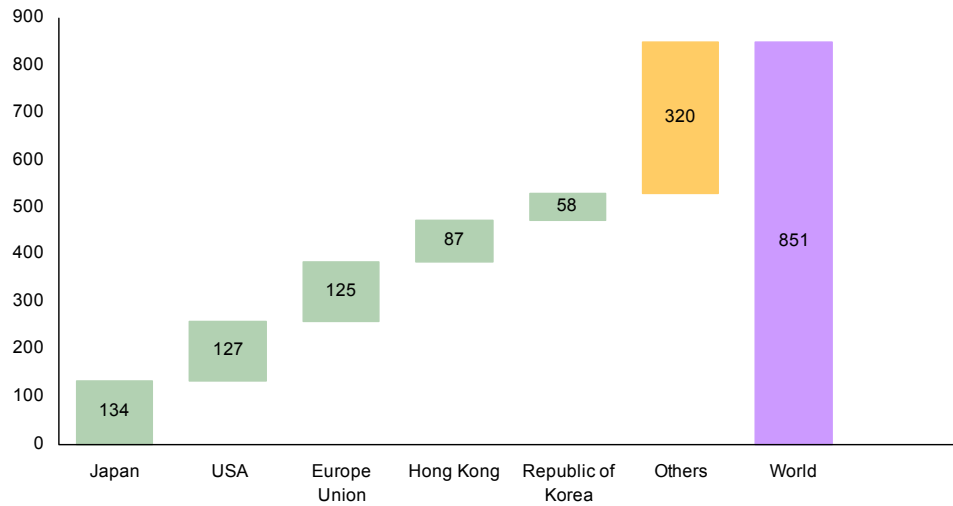
### 3.2.1 Mainland China

In 1991, China became a member of APEC (Asian-Pacific Economic Cooperation) and in 2001 of the WTO (World Trade Organization). Additionally, China has intensified its efforts to reach new trade agreements. Recently, China worked closely with ASEAN (Association of Southeast Asian Nations) to implement the first stages of a free trade agreement by reducing tariffs on more than 500 agricultural products.

In 2003, China's main trade partners were Japan, the United States, the European Union,<sup>6</sup> Hong Kong, and the Republic of Korea. Those five regions/countries represent about 62 percent of China's merchandise trade (Exhibit 3-10). Three of mainland China's five main trade partners are Asian regions/countries, demonstrating the importance of Chinese trade within the Asian continent. Asia in total accounts for more than half of mainland China's merchandise imports and exports.

<sup>6</sup> The original 15 member states of the European Union (EU) are Belgium, Denmark, United Kingdom, Germany, France, Ireland, Italy, Luxembourg, Netherlands, Greece, Portugal, Spain, Austria, Finland and Sweden.

Exhibit 3-10  
**Mainland China's Top Trade Partners: 2003**  
(US\$ billions, current prices)



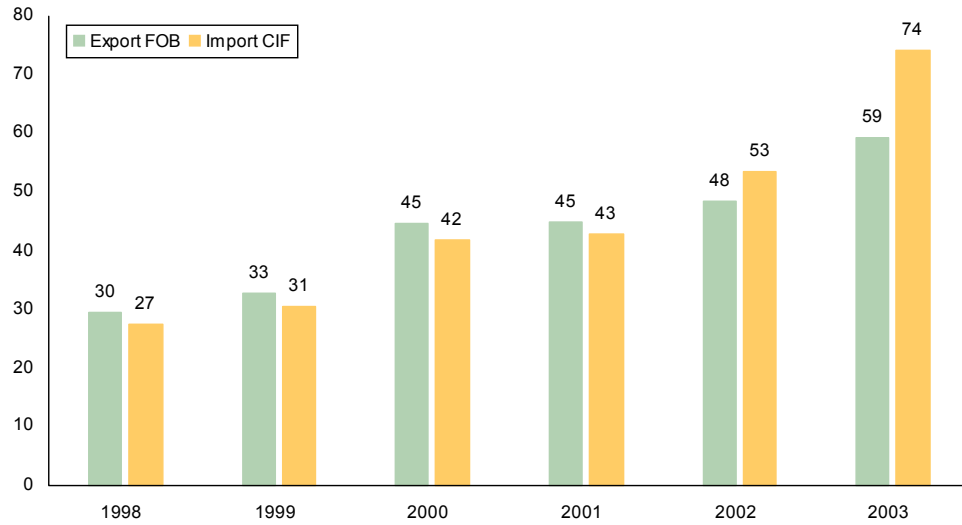
Source: International Trade Statistics 2004, World Trade Organization.

## Region Specific Trade Partners

### Japan

Japan has been mainland China's top trading partner since the 1960s, while China is Japan's second most important trade partner (after the United States). Additionally, Japan is one of the major providers of governmental loans, foreign investment and technology to China. An example of Japan's growing trade relevance to China is that the trade volume between the two countries in 1972 was only US\$1.1 billion, while in 2003 it was US\$133 billion (Exhibit 3-11).

Exhibit 3-11  
**Mainland China-Japan Trade: 1998-2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Japan Statistics Trade data, International Statistics Trade 2004, World Trade Organization.

### United States

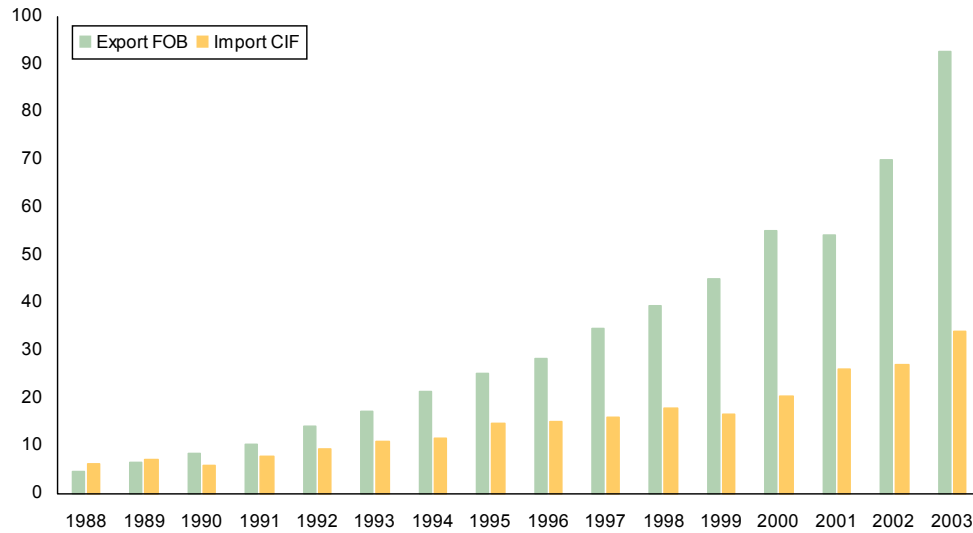
The United States has become mainland China’s second most important trade partner. Nevertheless, international relationships between those two countries have not always been serene. For many years, the US government restricted trade with China, mostly through the requirement for annual renewal of China’s Normal Trade Relations (NTR) status by the US Congress. However, with the entrance of China into the WTO, the US officially granted it Permanent Normal Trade Relations (PNTR), which became effective in 2002.

The US plays an important role in China’s adherence to the WTO. The Office of the US Trade Representative annually evaluates and reports on China’s evolution and compliance to trade commitments made since its entrance into the WTO.

The United States supplies China with power generating equipment, aircraft and aircraft parts, computers, industrial machinery, raw materials, and chemical and agricultural products. However, the US government continues to have concerns about fair market access due to testing restrictions and the lack of standards requirements for some imported products.

Since 1991, US demand for Chinese goods has outpaced its exports to China. This trade gap has worsened significantly over time (Exhibit 3-12).

Exhibit 3-12  
**Mainland China-United States Trade: 1988-2003**  
 (US\$ billions, current prices)



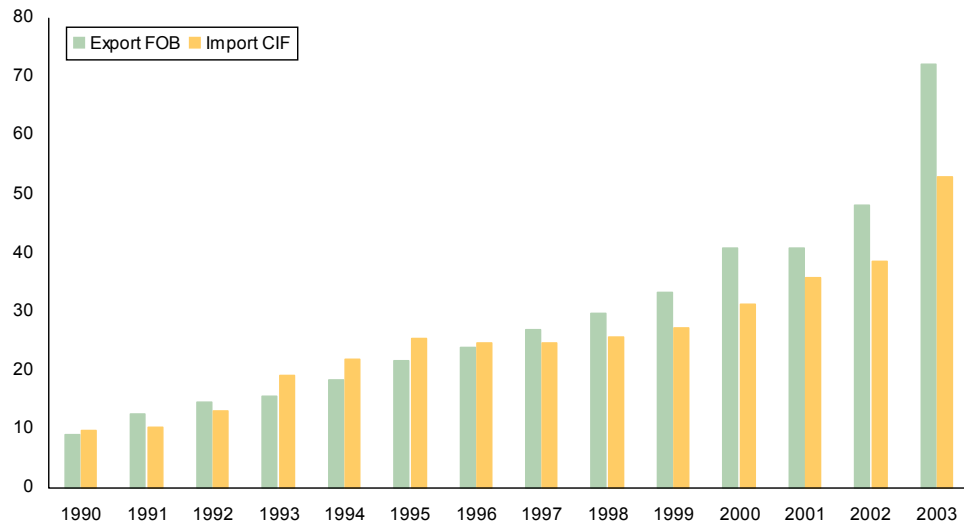
Source: Mercer analysis, US Department of Commerce, International Statistics Trade 2004, World Trade Organization.

### European Union (EU)

Since 1978, certain members of the EU have had open trade relationships with mainland China. In 2003, imports and exports reached US\$125 billion.<sup>7</sup> China is now the third most important non-European trading partner for the EU after the US and Japan, and the EU is the third largest export market (US\$72 billion) for mainland China and its second largest source of imports (US\$53 billion). China's exports to the EU have been outstripping its imports from the region since 1997 (Exhibit 3-13).

<sup>7</sup> International Statistics Trade 2004, World Trade Organization.

Exhibit 3-13  
**Mainland China-EU Trade: 1990-2003**  
 (US\$ billions, current prices)



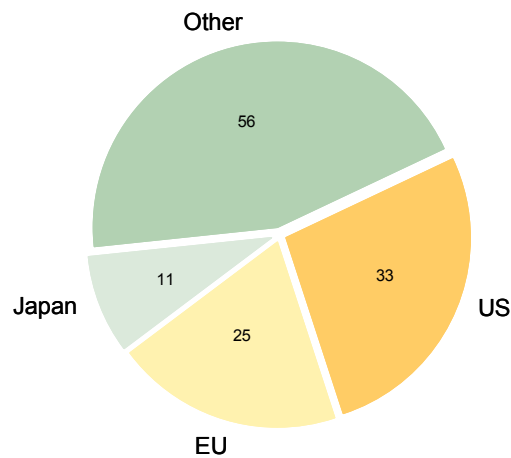
Source: Mercer analysis, Eurostat, International Statistics Trade 2004, World Trade Organization.

### Hong Kong, China

In spite of the fact that Hong Kong has become a Special Administrative Region of China, it retains the status of a free port and separate customs territory. In 2003, Hong Kong was the fourth most important trade partner of mainland China. Hong Kong's economy focuses on re-exportation. In this sense, it affects mainland China's international trade in two ways:

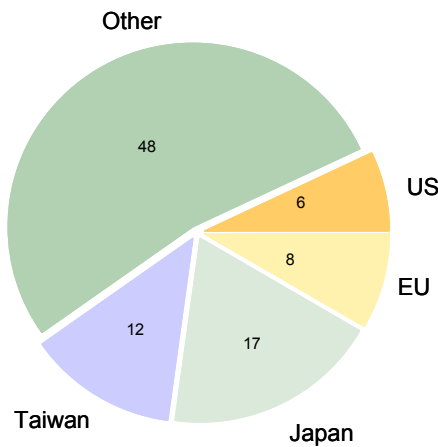
- Mainland China exports merchandise to Hong Kong for its domestic consumption, and in return, imports merchandise and services produced in Hong Kong. Since 1982, mainland China has been Hong Kong's largest merchandise supplier for domestic consumption (e.g., consumer goods, raw material and semi-manufactures, capital goods, foodstuffs).
- While mainland China sells products to Hong Kong for re-exportation, it also imports merchandise from Hong Kong that originated in other countries (Exhibits 3-14 and 3-15). In 2004, Hong Kong and mainland China signed a Closer Economic Partnership Arrangement (CEPA) which will reinforce the current trade relationship by eliminating tariffs on many products.

Exhibit 3-14  
**Destinations for Hong Kong Re-Exports of Chinese Imports: 2003**  
(US\$ billions, current prices, total = US\$125 billion)



Source: Trade and Industry Department, Government of Hong Kong, China.

Exhibit 3-15  
**Origins of Hong Kong Re-Exports to Mainland China: 2003**  
(US\$ billions, current prices, total = US\$91 billion)



Source: Trade and Industry Department, Government of Hong Kong, China.

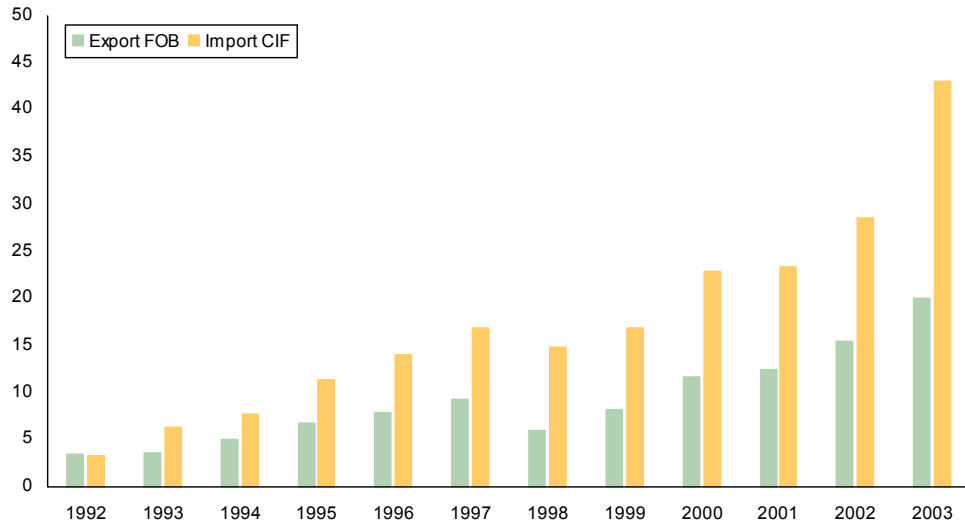
### Republic of Korea

In 1992, formal diplomatic relations between the Republic of Korea and mainland China were re-established and led to rapid growth of bilateral economic exchanges (Exhibit 3-16). In 2003, China surpassed the United States to become the largest importer of Korean products. China benefits from Korea's extensive production of semiconductors and communications equipment. Korea mainly exports industrial intermediate goods such as electrical machinery, nuclear reactors and boilers, plastics, petrochemical products, and iron and steel to mainland China.



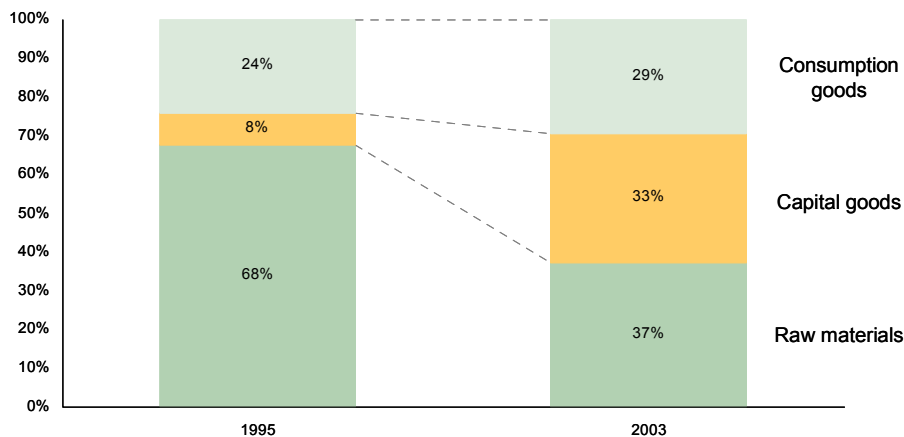
The mix of Chinese exports to Korea has changed in the last decade (Exhibit 3-17). Mainland China has been industrializing rapidly and has begun to manufacture high volumes of electronics and electrical components, which it then exports. This shift has caused mainland China and Korea to become more competitive with respect to certain commodities such as electrical machinery and optical instruments.

**Exhibit 3-16**  
**Mainland China-Republic of Korea Trade: 1992-2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Korea International Trade Association, International Statistics Trade 2004, World Trade Organization.

**Exhibit 3-17**  
**Mix of Chinese Mainland Exports to Republic of Korea: 2003**  
 (percentage based on value)



Source: Mercer analysis, Korea International Trade Association, International Statistics Trade 2004, World Trade Organization.

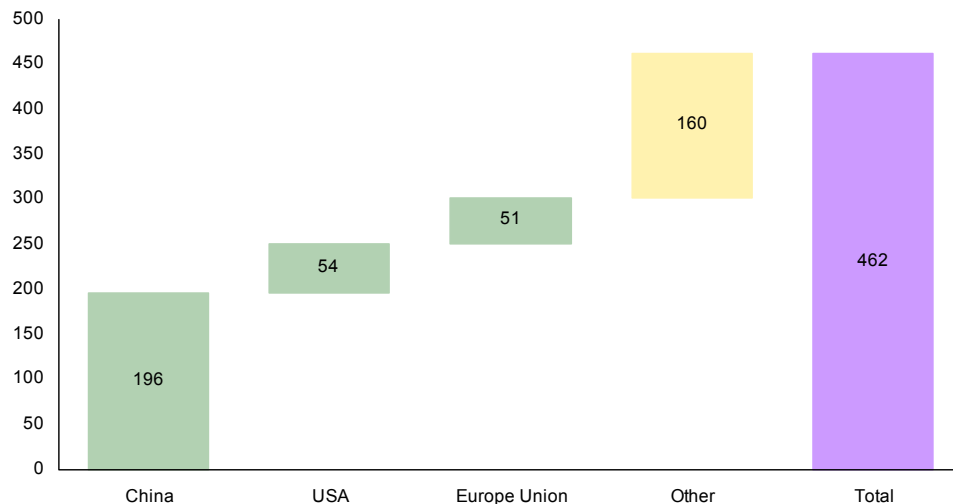
### 3.2.2 Hong Kong, China

Hong Kong's economy is highly dependent on international trade. It is an important player in the Asiatic international trade region, and was one of the founding members of the WTO and APEC. It is important to note that its position in these international organizations remains unchanged despite its change in political status.

Hong Kong's main trading partners are mainland China, the United States, and the European Union (Exhibit 3-18). Nevertheless, Hong Kong plays an important role in intra-Asiatic trade, which represents 60 percent of its international trade. In 2003, Hong Kong by itself was the 11<sup>th</sup> largest trade economy in the world.

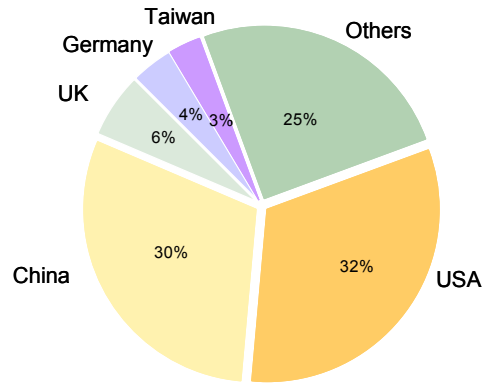
Major destinations for Hong Kong's domestic exports include the United States (32 percent share of exports), mainland China (30 percent), and United Kingdom (6 percent) (Exhibit 3-19).

Exhibit 3-18  
**Hong Kong, China Key Trade Partners: 2003**  
(US\$ billions, current prices)



Source: International Trade Statistics 2004, World Trade Organization.

Exhibit 3-19  
**Major Destinations for Hong Kong Domestic Exports: 2003**  
(percentage based in value)



Source: Census and Statistics Department, Government of Hong Kong, China.

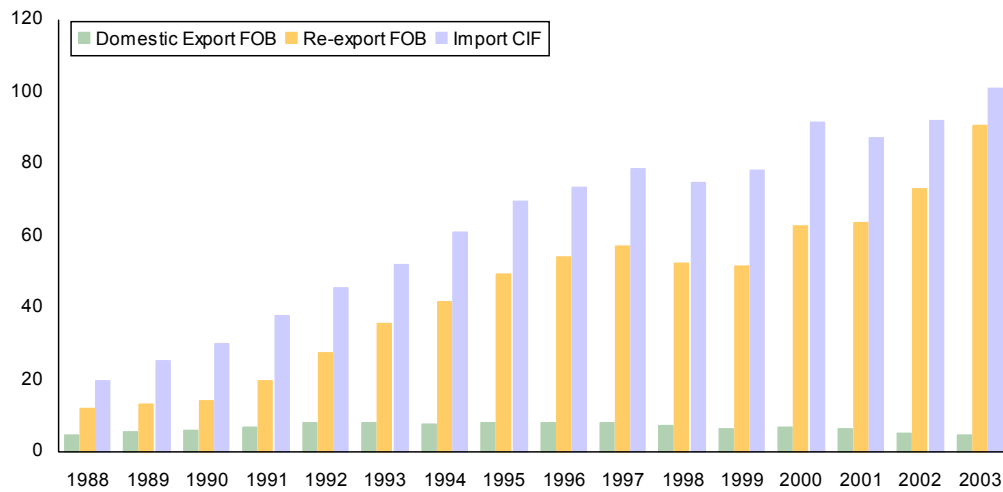
## Region-Specific Trade Partners

### Mainland China

Mainland China has always played an important role in Hong Kong's international trade. Hong Kong's re-export market makes it a gateway for Chinese exports and imports. Hong Kong re-exports machinery, apparel and clothing accessories, toys, jewelry, plastics items, and clocks imported from China. Also, mainland China is the second largest importer of Hong Kong's domestically produced exports (30 percent) which are characterized by apparel and clothing accessories, electrical machinery, and textiles.

Hong Kong's domestic exports to mainland China's have been decreasing over the last four years. While Hong Kong and mainland China have some similarities in their domestic manufacturing, Hong Kong has increased its re-exports to mainland China and its direct imports from mainland China, making these two economies important trade partners (Exhibit 3-20).

Exhibit 3-20  
**Hong Kong, China-Mainland China Trade: 1988-2003**  
 (US\$ billions, current prices)



Source: Trade and Industry Department, Government of Hong Kong, China.

### United States

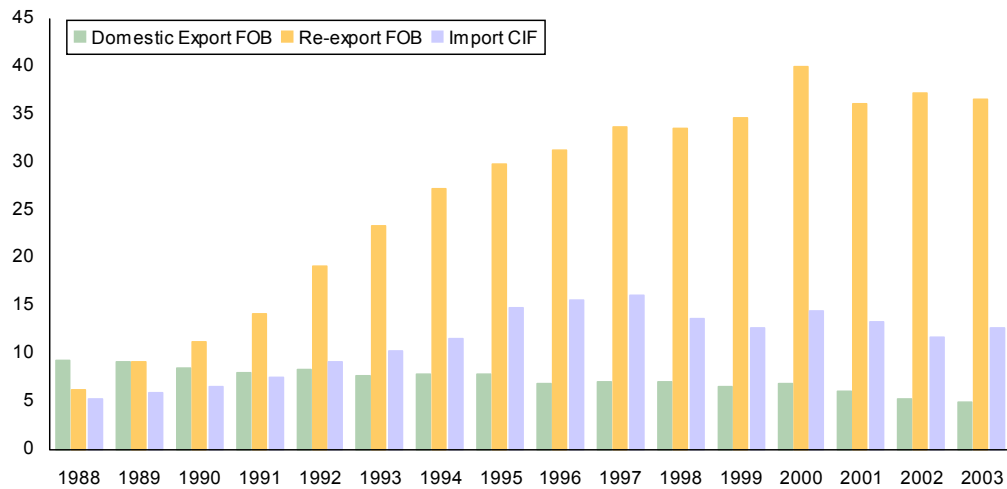
In 1992, the United States and Hong Kong signed the US-Hong Kong Policy Act, in which the United States supports Hong Kong's autonomy. It establishes the authority of the US government to treat Hong Kong as a non-sovereign entity distinct from mainland China by concluding and implementing bilateral agreements as well as promoting trade and investment. The cooperation between Hong Kong and the US is also due to the 55,000 American residents in Hong Kong and 1,100 US firms operating there.

The United States strongly supports Hong Kong because of their shared economic principles, including a liberal market philosophy, market transparency, free flow of information, and a strong legal system. Hong Kong is a “free port,” with virtually no duties or tariffs, allowing US businesses to easily reach its 6.8 million consumers.<sup>8</sup> Hong Kong imports from the United States were US\$12.75 billion in 2003.<sup>9</sup> The United States is the largest importer of Hong Kong’s domestic exports, which represented US\$5.02 billion in 2003 (Exhibit 3-21).

<sup>8</sup> Export America, February 2003.

<sup>9</sup> International Statistics Trade 2004, World Trade Organization.

Exhibit 3-21  
**Hong Kong, China-United States Trade: 1988-2003**  
 (US\$ billions, current prices)

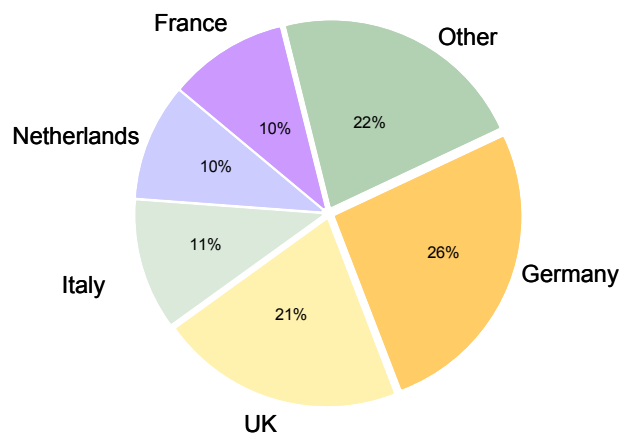


Source: Trade and Industry Department, Government of Hong Kong, China.

### European Union

The Europe Union is Hong Kong’s third most important trade partner. Within the EU, Germany, the United Kingdom, and Italy represent more than 50 percent of current trade with Hong Kong (Exhibit 3-22). For example, Germany exports motor vehicles, special machinery, and electrical appliances to Hong Kong, and imports clothing and accessories, computer components, and office machinery from it.

Exhibit 3-22  
**Hong Kong, China-EU Trade: 2003**  
 (percentage based on CIF value)



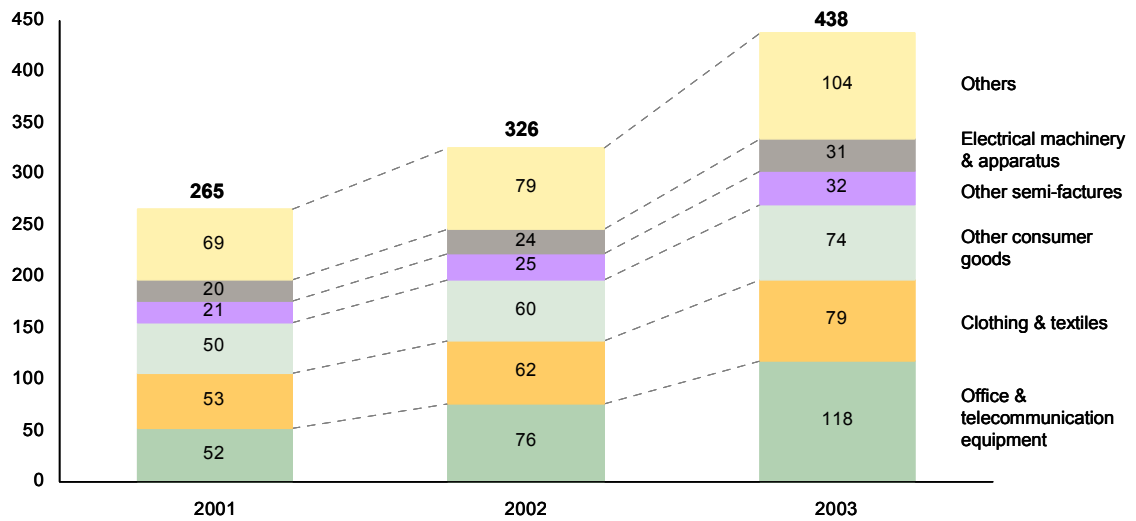
Source: Trade and Industry Department, Government of Hong Kong, China.

### 3.3 Key Trade Commodities

#### 3.3.1 Mainland China

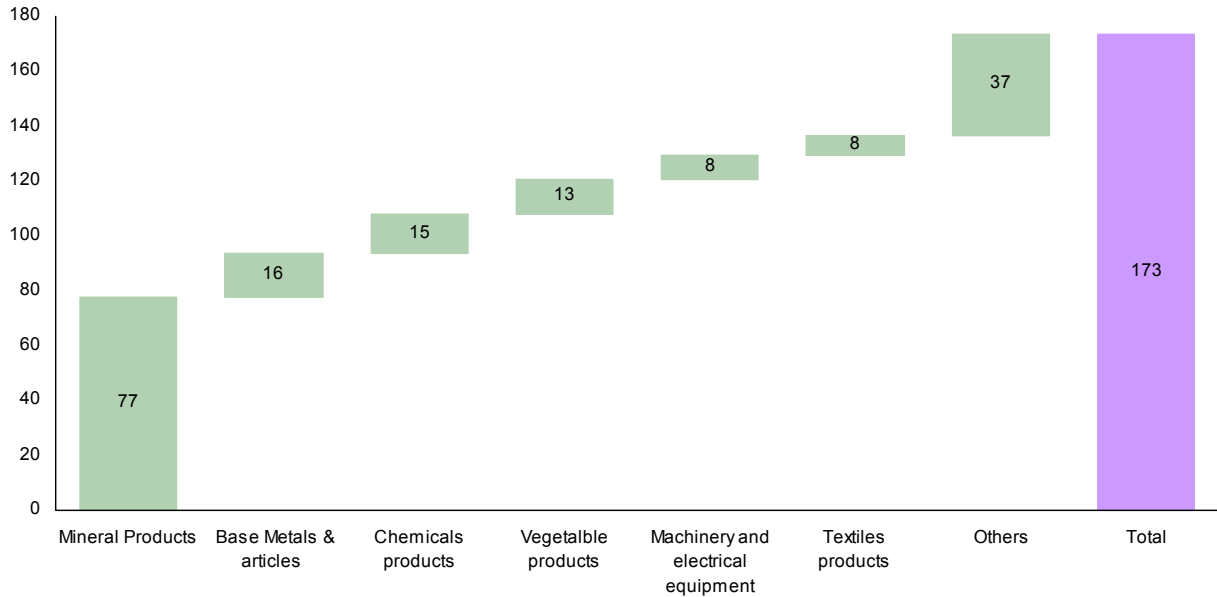
Mainland China is expected to continue to primarily produce consumer goods with imported components; thus the manufacturing industry is a main driver for exports and imports. Top export commodities by value include office and telecommunications equipment, textiles and clothing accessories, electrical machinery and computer equipment, and toys. Moreover, as a leading apparel manufacturer, mainland China exports clothing, accessories and textiles (Exhibit 3-23). Mineral products, however, make up 45 percent of China’s seaborne exports by weight (Exhibit 3-24).

Exhibit 3-23  
**Mainland China Exports by Value: 2001-2003**  
 (US\$ billions, current prices)



Source: International Statistics Trade 2004, World Trade Organization.

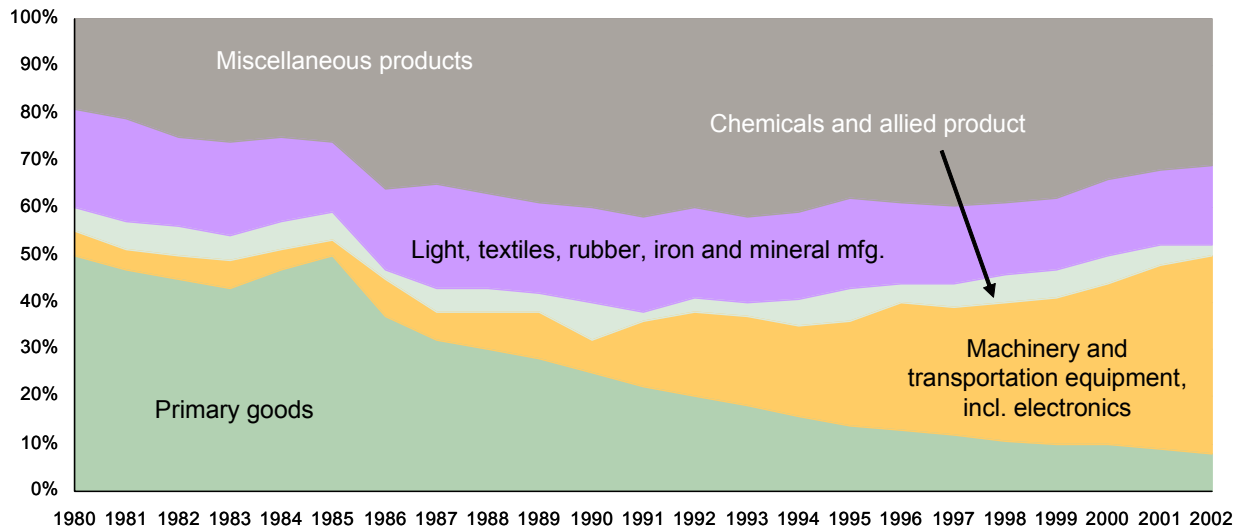
Exhibit 3-24  
**Mainland China Seaborne Exports by Weight: 2003**  
 (millions of metric tons)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003.

China’s main export commodities have been shifting over the past two decades. In the 1980s and early 1990s, mainland China exported mainly primary goods (50 percent of total exports), clothing, footwear, other light manufactures, and fuels (Exhibit 3-25). Since then, its export mix has changed to where primary goods represent less than 10 percent of total exports, and manufactured commodities (e.g., office machinery, telecommunications equipment, travel goods, furniture, industrial supplies) account for almost 40 percent.

Exhibit 3-25  
**Composition of Mainland China's Exports, 1980-2002**  
 (percentage based in value)



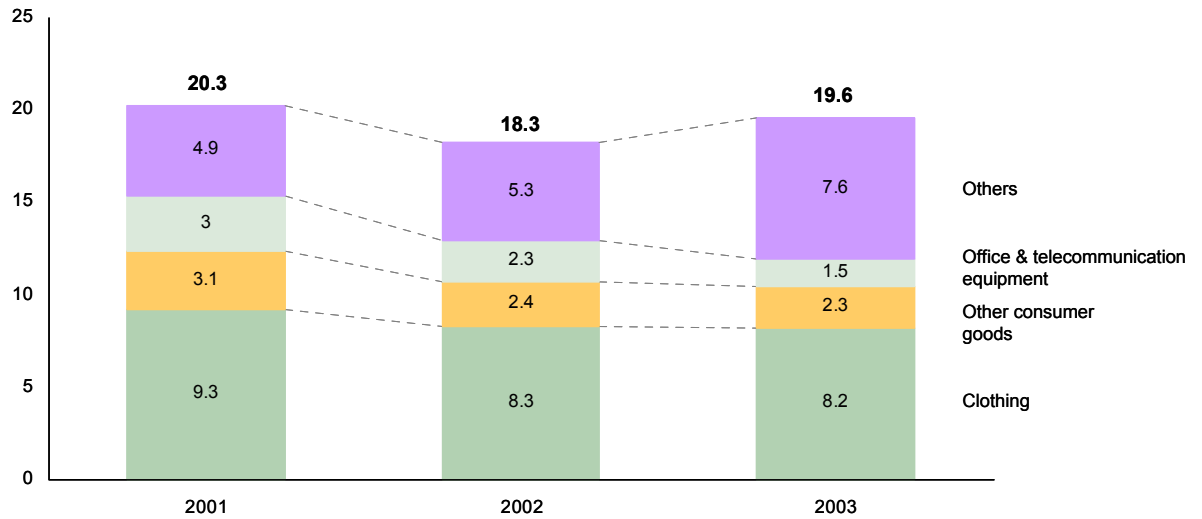
Source: International Monetary Fund, World Economic Outlook Database, April 2004.

### 3.3.2 Hong Kong, China

Hong Kong's main re-exporting sectors are manufactured and semi-manufactured goods such as office, telecommunications and computer equipment, recording and reproducing equipment, footwear, clothing and accessories, photographic equipment, and watches and clocks. Hong Kong also has an internal production economy, and is thus considered a domestic product exporter. The main domestic exports are clothing and accessories, which represent 40 percent of total domestic exports. Other consumer goods such as electrical machinery and textiles are also important domestic exported products (Exhibit 3-26). On the import side, the products which are imported for Hong Kong's internal consumption are similar to those imported for re-export.



Exhibit 3-26  
**Hong Kong, China Domestic Exports: 2001-2003**  
 (US\$ billions, current prices)



Source: International Statistics Trade 2004, World Trade Organization.

## 3.4 China Market Trends and Challenges

### 3.4.1 Mainland China

Chinese industry today focuses primarily on assembling components into consumer goods destined for export, which requires the importation of semi-finished products and raw materials. China is also dependent on imports for the use of its own domestic population and industry, including agricultural products, mineral fuel, and oil.

Recently, China has positioned itself as one of the most important trade partners of major economies such as the United States, Japan and the European Union. China competes both with medium-sized industrialized economies and increasingly with larger economies like the United States. For example, China had displaced the US as the main provider of raw material to Japan.

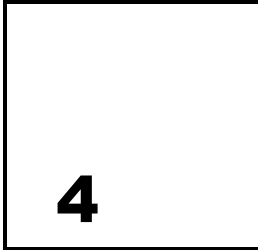
Additionally, mainland China is facing diverse internal and external challenges. Internally, China is fragmented in its regional development. It has also been under pressure, mainly from the WTO, to reform its banking and legal framework (property rights, uniform applications of law), privatize its state-owned companies, establish industrial policies, and liberalize its service markets (e.g., telecommunication, aviation, express delivery services). Those reforms would give China more international visibility and transparency in its domestic economy and would foster economic development through the introduction of more international companies and the creation of local businesses.

Mainland China has increased its sea trade significantly in the last decade. To handle this trade volume, China relies on two main ports: Shenzhen and Hong Kong. Shenzhen, currently being enlarged, is used mainly as a low-cost export hub due to its lower productivity, while Hong Kong is used for high-end exports. Nevertheless, as China improves Shenzhen, it could become more competitive with Hong Kong.

### **3.4.2 Hong Kong, China**

Even before Hong Kong reverted to Chinese administration in 1997, it was extensively linked with mainland China through trade. Nevertheless, after Hong Kong's integration into the Chinese economy and China's entrance into the WTO, Hong Kong became both more of a competitor with China as well as more dependent on it.

Hong Kong is under competitive pressure from China with regard to its service industries, such as water transportation, and soon will be confronted with Chinese air cargo services operating out of the new Guangzhou Baiyun International Airport. However, mainland China is Hong Kong's major growth driver, due to the re-export business. Hong Kong's government is attempting to maintain its position as the main gateway to the region and principal gateway to mainland China by signing a free trade agreement with China, the Closer Economic Partnership Arrangement (CEPA), which applies zero tariffs to 1,087 items and improved market access for certain services.



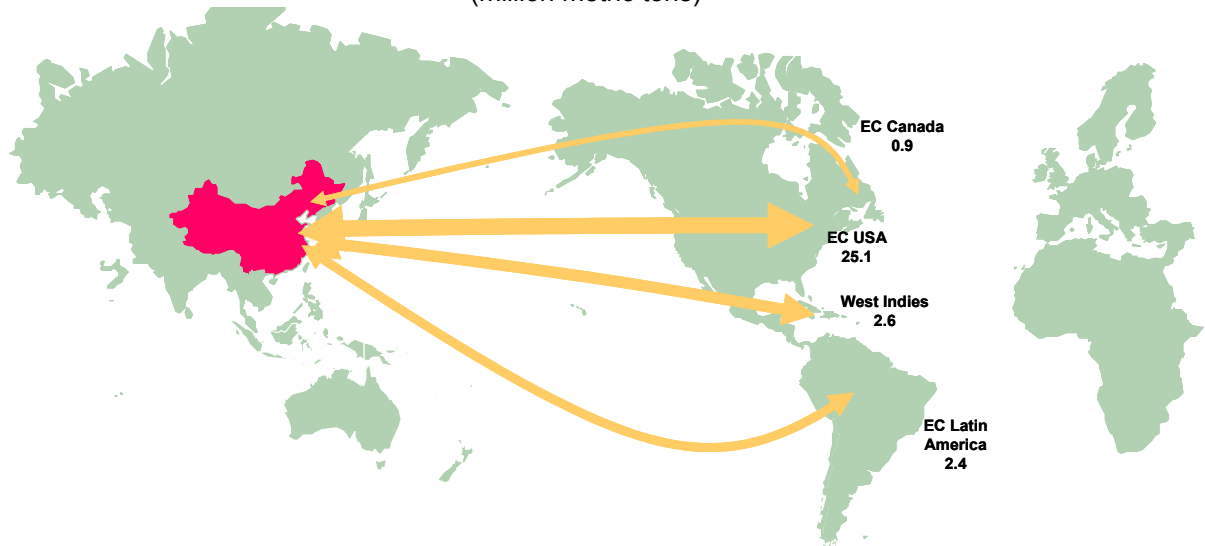
## **China and the Panama Canal**

### **4.1 Trade Routes Relevant to the Panama Canal**

#### **4.1.1 Mainland China**

Mainland China's most important trade partners are other Asian countries, which represent 62 percent (by value) of its international trade. Based on ACP data, the relevant trade routes transiting through the Panama Canal between mainland China and the world are: China-East Coast US, China-East Coast Canada, China-East Coast South America, and China-West Indies (Exhibit 4-1). In 2003, the total Chinese trade transiting the Canal represented 16 percent of the total tonnage transiting the Panama Canal and 5 percent of total Chinese sea trade.

Exhibit 4-1  
**Mainland China Trade Routes Relevant to the Panama Canal: 2003**  
(million metric tons)



Source: ACP database.

### East Coast United States

Commodities flowing to the East Coast of the US from China represented 13 percent of the total tonnage transiting the Panama Canal and 4 percent of total Chinese sea trade in 2003. The main commodities moved on this route are containerized cargo (e.g., electronic equipment), agricultural products (e.g., soybeans), fertilizers, minerals and metals (e.g., iron and steel ore), and fuels (e.g., coke).

### West Indies<sup>10</sup>

The commodities flowing from China to the West Indies represented 1 percent of the total tonnage transiting the Panama Canal and 0.4 percent of the total Chinese sea trade in 2003. The main commodities moving in this trade lane are containerized cargo, agricultural products (e.g., sugar), minerals (e.g., bauxite), and manufactured products (e.g., cement).

### Central & South America

Commodities flowing to the East Coast of Central & South America represented 1 percent of the tonnage transiting the Panama Canal and 0.4 percent of the total Chinese sea trade in 2003. This flow is composed mainly of containerized cargo, agricultural

<sup>10</sup> Netherlands West Indies, Trinidad-Tobago, Jamaica, Puerto Rico, Cuba, Haiti, Dominican Republic, French West Indies, West Indies Assoc. States.

products (e.g., sugar), minerals (e.g., bauxite, ore), and manufactured metals (e.g., iron, steel).

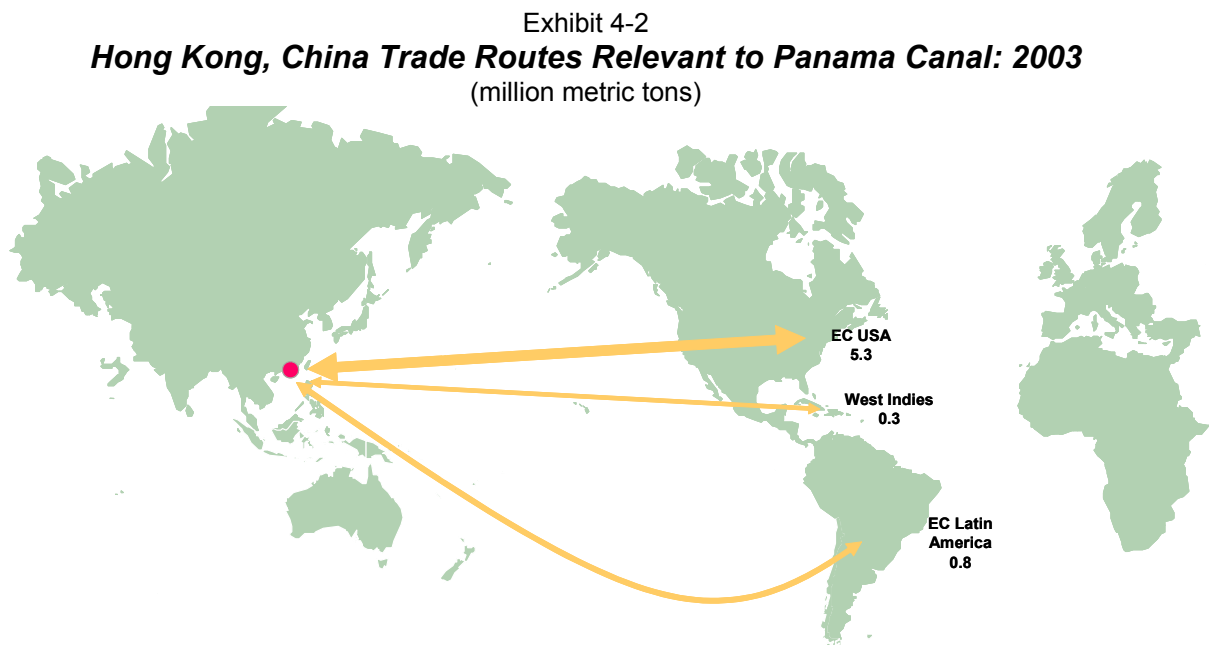
### East Coast of Canada

Commodities flowing from mainland China to the East Coast of Canada represented 0.5 percent of the volume of the Panama Canal and 0.1 percent of the total Chinese sea trade in 2003. This flow is composed mainly of minerals (e.g., ore, bauxite, manganese), fuels (e.g., coke, coal), containerized cargo, agricultural products (e.g., soybeans), and manufactured metals.

### 4.1.2 Hong Kong, China

Hong Kong, like mainland China, exports around 61 percent (in value) of its merchandise within the Asian continent (Exhibit 4-2). Based on ACP data, the relevant trade routes transiting through the Panama Canal between Hong Kong and the world are: Hong Kong-East Coast US, Hong Kong-East Coast South America, and Hong Kong-West Indies. The commodities moving in these trade lanes represented 3 percent of the total tonnage transiting the Panama Canal in 2003. The main commodities are containerized cargo (94 percent) and refrigerated products (6 percent).

The US East Coast accounts for 82 percent of the total Hong Kong trade volume transiting the Canal.



## 4.2 Chinese Imports/Exports through the Canal

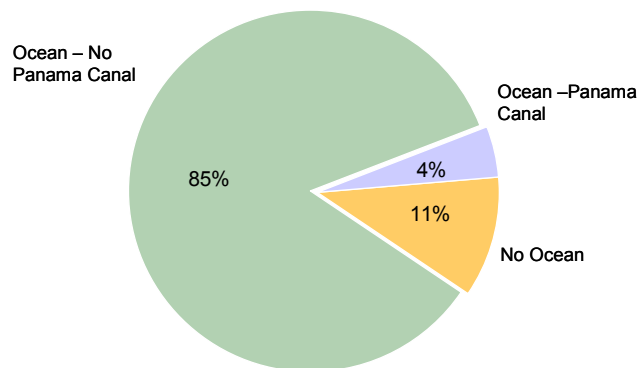
### 4.2.1 Mainland China

During the last five years, total Chinese export Canal traffic grew by an average of 22 percent annually. In 2003, Chinese exports transiting the Panama Canal represented around 4 percent of the total sea trade of mainland China (Exhibit 4-3). This primarily represents Chinese trade to the US East Coast.

As Chinese exports transiting the Canal have grown, the commodity mix has evolved. For example, during 1999-2003, gasoline and container cargo grew by around 70 percent in total, while other commodities such as rice decreased by 3 percent and cement by 15 percent. For this study, we determined the most relevant Canal commodities to analyze based on an average of 1999-2003 trade data (Exhibit 4-4).

Due to the highly fragmented nature of its containerized cargo, the total mainland China commodities studied in this report represent 60 percent of Chinese trade transiting the Canal.

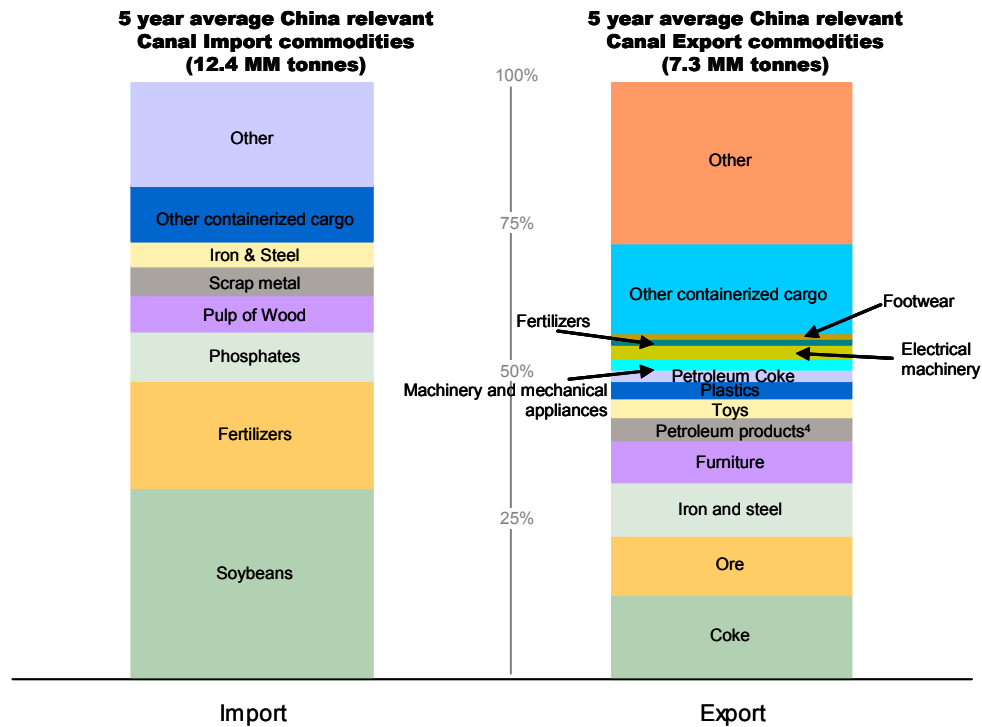
Exhibit 4-3  
**Canal Participation in Mainland China Trade: 2003**  
(percentage of metric tons)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003 and ACP database.

Exhibit 4-4

**Mainland China Trade Relevant to the Panama Canal: Average 1999-2003**  
(percentage of metric tons)



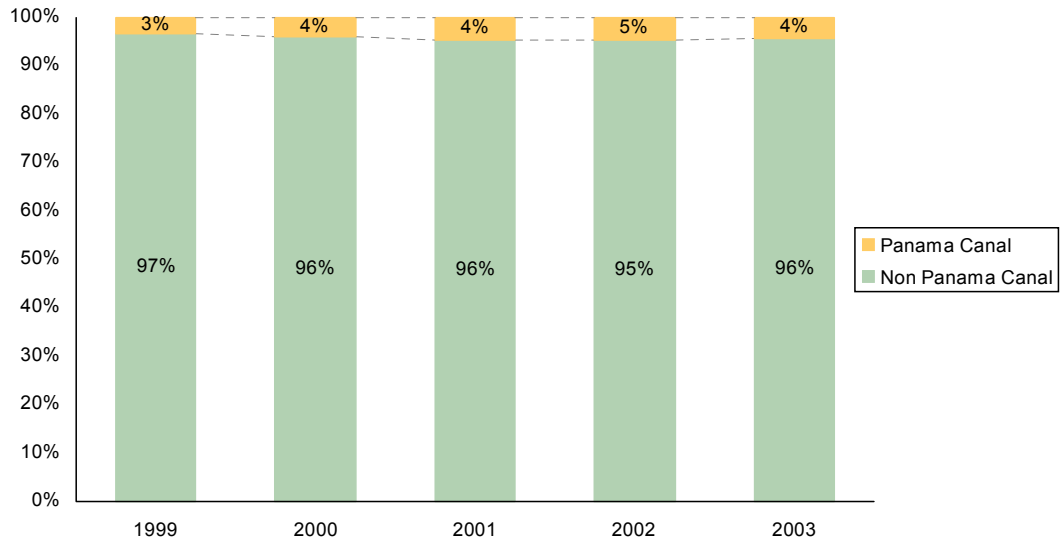
Source: ACP database and US Preliminary Waterborne Databanks 2003.

**4.2.1 Hong Kong, China**

The Panama Canal represents 4 percent of the total sea trade volume of Hong Kong. In 2003, around 7 percent of Hong Kong seaborne exports passed through the Panama Canal (Exhibit 4-5). Additionally, Hong Kong’s seaborne exports, including re-exports, through the Panama Canal grew by an average of 12 percent annually.

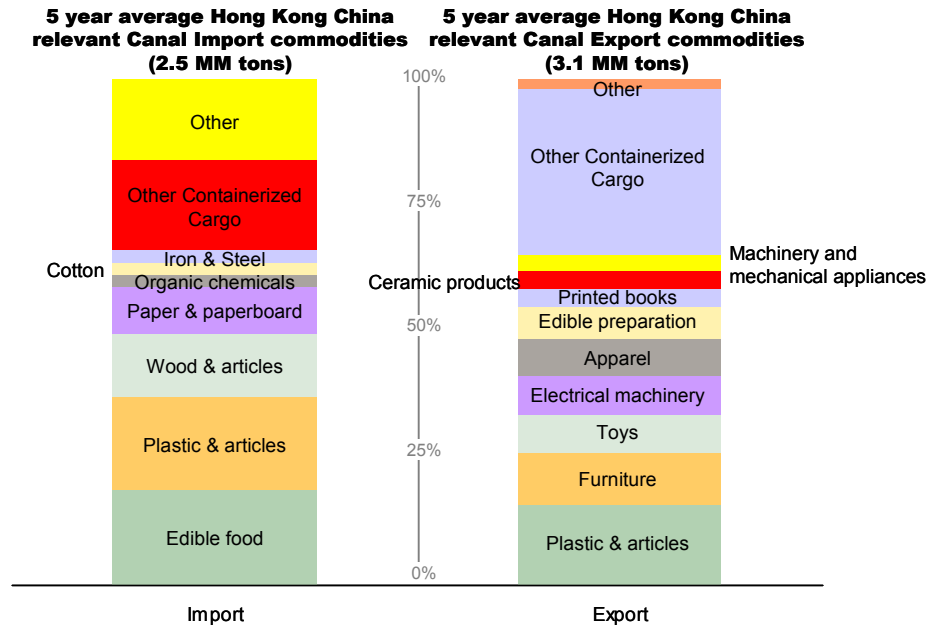
Hong Kong exported and imported mainly containerized merchandise through the Canal (Exhibit 4-6). In the last five years, the volume of containers passing through the Panama Canal has grown by approximately 12 percent a year for Hong Kong exports and 14 percent a year for Hong Kong imports.

Exhibit 4-5  
**Hong Kong, China Exports Through the Panama Canal: 1999-2003**  
 (percentage based on metric tons)



Source: ACP database, Hong Kong Shipping and Cargo Statistics Section and Hong Kong Census and Statistics Department.

Exhibit 4-6  
**Hong Kong, China Trade Relevant to the Panama Canal: Average 1999-2003**  
 (million metric tons)



Source: ACP database and US Preliminary Waterborne Databanks 2003.

It must be noted, however, that a large proportion of Hong Kong exports are re-exports; only approximately 7 percent are domestic exports. In order to properly analyze the



potential impact of a Canal toll increase on the Chinese economy as a whole, Mercer first separately determined the amount of Hong Kong domestic exports only transiting the Canal and whether these Canal toll increase for these exports would be sufficient to have an impact on the Chinese economy.<sup>11</sup>

According to the US Waterborne Commerce 2003 database, the US in 2003 received 32 percent of Hong Kong's domestic exports (including both exports that transit the Canal and those that do not), while 16 percent of the total value imported from Hong Kong landed on the East Coast, including re-exports. Multiplying these figures yields a value of 5 percent of total Hong Kong domestic exports potentially passing through the Canal to the US East Coast.

This 5 percent of Hong Kong domestic exports transiting the Canal represents only 0.15 percent of total Chinese exports.<sup>12</sup> Based on this analysis, it does not appear that an increase in the Canal toll for Hong Kong's domestic exports would have a significant impact on the Chinese economy as a whole. Therefore, this report does not further directly analyze domestic Hong Kong production or the impact of a potential increase in the Canal toll for Hong Kong trade, but focuses on analyzing mainland China trade and its impact on the Chinese economy.

### **4.3 Canal-Relevant Mainland China Export Commodities**

#### **4.3.1 Natural Coke**

Natural coke, also coke, is mainly used in the iron and steel industries and in the production of electricity for public consumption. Nevertheless, all types of industry use it, e.g., cement, chemicals, paper, and primary metals. The main Chinese coke importers are Japan, Brazil, and India. In 2003, China was the largest exporter of coke, accounting for 49 percent of worldwide exports of this commodity, representing US\$1.6 billion (Exhibit 4-7).

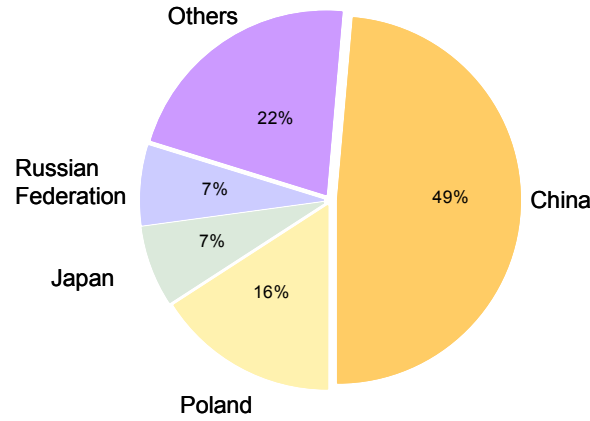
China exports of natural coke through the Canal have been stable for the last five years. In 2003, 90 percent of the Chinese coke exports which passed through the Canal were destined for the US East Coast.

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<sup>11</sup> Mainland China and Hong Kong economy.

<sup>12</sup> Hong Kong domestic exports represent 3 percent of total (mainland China & Hong Kong) Chinese domestic exports. Thus 5 percent Hong Kong domestic exports x 3 percent total Chinese domestic exports equals 0.15 percent of total Chinese domestic exports.

Exhibit 4-7  
**World Natural Coke Exports: 2003**  
(percentage)  
Total Value= US\$3,434 million



Source: UN COMTRADE.

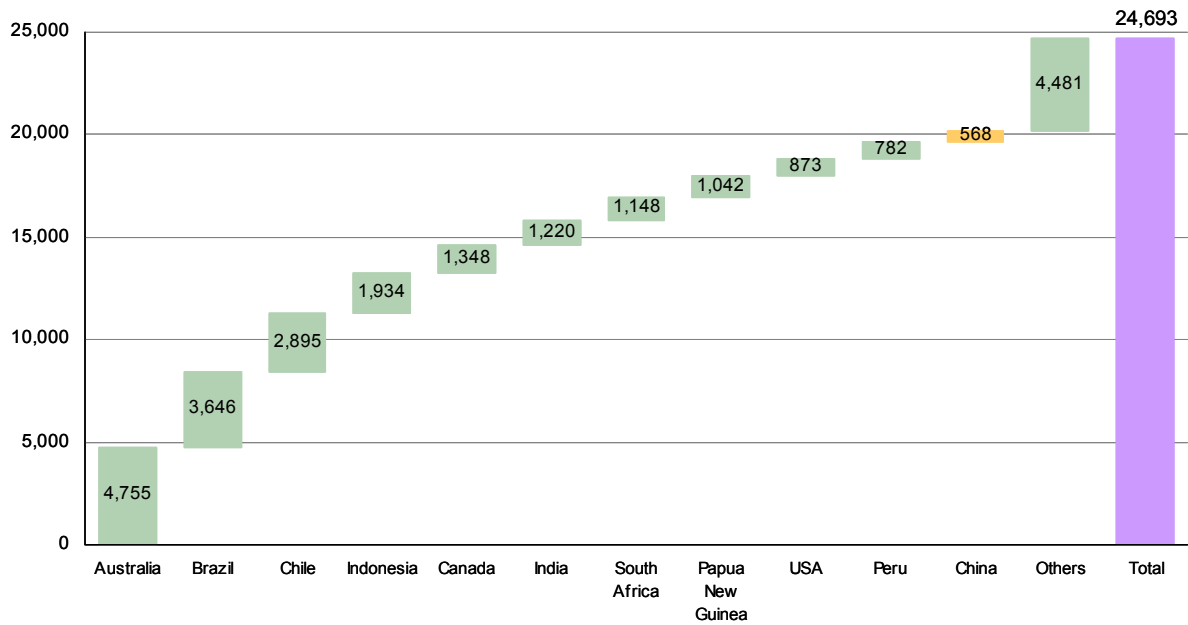
### 4.3.2 Ores

Ores are metal-bearing minerals; metals such as aluminum, iron, copper, lead, mercury, gold, platinum, and silver are extracted from ores and used in industrial processes or for construction. In 2003, China was the 11<sup>th</sup> largest exporter of ores (Exhibit 4-8). In 2003, the ores mix exported by China included magnesite (55 percent), dolomite (31 percent), and natural graphite (9 percent).<sup>13</sup> It also exports aluminum and molybdenum ores. The major destinations for Chinese magnesite, natural graphite, dolomite and molybdenum ores are the Netherlands, Japan, and the Republic of Korea.

Around 80 percent of China's exported ores transiting the Canal are destined for the East Coast US.

<sup>13</sup> UN COMTRADE; statistic based on weight.

Exhibit 4-8  
**World Exports of Ores: 2003**  
 (US\$ million, current prices)



Source: UN COMTRADE.

### 4.3.3 Iron & Steel

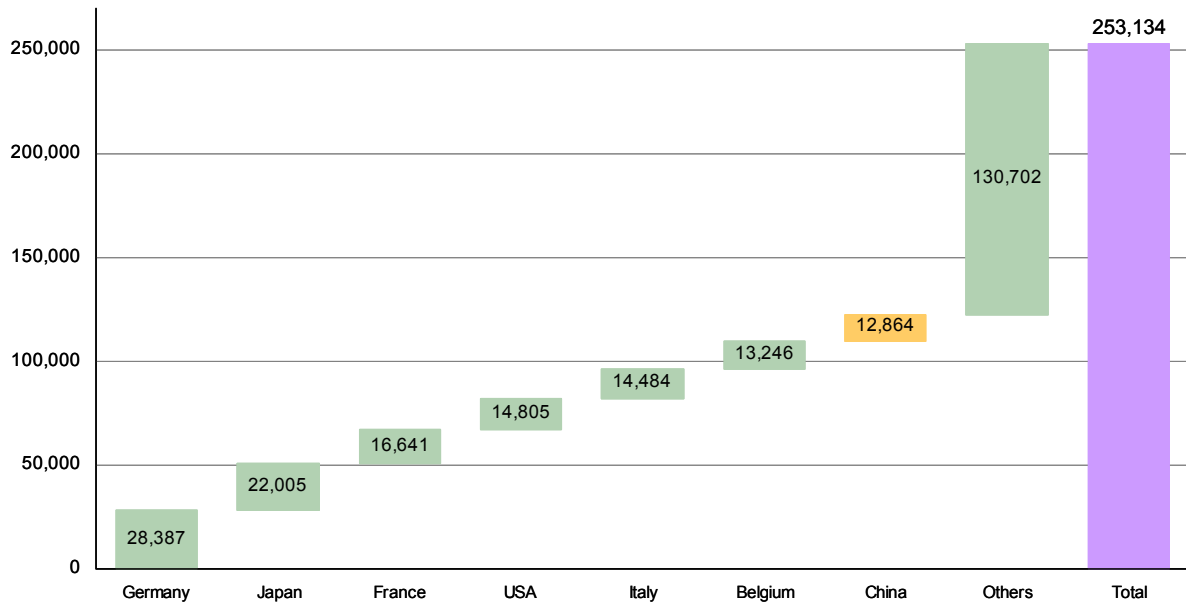
Iron and steel comprise about 95 percent of all of the tonnage of metal produced annually in the world.<sup>14</sup> In 2003, China was the fifth largest exporter of iron and steel by value, with total exports of US\$12.9 billion (Exhibit 4-9). China exports iron and steel primarily to the United States, Japan, and Hong Kong.

About half of Chinese export iron and steel traveling through the Canal is transported as bulk commodities and the rest as containerized cargo (52 percent).<sup>15</sup> Additionally, around 80 percent of the iron and steel transiting the Canal is destined for the US East Coast.

<sup>14</sup> US Department of the Interior, US Geological Survey.

<sup>15</sup> ACP database, US Waterborne Commerce 2003 database.

Exhibit 4-9  
**World Exports of Iron & Steel and Iron & Steel Products: 2003**  
 (US\$ million, current prices)



Source: UN COMTRADE.

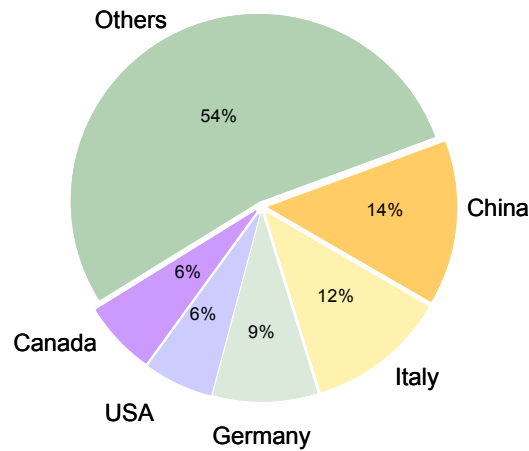
#### 4.3.4 Furniture & Lighting Fittings

Furniture is an end-product generally sold to consumers directly through retail stores. China produces a diversity of furniture: office, dining room, outdoor, bedroom, etc. In 2003, China was the largest exporter within the category of furniture and lighting, with US\$12.9 billion in exports (Exhibit 4-10). The majority of these exports are destined for the United States and Japan. During 1999 to 2003, Chinese furniture exports increased significantly, by more than 130 percent total.

In 2003, 89 percent of Chinese furniture exports were moved by sea, primarily as containerized cargo.<sup>16</sup> Approximately 80 percent of the containerized cargo from China transiting the Canal moves to the US East Coast. Based on US Waterborne Commerce 2003 data, furniture accounts for 19 percent of total containerized cargo weight.

<sup>16</sup> Customs General Administration of PR China.

Exhibit 4-10  
**World Exports of Furniture & Lighting Fittings: 2003**  
(percentage based on value)



Source: UN COMTRADE.

#### 4.3.5 Other Relevant Commodities

In addition to the major commodities mentioned, there is a smaller group of other commodities exported by China that are also Canal-relevant, such as petroleum products (including gasoline), toys, games & sports requisites, plastics & plastics products, petroleum coke, machinery and mechanical appliances, electrical machinery & equipment, fertilizers, footwear, paper & paperboard, and articles of apparel & clothing accessories.

##### Petroleum Products, Including Gasoline

Chinese petroleum products are composed of gasoline (39 percent), petroleum crude (37 percent), and petroleum oils and derivatives (23 percent). In 2003, China accounted for 1.6 percent of the total petroleum products exported worldwide. Petroleum products are liquid bulk commodities and 75 percent of those transiting the Canal were landed on the East Coast US in 2003.

##### Toys, Games & Sports Requisites

This category includes a wide range of items, e.g., tricycles, dolls, puzzles, casino game tables, bowling alley equipment, and athletics equipment. In 2003, China was the largest exporter of toys, games, and sports equipment, with 28 percent of the worldwide market, representing US\$13.2 billion.<sup>17</sup> Its main destinations for exports are the United States,

<sup>17</sup> UN COMTRADE.

Hong Kong, and Japan. Chinese toy exports has been increasing during the last five years at an annual rate of 15 percent.<sup>18</sup> Toys normally travel as containerized cargo. In 2003, around 80 percent of the containers transiting the Canal landed in the East Coast US. About 11 percent of containerized cargo by weight destined for the East Coast US from China is composed of toys, games and sport requisites, according to US Waterborne Commerce data for 2003.

### **Plastics & Plastics Products**

In 2003, China was the eighth largest exporter of plastic & plastic products, exporting US\$9.9 billion.<sup>19</sup> Importers of Chinese plastics include the United States, Hong Kong, and Japan.

Chinese plastics and plastic products transiting the Canal are transported in containers. In 2003, around 80 percent of containers from China transiting the Canal were imported by the East Coast US. About 8 percent of containerized cargo by weight destined for the East Coast US from China is composed of plastics and plastic products, according to US Waterborne Commerce data for 2003.

### **Petroleum Coke**

Petroleum coke is a solid residue from the cracking process in oil refining, which can be used as a source of energy. In 2003, China was the fourth largest exporter of petroleum coke by value, at US\$88 million.<sup>20</sup> The major importers of Chinese petcoke are the Russian Federation, Japan, and India. Petroleum coke is a bulk commodity and in transiting the Canal is mainly imported by the East Coast US.

### **Machinery & Mechanical Appliances**

This category includes machinery and appliances for industry, computer hardware, automated teller machines (ATMs), and other computer-based systems. In 2003, the world exported US\$1,000 billion in machinery and mechanical appliances, and China was the fourth largest exporter by value at US\$83.3 billion, representing 8 percent of the world's exports.<sup>21</sup> Chinese machinery and mechanical appliances are exported to the United States, Hong Kong, and Japan. Chinese exports of machinery and mechanical appliances have increased 44 percent annually during the last five years.<sup>22</sup>

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<sup>18</sup> Customs General Administration of PR China.

<sup>19</sup> UN COMTRADE.

<sup>20</sup> UN COMTRADE.

<sup>21</sup> UN COMTRADE.

<sup>22</sup> Customs General Administration of PR China.

Fifty-three percent of this commodity moves by sea from China, primarily in containers.<sup>23</sup> In 2003, around 80 percent of containers from China transiting the Canal were landed on the East Coast US. Approximately 6 percent of the container weight imported by the United States from China consists of machinery and mechanical appliances.<sup>24</sup>

### Electrical Machinery & Equipment

Electrical machinery & equipment is a category that includes a large range of commodities, e.g., electro-mechanical domestic appliances, vehicles parts (windscreen wipers, defrosters and demisters), and audio and video equipment. In 2003, China was the third largest exporter of this type of commodity after the United States and Japan. China exported 9 percent of the world's total exports of electrical machinery, at a value of US\$88.9 billion.<sup>25</sup> Major destinations for these exports are Hong Kong, the United States, and Japan.

Chinese exports in this category have increased by 28 percent annually in the last five years.<sup>26</sup> Sea trade accounts for 41 percent of exports of this commodity group, which moves in containers.<sup>27</sup> In 2003, around 80 percent of containers from China transiting the Canal were landed on the East Coast US. Approximately 5 percent of the container weight imported by the United States from China consists of electrical machinery and equipment.<sup>28</sup>

### Miscellaneous Fertilizers

This group includes fertilizers such as nitrogen, phosphorus, potassium, calcium, sulfur, and magnesium. In 2003, China exported US\$737 million worth of misc. fertilizers, which equals 7 percent of world exports of this commodity. Chinese fertilizers exported include urea (54 percent), diammonium phosphate (16 percent), superphosphates (10 percent) and potassium chloride (6 percent),<sup>29</sup> primarily to Vietnam, Bangladesh and the Republic of Korea. Fertilizers are liquid bulk commodities; all fertilizers transiting the Canal from China were destined for the US East Coast in 2003.

### Footwear

China is the largest exporter of footwear at 26 percent of total world exports in 2003, valued at US\$12.9 billion.<sup>30</sup> This category includes ready to wear footwear and pieces that are used in footwear production.

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<sup>23</sup> Customs General Administration of PR China.

<sup>24</sup> US Waterborne Commerce data, 2003.

<sup>25</sup> UN COMTRADE.

<sup>26</sup> Customs General Administration of PR China.

<sup>27</sup> Customs General Administration of PR China.

<sup>28</sup> US Waterborne Commerce data, 2003.

<sup>29</sup> UN COMTRADE.

<sup>30</sup> UN COMTRADE.

Chinese footwear exports had been increasing by 11 percent annually during the last five years,<sup>31</sup> primarily to the United States, Japan, and Hong Kong. Three-fourths of footwear exports move by sea in containers. In 2003, 80 percent of containers from China transiting the Canal were landed on the US East Coast. Approximately 3 percent of the container weight imported by the United States from China consists of footwear.<sup>32</sup>

## **Paper & Paperboard Articles**

Paper and paperboard articles can be intermediate goods or end-products. For example, this category includes newsprint, napkin and tissue paper, wallpaper, and office paper. In 2003, China exported 2 percent of the world's exports of this commodity, worth US\$2.3 billion.<sup>33</sup> Key importers are Hong Kong, the United States, and Japan. Chinese paper and paperboard exports have been increasing over the last five years, by 25 percent annually on average, with 73 percent of this commodity moving by sea in containers.<sup>34</sup> In 2003, 80 percent of containers from China transiting the Canal were landed on the US East Coast. Approximately 1 percent of the container weight imported by the United States from China consists of paper and paperboard articles.<sup>35</sup>

## **Articles of Apparel & Clothing Accessories**

The apparel category consists primarily of clothing and accessories ready for end consumer purchase through retail channels. In 2003, China was the largest exporter of apparel, with 23 percent of world exports, worth US\$45 billion.<sup>36</sup> Primary importers include Japan, Hong Kong, and the United States. Apparel has been increasing by 13 percent annually over the last five years, with 72 percent of Chinese apparel exports transported by sea in containers in 2003.<sup>37</sup> In 2003, 80 percent of containers from China transiting the Canal were landed on the US East Coast. Approximately 1 percent of the container weight imported by the United States from China consists of apparel.<sup>38</sup>

## **4.4 Canal-Relevant Chinese Import Commodities<sup>39</sup>**

### **4.4.1 Soybeans**

Mainland China imports soybeans mainly for direct consumption. Soybeans can be consumed raw or processed and can be transformed into a large variety of food and food-

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<sup>31</sup> Customs General Administration of PR China.

<sup>32</sup> US Waterborne Commerce data, 2003.

<sup>33</sup> UN COMTRADE.

<sup>34</sup> Customs General Administration of PR China.

<sup>35</sup> US Waterborne Commerce 2003 database.

<sup>36</sup> UN COMTRADE.

<sup>37</sup> Customs General Administration of PR China.

<sup>38</sup> US Waterborne Commerce 2003 database.

<sup>39</sup> Includes mainland China & Hong Kong, China. Data includes trade between mainland China & Hong Kong.



related products such as oil, crackers, vegetarian burgers, non-dairy cheese and milk, bread/flour, etc. Mainland China is the largest importer of soybeans in the world, importing 20.7 million tons (US\$5 billion) in 2003.

From 2002 to 2003, Mainland China increased its soybean imports by 83 percent, from 11.3 tons to 20.7 tons. The main exporters of soybeans to the world as well as to mainland China are the United States, Brazil, and Argentina. Soybeans are principally transported as dry bulk cargo. Practically all of mainland Chinese soybean imports transiting the Canal were exported from the US East Coast.

#### **4.4.2 Fertilizers**

Fertilizers are key components of agricultural production, enhancing the ability of existing land and soil resources to increase food production. In 2003, Chinese fertilizer imports included potassium chloride (43 percent), diammonium phosphate (29 percent), and mixed fertilizers containing nitrogen and phosphates (22 percent). Fertilizers are transported as bulk commodities. In 2003, mainland China imported US\$1.7 billion in fertilizers, of which 28 percent were imported from the United States. All mainland China fertilizers imports transiting the Canal were exported from the US East Coast.

#### **4.4.3 Pulpwood**

Wood currently provides the basis for approximately 90 percent of global pulp production. Pulp is a generic term for a wide range of technically distinct products resulting from manufacturing processes that involve the chemical and/or mechanical treatment of various types of plant material. The primary use for wood pulp is for the creation of paper and paperboard products. Mainland China pulpwood imports are composed of 55 percent wood pulp, 32 percent waste and scrap of paper or paperboard, and 13 percent other. In 2003, mainland China imported US\$2.6 billion in pulpwood, principally from the US, Canada, and Indonesia. Pulpwood is mainly transported in containers. Around 79 percent of mainland China pulpwood imports transiting the Canal were exported from the US East Coast.

#### **4.4.4 Scrap Metal**

Scrap metal is a diverse product category that is used for industrial purposes to manufacture different products. It is generally considered to include any metal product that is being recycled and reused. Mainland China's major imports of scrap metal are ferrous and copper scraps, transported as bulk commodities. In 2003, mainland China imported US\$3.2 billion of scrap metals, mainly from the US, Hong Kong and Japan. Around 84 percent of Chinese mainland scrap metal imports transiting the Canal were exported from the US East Coast.

#### **4.4.5 Other Relevant Commodities**

##### **Plastics**

Plastic are a Canal relevant commodity for mainland China and Hong Kong, China. Plastics can be considered intermediate goods as well as a final goods for direct consumption. Plastics are primarily containerized cargo. In 2003, mainland China imported US\$21 billion of plastics, of which only 8 percent came from the United States. Hong Kong imported US\$9.5 billion of plastics, mainly from Asian partners such as Japan and the Republic of Korea. Around 80 percent of total Chinese plastic imports transiting the Canal were exported from the US East Coast.

##### **Meat & Edible Meat**

Meat & edible meat is mainly used for direct customer consumption and in food processing. This commodity is principally imported by Hong Kong. In 2003, Hong Kong, imported 3 percent of world meat exports, equivalent to US\$1.3 billion, primarily from the US and Brazil. Meat is transported in containers or in refrigerated containers. Around 81 percent of Hong Kong meat imports transiting the Canal were exported from ECUS.

##### **Paper & Paperboard**

This commodity group includes intermediate goods (products that have been partially developed and processed for consumer use) or consumer ready products. Paper is transported as containerized cargo. In 2003, mainland China imported US\$4.3 billion in paper, of which 14 percent came from the US, while Hong Kong imported US\$2.2 billion, mainly from Japan and the US. Around 80 percent of Chinese paper imports transiting the Panama Canal were exported from the US East Coast.

##### **Miscellaneous Chemicals**

Chinese chemicals imports are very fragmented; however, the chemicals mix imported in 2003 included 18 percent polycarboxylic acids, 16 percent polyacetals, 9 percent chemical elements used in electronics, 8 percent of artificial corundum and 49 percent other chemicals. In 2003, mainland China imported US\$17.9 billion in misc. chemicals, of which 14 percent were imported from the US. The top mainland Chinese chemical providers are the Republic of Korea, Australia, and Japan. Around 94 percent of Chinese chemical imports transiting the Canal were exported from the US East Coast.

##### **Iron & Steel**

Iron & steel are the most common metals used in different industrial processes, in construction, and in car production. Mainland China imports iron & steel in bulk and in containers. In 2003, China imported iron and steel as 87 percent raw materials and 13

percent articles. Its main providers are Japan, the Republic of Korea, and the Russian Federation. Around 63 percent of Chinese iron and steel imports in bulk and 79 percent of Chinese iron and steel imports in containers were exported from the US East Coast.

## Copper

Copper is used in building construction, electronics and electronic products, transportation, industrial machinery, and consumer and general products. In 2003, mainland China was the largest importer of copper & articles of copper, importing US\$7.1 billion. Its main providers are Chile, Japan, and Republic of Korea. Copper & copper articles are mainly transported as containerized cargo. Around 79 percent of Chinese copper imports transiting the Canal were exported from the East Coast.

## Cotton

The cotton category includes cotton carded, yard, and woven. Cotton is used mainly in the textile industry. It is an intermediate or a raw material and is transported as containerized cargo. In 2003, mainland China was the largest cotton importer, importing US\$4.6 billion. Its main providers are the United States and Japan. Around 80 percent of Chinese cotton imports transiting the Canal were exported from the US East Coast.

## Petroleum Coke

As mentioned formerly, petroleum coke is obtained in the cracking process of oil refining. Like natural coke, it is mainly used in the iron and steel industries and as an energy source to generate electricity. In 2003, China imported US\$80 million of petroleum coke, of which 70 percent was imported from the United States as bulk cargo. Other providers of petcoke to China include Indonesia and the United Kingdom. Around 97 percent of Chinese petcoke imports transiting the Canal were exported from ECUS.

## Organic Chemicals

Organic chemicals include acyclic hydrocarbons, cyclic hydrocarbons, acyclic alcohols, nitrated, phenol, carboxylic acid, phosphoric esters, etc. The mix of organic chemicals imported by Hong Kong includes 20 percent compounds of nitrogen, 17 percent cyclic hydrocarbons, 9 percent acyclic alcohols and 54 percent other chemicals. Organic chemicals are used in industrial processes, such as the manufacture of foams, fibers, and coatings. Mainland China organic chemicals trade is not relevant to the Panama Canal but it is for Hong Kong, China.

Organic chemicals imported by Hong Kong are mainly transported as a containerized cargo. In 2003, Hong Kong imported US\$1.4 billion of organic chemicals, primarily from

Japan and the United States. Around 80 percent of Hong Kong organic chemicals transiting the Canal are exported from the US East Coast.

**5**

## **Canal-Relevant Commodities Analysis**

### **5.1 Methodology for Export Commodities Analysis**

This section provides the results of an analysis of the China 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 Chinese trade and the Chinese 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 China was determined.
2. For those commodities deemed relevant to China's overall trade, Mercer then determined the fraction of total landed cost (CIF) represented by Canal costs (toll and other maritime services) as a share of total landed freight cost (CIF). For the purposes of this analysis, the landed freight cost value chain was unbundled into FOB price, Canal toll and other maritime services, and freight, insurance, and other costs.
  - For bulk commodities, Mercer used a benchmark ratio in order to convert value into weight and weight into value. This ratio allowed Mercer to estimate the FOB price of the commodity transiting the Canal. This benchmark is based on the United States Foreign Trade Census 2003 for (in each case) imports and exports from or to China.
  - For containerized commodities, Mercer used the US Waterborne Commerce 2003 database for US imports from China to estimate FOB price and freight, insurance, and other costs.

- ACP transit data was used to determine Panama Canal transits for each commodity. 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.:

$$\text{Canal Cost}/(\text{FOB}+\text{Freight}+\text{Insurance}+\text{Toll}+\text{OMS}) = \text{Canal Cost as \% of CIF}$$

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

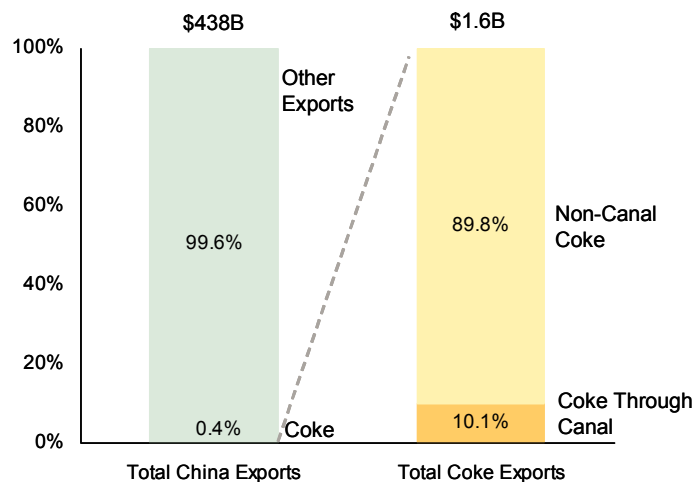
This methodology may have been slightly modified depending on the particular commodity analyzed (and if so, that information is noted below).

## 5.2 Natural Coke Analysis

### 5.2.1 Overview

Natural coke or coke is a bulk commodity representing 0.4 percent in value of mainland China’s total exports (Exhibit 5-1). In 2003, about 10 percent of total Chinese coke in value terms passed through the Canal.

Exhibit 5-1  
**Panama Canal Transit Share of Total Chinese Coke Exports: 2003**  
(US\$ billions, current prices)

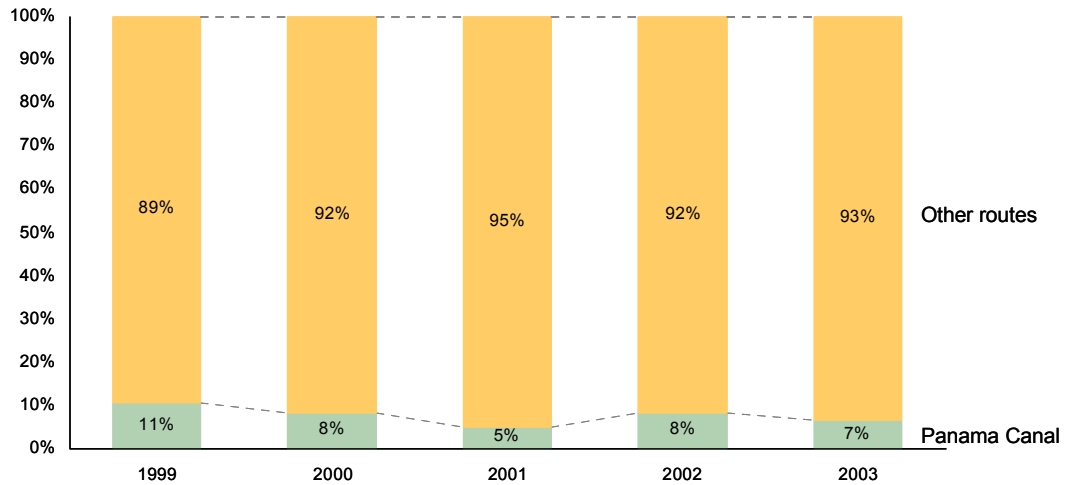


Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP database.

Chinese coke exports have been growing by 10 percent annually over the last five years. However, based on ACP data, Chinese coke exports transiting through the Canal have

remained constant during this period. In 2003, coke transiting the Canal represented 7 percent of total Chinese coke sea trade exports in metric cargo tons (Exhibit 5-2).

Exhibit 5-2  
**Chinese Natural Coke Sea Exports: 1999-2003**  
 (percentage based on weight)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP database.

### 5.2.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal cost for natural coke are shown in Exhibit 5-3. The total Canal charges represent 1.4 percent of coke CIF.

Exhibit 5-3  
**Total Canal Cost Share of Chinese Natural Coke Export CIF (Landed Cost)**  
 (US\$/ton)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Natural coke	\$ 180	\$ 7.16	\$ 2.66	\$ 190	1.4 %

Source: Mercer analysis, Foreign Trade Division US Census 2003, ACP database.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-4). This sensitivity analysis showed that the impact of a Canal toll increase on coke CIF would be minimal: the maximum increase of the Canal toll would increase the coke CIF price by only 2.3 percent, which is equivalent to US\$4 per metric ton.

Exhibit 5-4  
**Sensitivity Analysis of Chinese Coke CIF**  
 (US\$/ton)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.6%	1.1%	1.7%	2.3%
<b>New CIF price</b>	US\$191	US\$192	US\$194	US\$195

Source: Mercer analysis.

### 5.2.3 Analysis of Commodity Relevance

Natural coke represents only 0.4 percent of total mainland Chinese exports; around 10 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 2.3 percent on the CIF price of 0.04 percent of Chinese exports would therefore not materially affect the Chinese economy.

## 5.3 Ores Analysis

### 5.3.1 Overview

Ores are bulk commodities representing 0.1 percent in value of mainland China's total exports (Exhibit 5-5). In 2003, about 19 percent of total Chinese ores in value terms passed through the Canal.

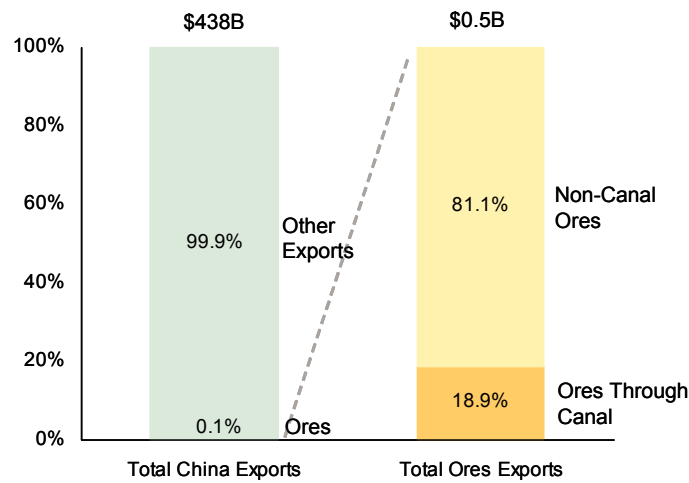
Chinese ores exports have been stable in terms of cargo tons over the past five years.<sup>40</sup> According to ACP data, Chinese export ores transiting the Canal increased on average by 6 percent annually over the same period. In 2003, ores transiting the Canal represented 19 percent of total Chinese sea trade ore exports in cargo tons (Exhibit 5-6).

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<sup>40</sup> UN COMTRADE.

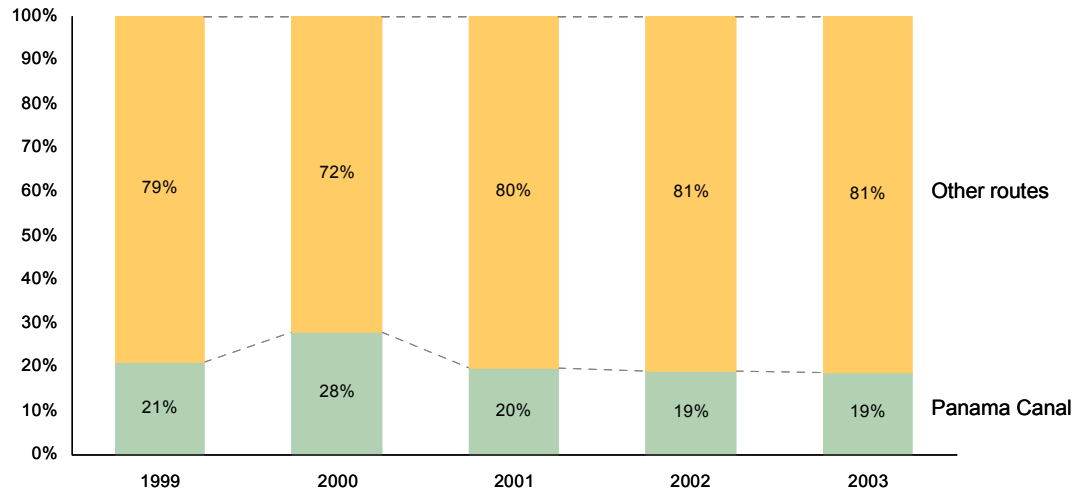


Exhibit 5-5  
**Panama Canal Transit Share of Total Chinese Ores Exports: 2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP database.

Exhibit 5-6  
**Chinese Ores Sea Exports: 1999-2003**  
 (percentage based in weight)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP database.

### 5.3.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for ores are shown in Exhibit 5-7. The analysis determined that the Canal total charges represent 1.2 percent of ores export CIF.

Exhibit 5-7

**Total Canal Cost Share of Chinese Ores Export CIF (Landed Cost)**  
(US\$/ton)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Ores	\$ 152	\$ 20.84	\$ 2.17	\$ 175	1.2%

Source: Mercer analysis, Foreign Trade Division US Census 2003, ACP database.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-8). This sensitivity analysis showed that the impact of a Canal toll increase on ore CIF would be minimal: the maximum increase of the Canal toll would increase the ore CIF price by only 1.9 percent, which is equivalent to US\$4 per metric ton.

Exhibit 5-8

**Sensitivity Analysis of Ores CIF**  
(US\$/ton)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.5%	1.0%	1.4%	1.9%
<b>New CIF price</b>	US\$176	US\$177	US\$178	US\$179

Source: Mercer analysis.

### 5.3.3 Analysis of Commodity Relevance

Ores represent only 0.1 percent of total mainland China exports; around 19 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 1.9 percent on the CIF price for 0.02 percent of Chinese exports would not materially affect the Chinese economy.

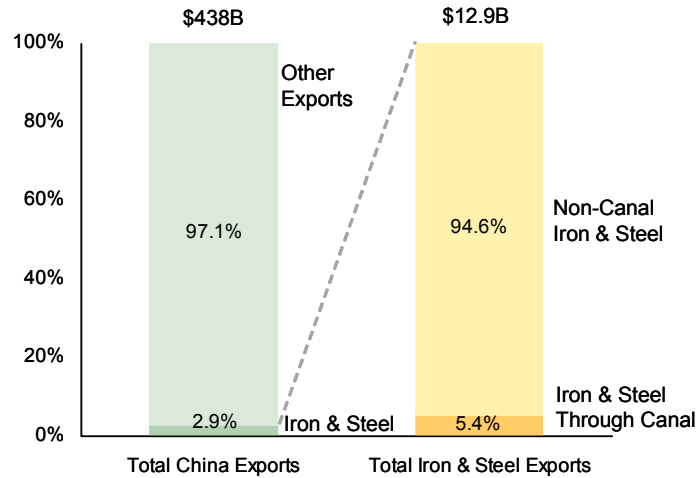
## 5.4 Iron & Steel

### 5.4.1 Overview

Iron & steel are transported as bulk commodities and as containerized cargo. Iron and steel represent 2.9 percent in value of mainland China's total exports (Exhibit 5-9). In 2003, about 5.4 percent of total Chinese iron and steel exports in value terms passed through the Canal.

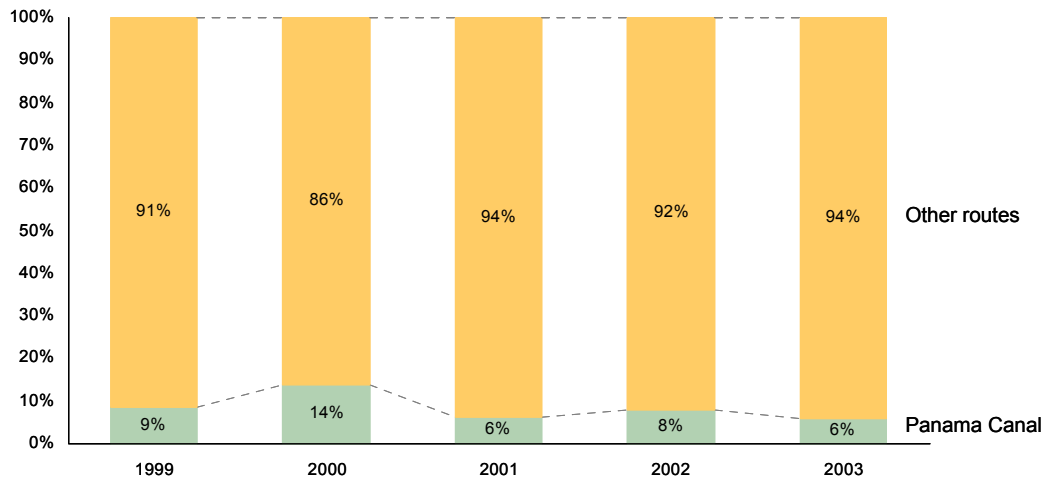
Chinese iron and steel sea exports have been growing by 23 percent annually over the last five years.<sup>41</sup> During the same period, Chinese iron & steel exports transiting the Canal have increased on average by 11 percent annually.<sup>42</sup> In 2003, iron & steel transiting the Canal represented 6 percent of total Chinese iron & steel sea trade exports in cargo tons (Exhibit 5-10).

**Exhibit 5-9**  
**Panama Canal Transit Share of Total Chinese Iron & Steel Exports: 2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, US Waterborne Commerce 2003 and ACP databases.

**Exhibit 5-10**  
**Chinese Iron & Steel Sea Exports: 1999-2003**  
 (thousands of metric tons)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP and US Waterborne Commerce 2003 databases.

<sup>41</sup> UN COMTRADE.

<sup>42</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

## 5.4.2 Panama Canal Cost Share of Landed Cost

Iron & steel are transported in two different modes: bulk and containers. The total CIF and Panama Canal total charges for this commodity group are shown in Exhibit 5-11 & Exhibit 5-12. The analysis determined that the Canal total charges represent 1 percent of iron & steel bulk CIF and 0.2 percent of iron & steel containerized cargo CIF.

Exhibit 5-11

### ***Canal Cost Share of Chinese Bulk Iron & Steel Export CIF (Landed Cost)*** (US\$/ton)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Iron & Steel and product (bulk)	\$ 254	\$ 34.70	\$ 2.97	\$ 292	1%

Source: Mercer analysis, US Waterborne Commerce 2003 database, ACP database.

Exhibit 5-12

### ***Landed Cost of Chinese Containerized Iron & Steel Exports: 2003*** (US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Iron & Steel and product (container)	\$ 15,592	\$ 1,902	\$ 40.61	\$ 17,535	0.2%

Source: Mercer analysis, US Waterborne Commerce 2003 database, ACP database.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-13 & Exhibit 5-14). This sensitivity analysis shows that the impact of a Canal toll increase on iron & steel CIF would be minimal: the maximum increase of the Canal toll would increase the iron & steel bulk CIF price by only 1.5 percent, which is equivalent to US\$4 per metric ton, and would increase the iron & steel containerized CIF by only 0.3 percent, which is equivalent to US\$61 per TEU.

Exhibit 5-13

**Sensitivity Analysis of Iron & Steel (Bulk) CIF**  
(US\$/ton)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact (bulk)</b>	0.4%	0.8%	1.1%	1.5%
<b>New CIF price (bulk)</b>	US\$293	US\$294	US\$295	US\$296

Source: Mercer analysis.

Exhibit 5-14

**Sensitivity Analysis of Iron & Steel (Container) CIF**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact (container)</b>	0.1%	0.2%	0.3%	0.3%
<b>New CIF price (container)</b>	US\$17,550	US\$17,565	US\$17,581	US\$17,596

Source: Mercer analysis.

### 5.4.3 Analysis of Commodity Relevance

Iron & steel represent only 2.9 percent of total mainland Chinese exports; around 5.4 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 1.5 percent on the CIF price for 0.16 percent on Chinese exports would not materially affect the Chinese economy.

## 5.5 Furniture & Lighting Fittings

### 5.5.1 Overview

Furniture and lighting fitting are mainly containerized cargos, representing 2.9 percent in value of mainland China's total exports (Exhibit 5-15). In 2003, about 19 percent of total Chinese furniture exports in value terms passed through the Canal.

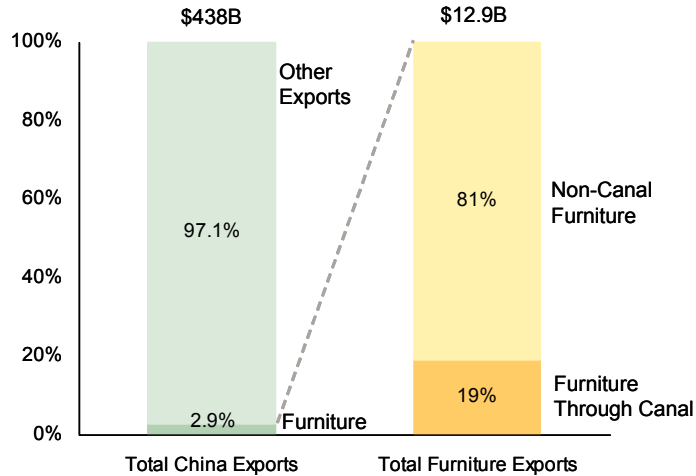
Chinese furniture sea exports have been growing by 35 percent annually over the last five years.<sup>43</sup> According to ACP data, furniture transiting the Canal has increased on average by 75 percent annually.<sup>44</sup> In 2003, furniture and lighting fittings transiting the Canal

<sup>43</sup> UN COMTRADE

<sup>44</sup> Mercer analysis, ACP database and US Waterborne Commerce 2003 database.

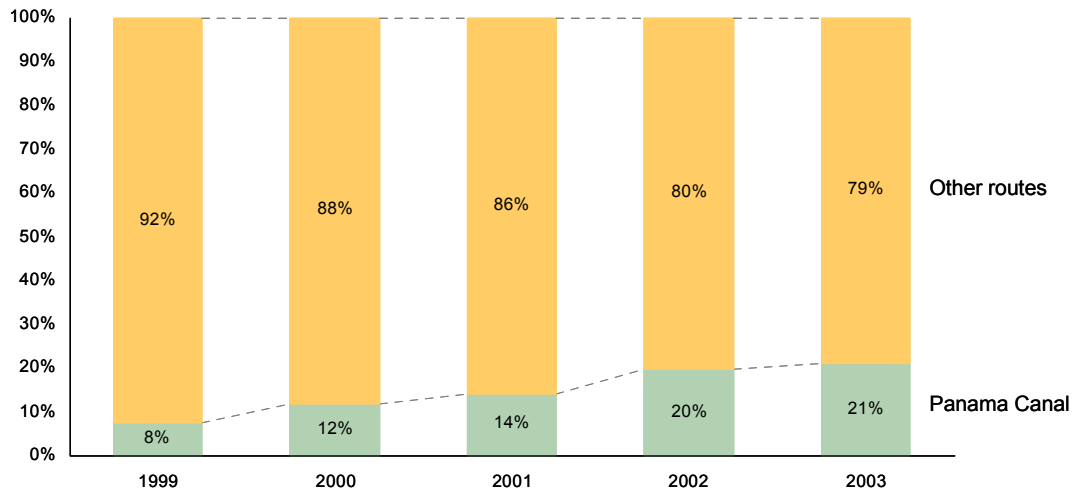
represented 21 percent of total Chinese furniture sea trade exports in cargo tons (Exhibit 5-16).

Exhibit 5-15  
**Panama Canal Transit Share of Total Chinese Furniture Exports: 2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, ACP and US Waterborne Commerce 2003 databases.

Exhibit 5-16  
**Chinese Furniture & Lighting Fittings Sea Exports: 1999-2003**  
 (percentage based in weight)



Source: Mercer analysis, Customs General Administration of PR China, ACP and US Waterborne Commerce 2003 databases.

### 5.5.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for this commodity group are shown in Exhibit 5-17. The analysis determined that the Canal total charges represent 0.4 percent of the CIF for furniture.

Exhibit 5-17

**Total Canal Cost Share of Chinese Furniture Export CIF (Landed Cost)**  
(US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Furniture	\$ 10,016	\$ 1,520	\$ 40.61	\$ 11,577	0.4%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-18). This sensitivity analysis shows that the impact of a Canal toll increase on coke CIF would be minimal: the maximum increase of the Canal toll would increase the coke CIF price by only 0.5 percent, which is equivalent to US\$61 per TEU, versus a high total CIF price of \$11,638 per TEU.

Exhibit 5-18

**Sensitivity Analysis of Furniture & Lighting Fittings CIF price**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.1%	0.3%	0.4%	0.5%
<b>New CIF price</b>	US\$11,592	US\$11,607	US\$11,622	US\$11,638

Source: Mercer analysis.

### 5.5.3 Analysis of Commodity Relevance

Furniture & lighting fittings represent only 2.9 percent of total mainland China exports; approximately 19 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 0.5 percent on the CIF price for 0.55 percent of Chinese exports would not materially affect the Chinese economy.

## 5.6 Petroleum Products, Including Gasoline

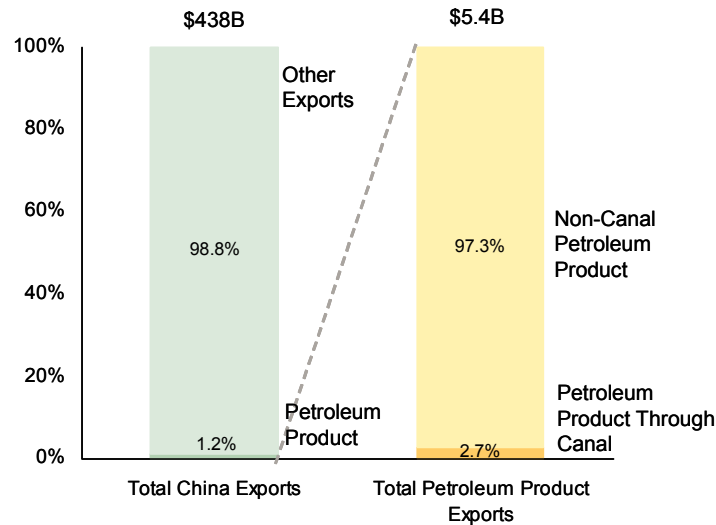
### 5.6.1 Overview

Petroleum products are liquid bulk commodities, representing 1.2 percent in value of mainland China's total exports (Exhibit 5-19). In 2003, about 2.7 percent of total Chinese petroleum products exports in value terms passed through the Canal.

In 2003, Chinese petroleum products exports grew by 20 percent in cargo tons.<sup>45</sup> According to ACP data, petroleum products transiting the Canal have increased on average by 82 percent annually during 1999-2003.<sup>46</sup> In 2003, petroleum products transiting the Canal represented 3 percent of total Chinese petroleum product sea trade exports in cargo tons (Exhibit 5-20).

Exhibit 5-19

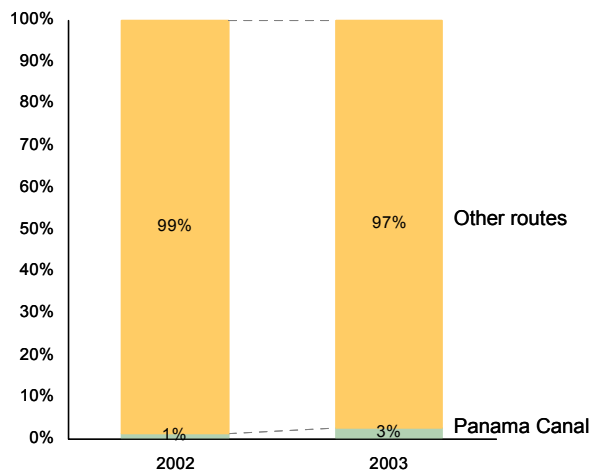
**Panama Canal Transit Share of Chinese Petroleum Products Exports: 2003**  
(US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP database.

Exhibit 5-20

**Chinese Petroleum Products Sea Exports, 2002-2003**  
(percentage based in weight)



Source: Mercer analysis, UN COMTRADE, ACP database.

<sup>45</sup> UN COMTRADE.

<sup>46</sup> ACP database.



### 5.6.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for this commodity group are shown in Exhibit 5-21. The analysis determined that the Canal total charges represent 0.9 percent of the CIF for petroleum products.

Exhibit 5-21

**Canal Cost Share of Chinese Petroleum Product Export CIF (Landed Cost)**  
(US\$/ton)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Petroleum products	\$ 245	\$ 21	\$ 2.44	\$ 268	0.9%

Source: Mercer analysis, Foreign Trade Division US Census 2003, ACP database.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-22). This sensitivity analysis shows that the impact of a Canal toll increase on petroleum products CIF would be minimal: the maximum increase in the Canal toll would increase the petroleum products CIF price by only 1.4 percent, which is equivalent to US\$4 per metric ton.

Exhibit 5-22

**Sensitivity Analysis of Petroleum Products CIF price**  
(US\$/ton)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.4%	0.7%	1.1%	1.4%
<b>New CIF price</b>	US\$269	US\$270	US\$271	US\$272

Source: Mercer analysis.

### 5.6.3 Analysis of Commodity Relevance

Petroleum products represent only 1.2 percent of total mainland China exports; around 2.7 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 1.4 percent on the CIF price for 0.05 percent on Chinese exports would not materially affect the Chinese economy.

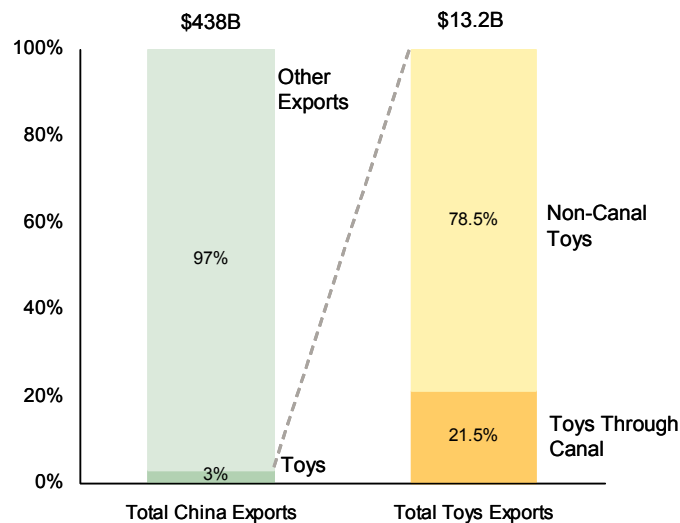
## 5.7 Toys, Games & Sports Requisites

### 5.7.1 Overview

Toys, games and sport requisites are mainly containerized cargos, representing 3 percent in value of mainland China’s total exports (Exhibit 5-23). In 2003, about 21.5 percent of total Chinese toy exports in value terms passed through the Canal.

Chinese sea exports of toys, games and sport requisites have been growing by 31 percent annually over the last five years.<sup>47</sup> According to ACP and US Waterborne Commerce data, Chinese toy exports transiting the Canal increased on average by 73 percent annually during the same period.<sup>48</sup> In 2003, toys, games and sport requisites transiting the Canal represented 30 percent of total Chinese sea trade toy exports in cargo tons (Exhibit 5-24).

Exhibit 5-23  
**Panama Canal Transit Share of Total Chinese Toys Exports: 2003**  
 (US\$ billions, current prices)

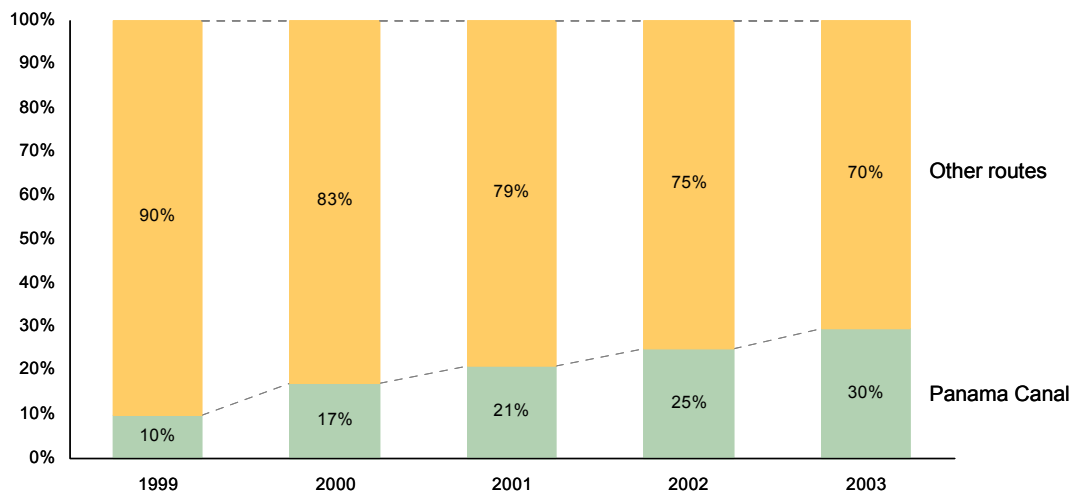


Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

<sup>47</sup> UN COMTRADE.

<sup>48</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

Exhibit 5-24  
**Chinese Toys Sea Exports: 1999-2003**  
 (percentage based in weight)



Source: Mercer analysis, Customs General Administration of PR China, ACP and US Waterborne Commerce 2003 databases.

### 5.7.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for this commodity group are shown in Exhibit 5-25. The analysis determined that the Canal total charges represent 0.2 percent of the CIF for toys.

Exhibit 5-25  
**Total Canal Cost Share of Chinese Toys Export CIF (Landed Cost)**  
 (US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Toys	\$ 17,177	\$ 1,301	\$ 40.61	\$ 18,519	0.2%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-26). This sensitivity analysis shows that the impact of a Canal toll increase on the toy CIF would be minimal: the maximum increase in the Canal toll would increase the toy products CIF price by only 0.3 percent, which is equivalent to US\$61 per TEU, versus a high total CIF of US\$18,580 per TEU.

Exhibit 5-26

**Sensitivity Analysis of Toys, Games & Sports Requisites CIF price**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.1%	0.2%	0.2%	0.3%
<b>New CIF price</b>	US\$18,534	US\$18,550	US\$18,565	US\$18,580

Source: Mercer analysis.

### 5.7.3 Analysis of Commodity Relevance

Toys, games & sports requisites represent only 3 percent of total mainland China exports; around 21.5 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 0.35 percent on the CIF price for 0.6 percent of total Chinese exports would not materially affect the Chinese economy.

## 5.8 Plastics & Plastic Products

### 5.8.1 Overview

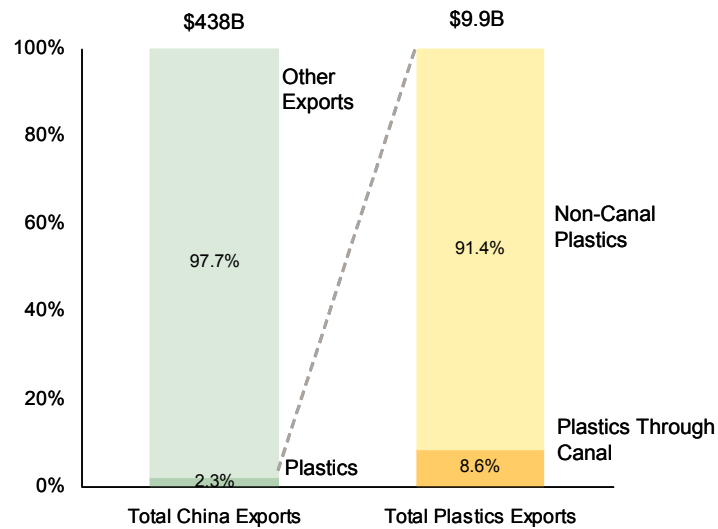
Plastics & plastic products are mainly containerized cargos, representing 2.3 percent in value of mainland China's total exports (Exhibit 5-27). In 2003, about 8.6 percent of total Chinese export plastics in value terms passed through the Canal.

Chinese plastics & plastic product sea exports have been growing by 18 percent annually over the last five years.<sup>49</sup> According to ACP and US Waterborne Commerce 2003 data, plastics transiting the Canal increased on average by 72 percent annually during the same period.<sup>50</sup> In 2003, plastics & plastic products transiting the Canal represented 9 percent of total Chinese sea trade plastics exports in cargo tons (Exhibit 5-28).

<sup>49</sup> Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 database.

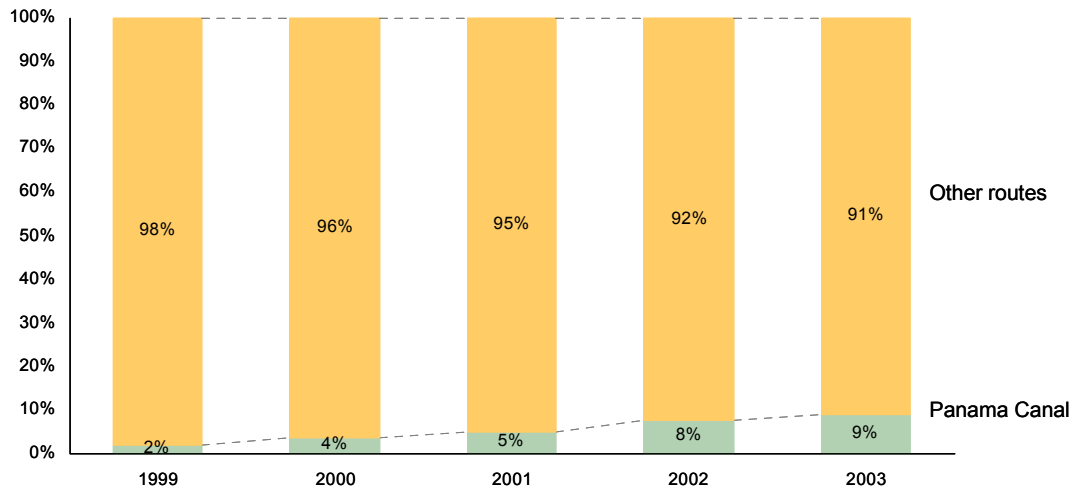
<sup>50</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

Exhibit 5-27  
**Panama Canal Transit Share of Total Chinese Plastics Exports: 2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

Exhibit 5-28  
**Chinese Plastics & Plastics Products Sea Exports: 1999-2003**  
 (percentage based on weight)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

### 5.8.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for this commodity group are shown in Exhibit 5-29. The analysis determined that the Canal total charges represent 0.2 percent of the CIF for plastics.

Exhibit 5-29

**Total Canal Cost Share of Chinese Plastics Export CIF (Landed Cost)**  
(US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Plastic & plastic products	\$15,563	\$ 1,704	\$ 40.61	\$ 17,308	0.2%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-30). This sensitivity analysis shows that the impact of a Canal toll increase on plastics CIF would be minimal: the maximum increase in the Canal toll would increase the plastics CIF price by only 0.4 percent, which is equivalent to US\$61 per metric ton, versus a high total CIF of US\$17,369 per ton.

Exhibit 5-30

**Sensitivity Analysis of Plastics & Plastics Products CIF Price**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.1%	0.2%	0.3%	0.4%
<b>New CIF price</b>	US\$17,323	US\$17,338	US\$17,353	US\$17,369

Source: Mercer analysis.

### 5.8.3 Analysis of Commodity Relevance

Plastics & plastic products represent only 2.3 percent of total mainland China exports; around 8.6 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 0.4 percent on the CIF price for 0.2 percent of Chinese exports would not materially affect the Chinese economy.

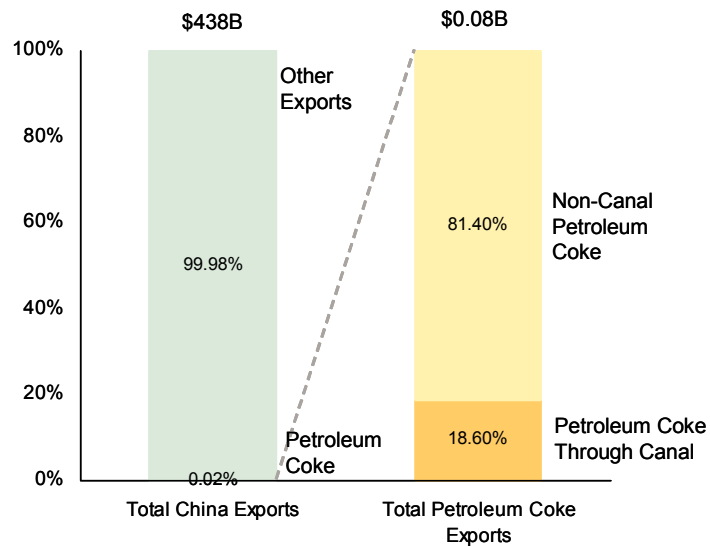
## 5.9 Petroleum Coke

### 5.9.1 Overview

Petroleum coke is a bulk commodity, representing 0.02 percent in value of mainland China's total exports (Exhibit 5-31). In 2003, about 19 percent of total Chinese petroleum coke in value terms passed through the Canal.

In 2003, Chinese petroleum coke exports grew by 3 percent.<sup>51</sup> According to ACP data, petroleum coke transiting the Canal has increased on average by 19 percent annually during 1999-2003.<sup>52</sup> In 2003, petroleum coke transiting the Canal represented 19 percent of total Chinese petroleum coke sea trade exports in cargo tons (Exhibit 5-32).

Exhibit 5-31  
**Panama Canal Transit Share of Chinese Petroleum Coke Exports: 2003**  
 (US\$ billions, current prices)

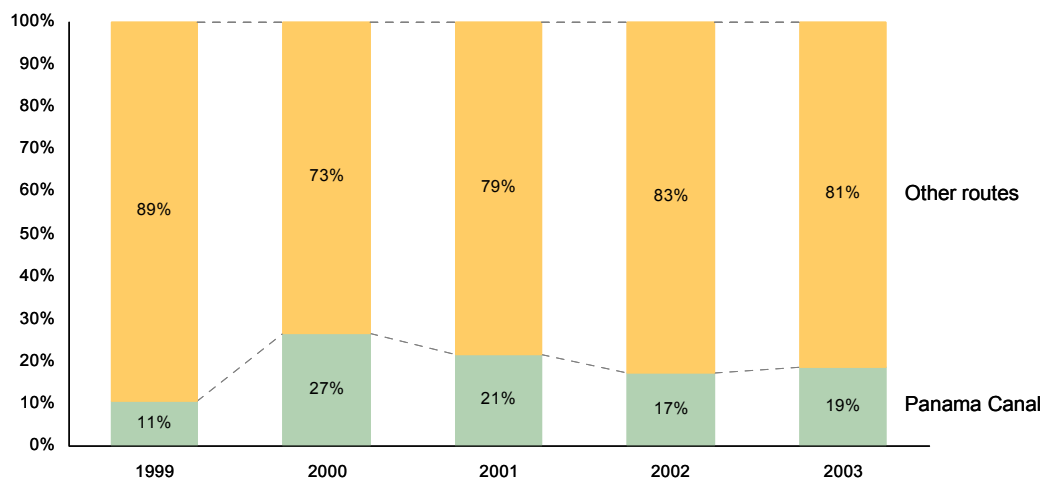


Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP database.

<sup>51</sup> UN COMTRADE.

<sup>52</sup> Mercer analysis, ACP database.

Exhibit 5-32  
**Chinese Petroleum Coke Sea Exports, 2002-2003**  
 (percentage of weight)



Source: Mercer analysis, UN COMTRADE, ACP database.

### 5.9.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for petcoke are shown in Exhibit 5-33. The analysis determined that the Canal total charges represent 1.6 percent of the CIF for petcoke.

Exhibit 5-33  
**Total Canal Cost Share of Chinese Petcoke Export CIF (Landed Cost)**  
 (US\$/ton)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Petroleum coke	\$ 110	\$ 33.50	\$ 2.37	\$ 146	1.6%

Source: Mercer analysis, Foreign Trade Division US Census 2003, ACP database.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-34). This sensitivity analysis shows that the impact of a Canal toll increase on pet coke CIF would be minimal: the maximum increase in the Canal toll would increase the petcoke CIF price by only 2.5 percent, which is equivalent to US\$4 per metric ton.



Exhibit 5-34

**Sensitivity Analysis of Petroleum Coke CIF price**  
(US\$/ton)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.6%	1.3%	1.9%	2.5%
<b>New CIF price</b>	US\$147	US\$148	US\$149	US\$150

Source: Mercer analysis.

### 5.9.3 Analysis of Commodity Relevance

Petroleum coke represents only 0.02 percent of total mainland China exports; around 18.6 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 2.5 percent on the CIF price for 0.004 percent on Chinese exports would not materially affect the Chinese economy.

## 5.10 Machinery and Mechanical Appliances

### 5.10.1 Overview

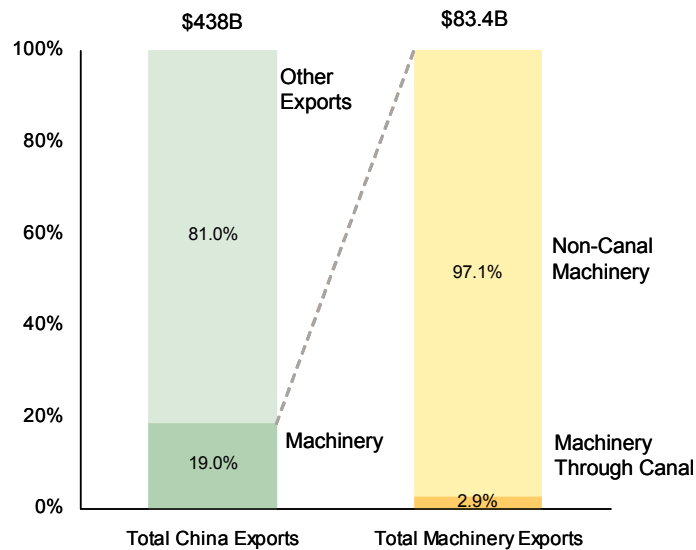
Machinery & mechanical appliances are mainly containerized cargos, representing 19 percent in value of mainland China's total exports (Exhibit 5-35). In 2003, about 2.9 percent of total Chinese machinery & mechanical appliances in value terms passed through the Canal.

Chinese machinery & mechanical appliances sea exports have been growing by 44 percent annually over the past five years.<sup>53</sup> According to ACP and US Waterborne Commerce 2003 data, machinery & mechanical appliances transiting the Canal increased on average by 80 percent annually during the same period.<sup>54</sup> In 2003, machinery & transiting the Canal represented 4 percent of total Chinese machinery sea trade exports in cargo tons (Exhibit 5-36).

<sup>53</sup> Customs General Administration of PR China.

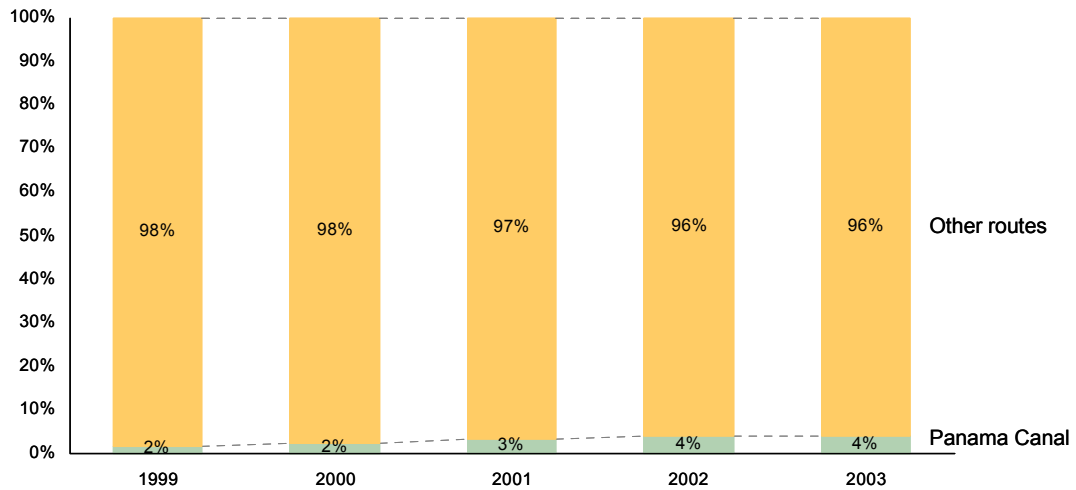
<sup>54</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

Exhibit 5-35  
**Panama Canal Transit Share of Total Chinese Machinery Exports: 2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

Exhibit 5-36  
**Chinese Machinery Sea Exports: 1999-2003**  
 (percentage based on weight)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

### 5.10.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for this commodity group are shown in Exhibit 5-37. The analysis determined that the Canal total charges represent 0.1 percent of the CIF for machinery and mechanical appliances.

Exhibit 5-37

**Total Canal Cost Share of Chinese Machinery Export CIF (Landed Cost)**  
(US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Machinery & mechanical appliances	\$ 36,849	\$ 1,430	\$ 40.61	\$ 38,319	0.1%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-38). This sensitivity analysis shows that the impact of a Canal toll increase on machinery CIF would be minimal: the maximum increase in the Canal toll would increase the machinery CIF price by only 0.16 percent, which is equivalent to US\$61 per TEU, versus a high total CIF of \$38,380.

Exhibit 5-38

**Sensitivity Analysis of Machinery & Mechanical Appliances CIF price**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.04%	0.08%	0.12%	0.16%
<b>New CIF price</b>	US\$38,334	US\$38,350	US\$38,365	US\$38,380

Source: Mercer analysis.

### 5.10.3 Analysis of Commodity Relevance

Machinery & mechanical appliances represent only 19 percent of total mainland China exports and around 2.9 percent of Chinese exports transiting the Canal. A maximum impact of 0.16 percent on the CIF price for 0.5 percent on Chinese exports would not materially affect the Chinese economy.

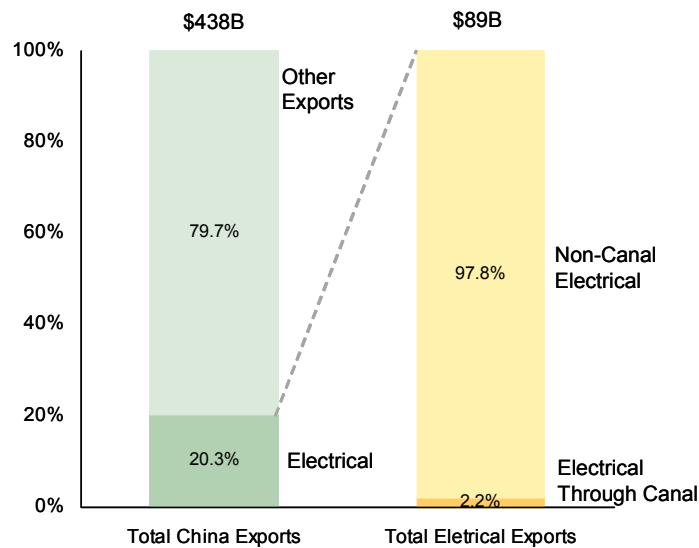
## 5.11 Electrical Machinery & Equipment

### 5.11.1 Overview

Electrical machinery & equipment are mainly containerized cargos, representing 20 percent in value of mainland China's total exports (Exhibit 5-39). In 2003, about 2.2 percent of total Chinese electrical machinery & equipment exports in value terms passed through the Canal.

Chinese electrical machinery & equipment sea exports have been growing by 28 percent annually over the last five years.<sup>55</sup> According to ACP and US Waterborne Commerce 2003 data, electrical machinery & equipment transiting the Canal increased on average by 70 percent annually during the same period.<sup>56</sup> In 2003, electrical machinery & equipment transiting the Canal represented 3 percent of total Chinese electrical machinery & equipment sea trade exports in cargo tons (Exhibit 5-40).

Exhibit 5-39  
**Panama Canal Transit Share of Total Chinese Electrical Machinery & Equipment Exports: 2003**  
 (US\$ billions, current prices)

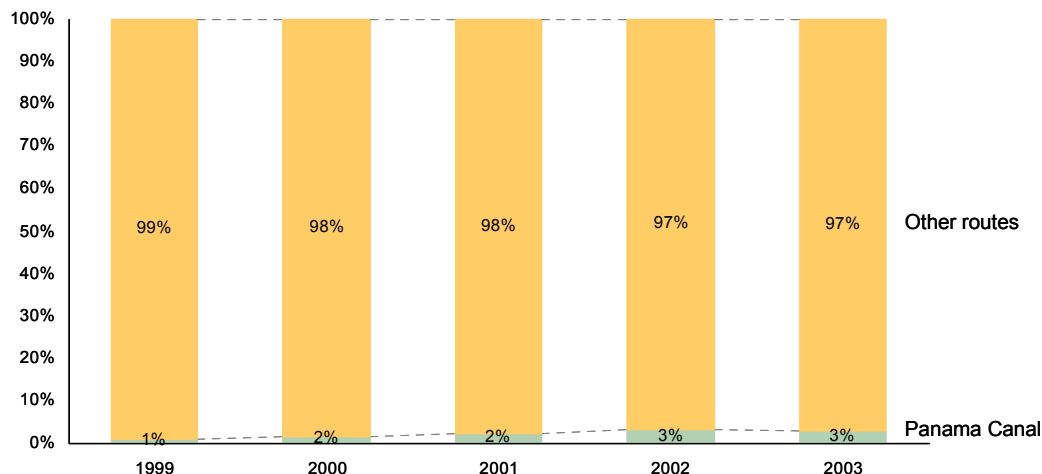


Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

<sup>55</sup> Customs General Administration of PR China.

<sup>56</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

Exhibit 5-40  
**Chinese Electrical Machinery & Equipment Sea Exports: 1999-2003**  
 (percentage based on weight)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

### 5.11.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for this commodity group are shown in Exhibit 5-41. The analysis determined that the Canal total charges represent 0.1 percent of the CIF for electrical machinery and equipment.

Exhibit 5-41  
**Canal Cost Share of Chinese Electrical Machinery Export CIF (Landed Cost)**  
 (US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Electrical machinery & equipment	\$ 38,163	\$ 1,712	\$ 40.61	\$ 39,916	0.1%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-42). This sensitivity analysis shows that the impact of a Canal toll increase on the electrical machinery CIF would be minimal: the maximum increase in the Canal toll would increase the electrical machinery CIF price by a very low 0.16 percent, which is equivalent to US\$61 per TEU, versus a total CIF of US\$39,977.

Exhibit 5-42

**Sensitivity Analysis of Electrical Machinery & Equipment CIF price**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.04%	0.08%	0.11%	0.15%
<b>New CIF price</b>	US\$39,931	US\$39,946	US\$39,962	US\$39,977

Source: Mercer analysis.

### 5.11.3 Analysis of Commodity Relevance

Electrical machinery & equipment represent only 20 percent of total mainland China exports; around 2.2 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 0.15 percent on the CIF price for 0.4 percent of Chinese exports would not materially affect the Chinese economy.

## 5.12 Miscellaneous Fertilizers

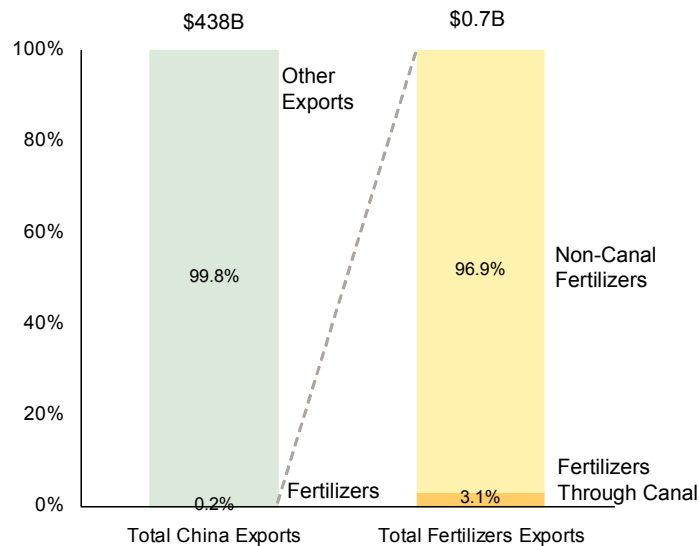
### 5.12.1 Overview

Fertilizers are liquid bulk commodities, representing 0.02 percent in value of mainland China's total exports (Exhibit 5-43). In 2003, about 19 percent of total Chinese fertilizers in value terms passed through the Canal. During 2000 to 2003, Chinese fertilizers exports grew by 28 percent.<sup>57</sup> According to the Canal database, fertilizers transiting the Canal increased by 80 percent annually over the same period.<sup>58</sup> In 2003, fertilizers transiting the Canal represented 3 percent of the total Chinese fertilizers sea trade exports in cargo tons (Exhibit 5-44).

<sup>57</sup> UN COMTRADE.

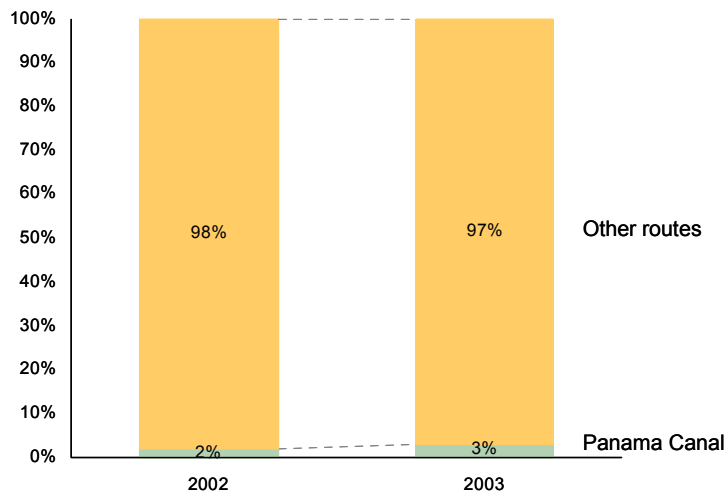
<sup>58</sup> Mercer analysis, ACP database.

Exhibit 5-43  
**Panama Canal Transit Share of Total Chinese Fertilizers Exports: 2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, Foreign Trade Division US Census 2003, ACP database.

Exhibit 5-44  
**Chinese Fertilizers Sea Exports, 2002-2003**  
 (percentage of weight)



Source: Mercer analysis, UN COMTRADE, ACP database.

### 5.12.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for misc. fertilizers are shown in Exhibit 5-45. The analysis determined that the Canal total charges represent 1.3 percent of the CIF for fertilizers.

Exhibit 5-45

**Total Canal Cost Share of Chinese Fertilizers Export CIF (Landed Cost)**  
(US\$/ton)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Fertilizers	\$ 146	\$ 20	\$ 2.26	\$ 168	1.3%

Source: Mercer analysis, Foreign Trade Division US Census 2003, ACP database.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-46). This sensitivity analysis shows that the impact of a Canal toll increase on fertilizer CIF would be minimal: the maximum increase in the Canal toll would increase the fertilizer CIF price by only 2.1 percent, which is equivalent to US\$3 per metric ton.

Exhibit 5-46

**Sensitivity Analysis of Fertilizers CIF price**  
(US\$/ton)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.5%	1%	1.6%	2.1%
<b>New CIF price</b>	US\$169	US\$170	US\$171	US\$171

Source: Mercer analysis.

### 5.12.3 Analysis of Commodity Relevance

Fertilizers represent only 0.2 percent of total mainland China exports; around 3.1 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 2.1 percent on the CIF price for 0.006 percent of Chinese exports would not materially affect the Chinese economy.

## 5.13 Footwear

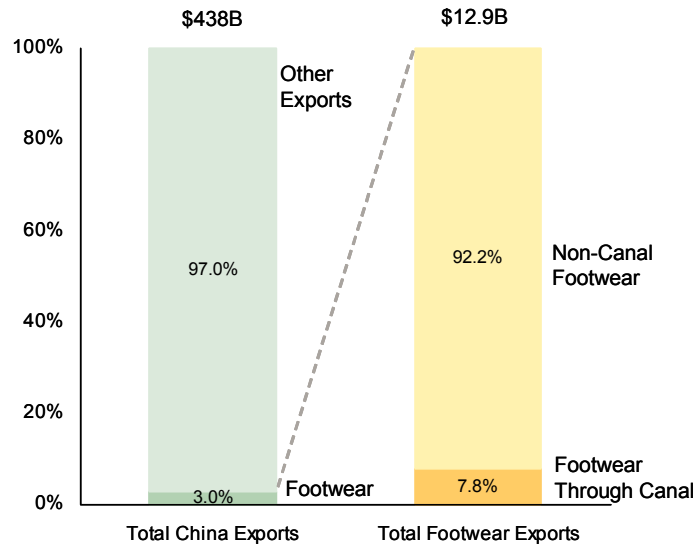
### 5.13.1 Overview

Footwear is mainly containerized cargo, representing 3 percent in value of mainland China's total exports (Exhibit 5-47). In 2003, about 7.8 percent of total Chinese footwear exports in value terms passed through the Canal.



Chinese footwear exports have been growing by 11 percent annually over the last five years.<sup>59</sup> According to ACP and US Waterborne Commerce 2003 data, footwear transiting the Canal has increased on average by 68 percent annually during this period.<sup>60</sup> In 2003, footwear transiting the Canal represented 8 percent of total Chinese footwear sea trade exports in cargo tons (Exhibit 5-48).

Exhibit 5-47  
**Panama Canal Transit Share of Total Chinese Footwear Exports: 2003**  
 (US\$ billions, current prices)

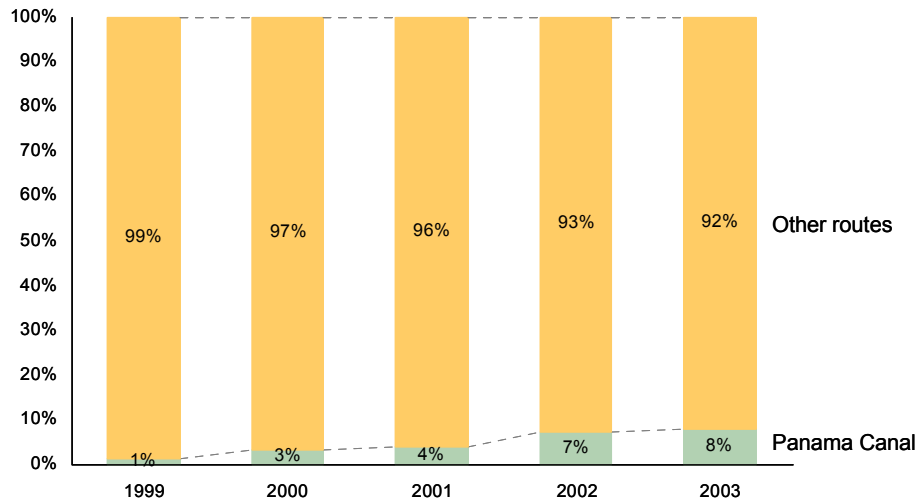


Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

<sup>59</sup> Customs General Administration of PR China.

<sup>60</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

Exhibit 5-48  
**Chinese Footwear Sea Exports: 1999-2003**  
 (percentage based on weight)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

### 5.13.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for footwear are shown in Exhibit 5-49. The analysis determined that the Canal total charges represent 0.1 percent of the CIF for footwear.

Exhibit 5-49  
**Total Canal Cost Share of Chinese Footwear Export CIF (Landed Cost)**  
 (US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Footwear	\$ 29,683	\$ 1,433	\$ 40.61	\$ 31,156	0.1%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-50). This sensitivity analysis shows that the impact of a Canal toll increase on footwear CIF would be minimal: the maximum increase in the Canal toll would increase the footwear CIF price by a very low 0.2 percent, which is equivalent to US\$61 per TEU, versus a CIF of US\$31,217 per TEU.

Exhibit 5-50

**Sensitivity Analysis of Footwear CIF price**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.05%	0.1%	0.15%	0.20%
<b>New CIF price</b>	US\$31,171	US\$31,187	US\$31,202	US\$31,217

Source: Mercer analysis.

**5.13.3 Analysis of Commodity Relevance**

Footwear represents only 3 percent of total mainland China exports; around 7.8 of Chinese exports of this commodity transit the Canal. A maximum impact of 2 percent on the CIF price for 0.2 percent of Chinese exports would not materially affect the Chinese economy.

**5.14 Paper & Paperboard Articles**

**5.14.1 Overview**

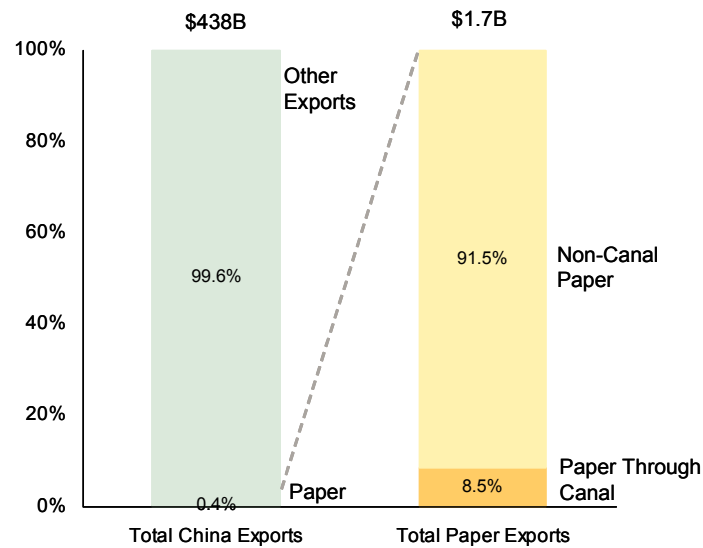
Paper & paperboard articles are mainly containerized cargo, representing 0.4 percent in value of mainland China's total exports (Exhibit 5-51). In 2003, about 8.5 percent of total Chinese paper & paperboard articles in value terms passed through the Canal.

Chinese paper sea exports have been growing by 41 percent annually over the last five years.<sup>61</sup> According to ACP and US Waterborne Commerce 2003 data, paper transiting the Canal increased on average by 87 percent annually during the same period.<sup>62</sup> In 2003, paper & paperboard articles transiting the Canal represented 9 percent of total Chinese paper sea trade exports in cargo tons (Exhibit 5-52).

<sup>61</sup> Customs General Administration of PR China, US Waterborne Commerce 2003 data and Mercer analysis.

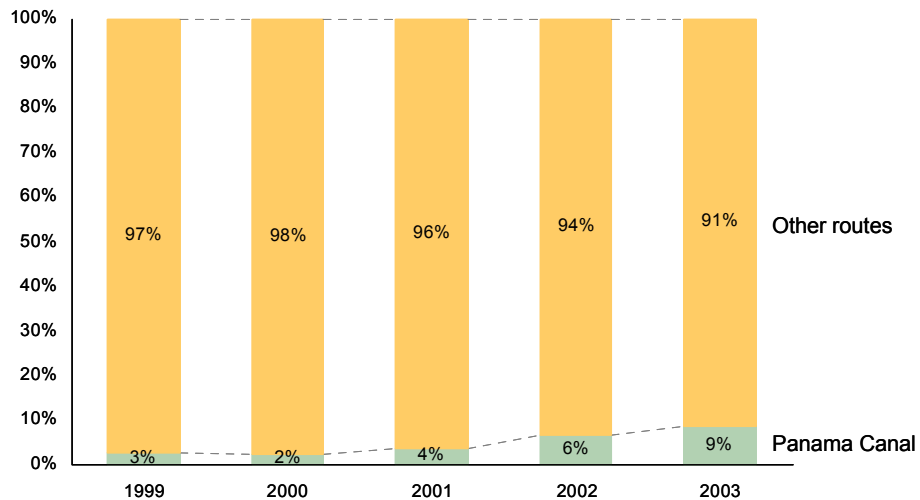
<sup>62</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

Exhibit 5-51  
**Panama Canal Transit Share of Total Chinese Paper Exports: 2003**  
 (US\$ billions, current prices)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

Exhibit 5-52  
**Chinese Paper Sea Exports: 1999-2003**  
 (percentage based on weight)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003, US Waterborne Commerce 2003 and ACP databases.

### 5.14.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for paper and paperboard are shown in Exhibit 5-53. The analysis determined that the Canal total charges represent 0.2 percent of the CIF for paper and paperboard.

Exhibit 5-53

#### **Total Canal Cost Share of Chinese Paper Export CIF (Landed Cost)** (US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Paper & paperboard articles	\$ 19,071	\$ 1,890	\$ 40.61	\$ 21,000	0.2%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-54). This sensitivity analysis shows that the impact of a Canal toll increase on paper CIF would be minimal: the maximum increase in the Canal toll would increase the paper CIF price by only 0.3 percent, which is equivalent to US\$61 per TEU, versus a high total CIF of US\$22,284 per TEU.

Exhibit 5-54

#### **Sensitivity Analysis of Paper & Paperboard articles CIF price** (US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.1%	0.1%	0.2%	0.3%
<b>New CIF price</b>	US\$22,238	US\$22,253	US\$22,269	US\$22,284

Source: Mercer analysis.

### 5.14.3 Analysis of Commodity Relevance

Paper & paperboard articles represent only 0.4 percent of total mainland China exports; 8.5 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 0.3 percent on the CIF price for 0.03 percent of Chinese exports would not materially affect the Chinese economy.

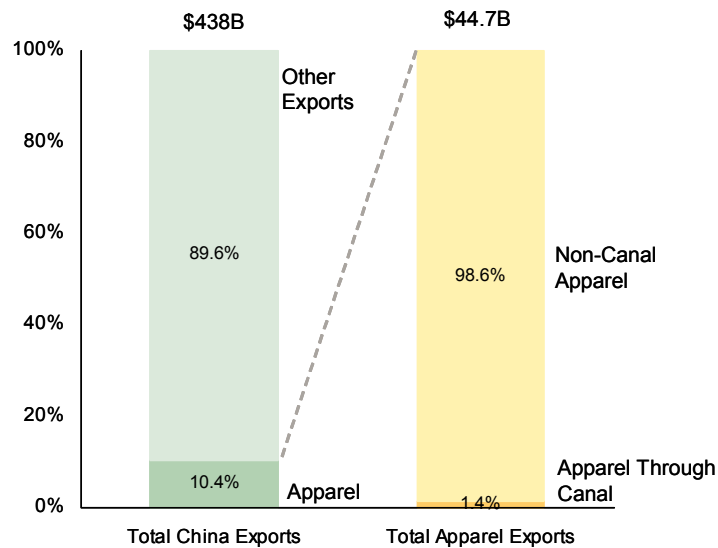
## 5.15 Articles of Apparel & Clothing Accessories

### 5.15.1 Overview

Apparel is mainly containerized cargo, representing 10.4 percent in value of mainland China’s total exports (Exhibit 5-55). In 2003, about 1.4 percent of total Chinese apparel in value terms passed through the Canal.

Chinese apparel sea exports have been growing by 17 percent annually over the last four years.<sup>63</sup> According to ACP and US Waterborne Commerce 2003 data, Chinese export apparel transiting the Canal increased on average by 85 percent annually over the same period.<sup>64</sup> In 2003, apparel transiting the Canal represented 2 percent of total Chinese apparel sea trade exports in cargo tons (Exhibit 5-56).

Exhibit 5-55  
**Panama Canal Transit Share of Total Chinese Apparel Exports: 2003**  
 (US\$ billions, current prices)

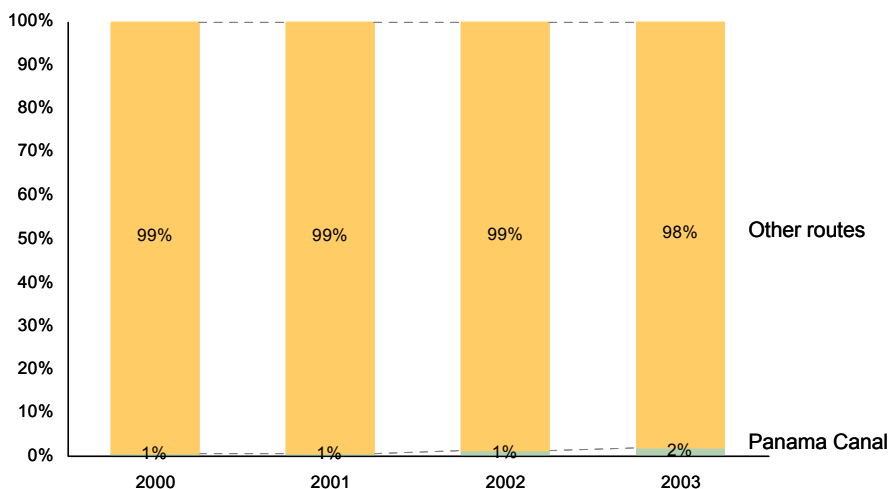


Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

<sup>63</sup> Customs General Administration of PR China, US Waterborne Commerce 2003 data and Mercer analysis.

<sup>64</sup> Mercer analysis, ACP database, US Waterborne Commerce 2003 database.

Exhibit 5-56  
**Chinese Apparel Sea Exports: 1999-2003**  
 (percentage based on weight)



Source: Mercer analysis, Customs General Administration of PR China, US Waterborne Commerce 2003 and ACP databases.

### 5.15.2 Panama Canal Cost Share of Landed Cost

The total CIF and Panama Canal total charges for apparel are shown in Exhibit 5-57. The analysis determined that the Canal total charges represent 0.1 percent of the CIF for apparel.

Exhibit 5-57  
**Total Canal Cost Share of Chinese Apparel Export CIF (Landed Cost)**  
 (US\$/TEU)

	<b>FOB</b>	<b>Charges (Freight &amp; Insurance)</b>	<b>Canal Cost (Toll + OMS)</b>	<b>Total CIF</b>	<b>Canal Cost as % of CIF</b>
Apparel	\$ 54,458	\$ 2,132	\$ 40.61	\$ 56,630	0.1%

Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

Additionally, a sensitivity analysis was developed to estimate the impact of a Canal toll increase on the landed cost price (Exhibit 5-58). This sensitivity analysis shows that the impact of a Canal toll increase on apparel CIF would be minimal: the maximum increase in the Canal toll would increase apparel CIF price by 0.1 percent, which is equivalent to US\$61 per TEU, versus a high CIF value of US\$56,691 per TEU.

Exhibit 5-58

**Sensitivity Analysis of Apparel CIF price**  
(US\$/TEU)

<b>Toll increase</b>	<b>50%</b>	<b>100%</b>	<b>150%</b>	<b>200%</b>
<b>CIF price impact</b>	0.03%	0.05%	0.08%	0.11%
<b>New CIF price</b>	US\$ 56,645	US\$56,661	US\$56,676	US\$56,691

Source: Mercer analysis.

**5.15.3 Analysis of Commodity Relevance**

Apparel represents only 10.4 percent of total mainland China exports; only 1.4 percent of Chinese exports of this commodity transit the Canal. A maximum impact of 0.1 percent on the CIF price for 0.14 percent of Chinese exports would not materially affect the Chinese economy.

**5.16 Analysis of Total Relevant Chinese Imports**

To ensure a thorough analysis of the effects of an increase in Panama Canal tolls, Chinese commodity imports were analyzed in addition to exports. For the purposes of this analysis, only the most significant commodities, representing approximately 70 percent of Chinese import tons passing through the Panama Canal, were analyzed. Imports analyzed in this section include both mainland China and Hong Kong, China imports in aggregate.

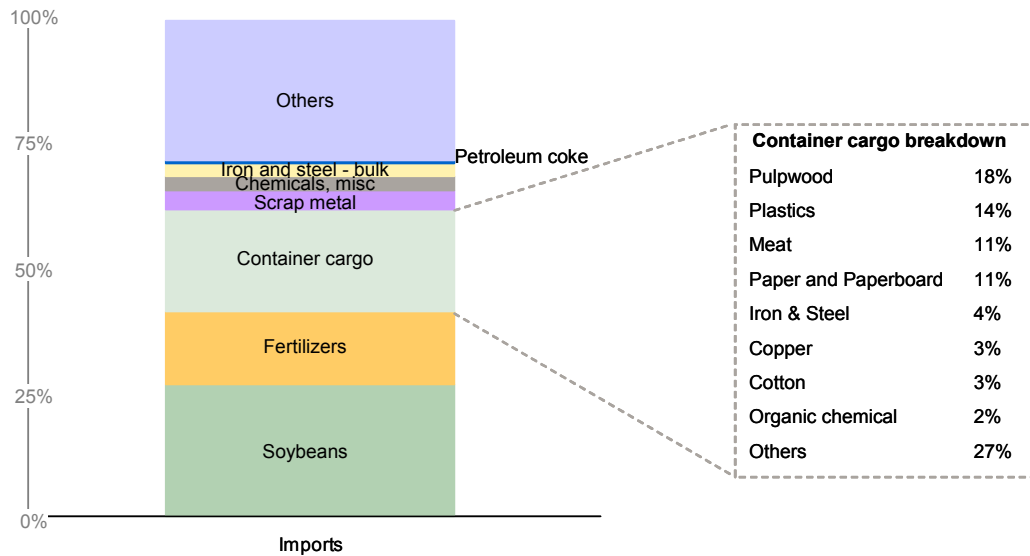
Exhibit 5-59 shows Canal-relevant commodities imported into China.<sup>65</sup> The largest imports for China include various fertilizers, metals such as iron & steel and scrap metal, soybeans, and some containerized merchandise such as pulpwood, plastics, meat, and paper.

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<sup>65</sup> Containerized imports were broken down using US Waterborne Commerce 2003 data for US exports to China in containers.



Exhibit 5-59  
**Average Canal Relevant Chinese Imports: 1999-2003**  
 (percentage of tons)



Source: Mercer analysis, US Waterborne Commerce 2003 and ACP databases.

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:

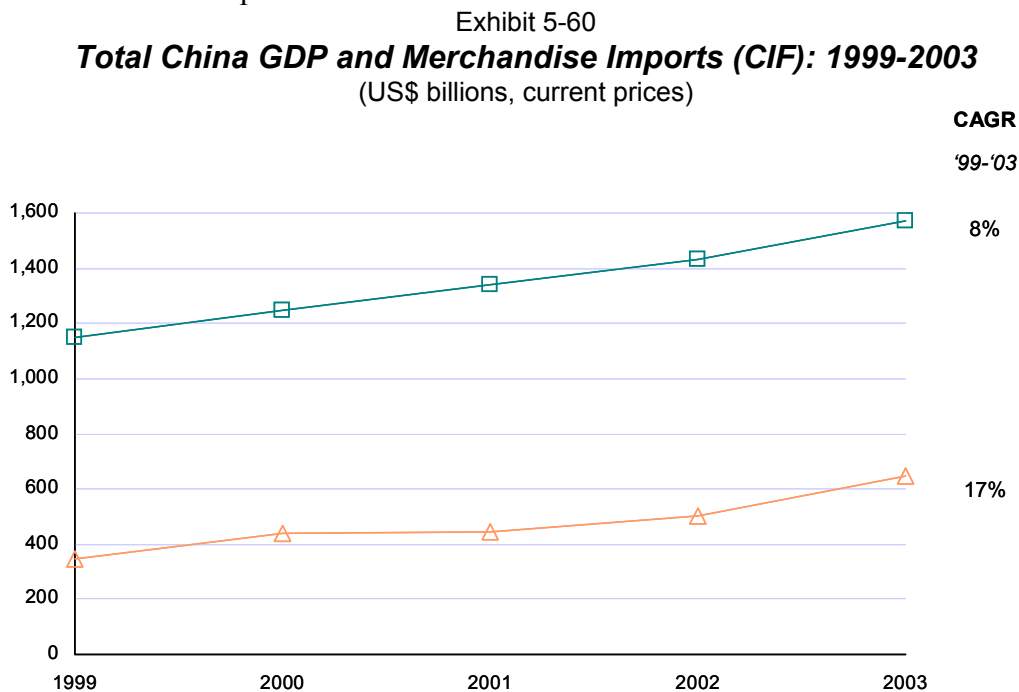
- One approach would be to examine the effect of the Panama Canal toll increases on the final consumer price for all of the relevant commodities imported. This method would evaluate the impact of a Canal toll increase relative to import tariffs, inland transportation costs, distribution and retailer mark-ups, and final state and federal taxes, and would take into account the total impact on the Chinese CPI (Consumer Price Index) and consequently on inflation.
- A more technical approach would be to evaluate the impact of a Canal toll increase on Chinese inflation and GDP by performing an analysis to capture the relationship between major Chinese 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 Chinese economy, assuming that everything else is constant. Therefore, a Panama Canal toll increase would be equivalent to a transfer of income from China 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 Chinese national income represented by the imports that are passing through the Panama Canal
- The Chinese 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 5-60 shows the relative significance of international imports to China’s economy. From 1999 to 2003, China’s GDP grew on average by 8 percent per year, less than half as fast as merchandise imports.



Source: International Monetary Fund World Economic Outlook Database (September 2004), UN COMTRADE.

As mentioned above, approximately 70 percent of Chinese Canal-relevant imports were analyzed in order to determine their share in CIF value of total imports and of GDP. Exhibit 5-61 illustrates the relevant values used for this analysis.

In 2003, Chinese imports transiting the Panama Canal accounted for 0.7 percent of total merchandise imports (valued in CIF terms). Additionally, Chinese imports transiting the Panama Canal represented only 0.3 percent of Chinese GDP in 2003. Thus, the Canal (and associated toll increases) are relevant for only a small portion of Chinese imports, which represent an even smaller contribution to China’s GDP (Exhibit 5-62).

Exhibit 5-61

**Canal-Relevant Chinese Imports Analyzed**

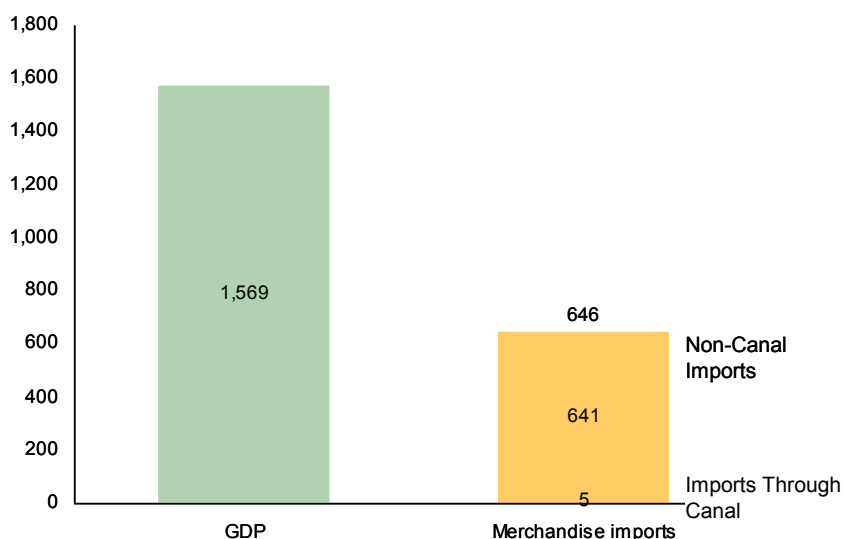
Commodity	Canal Share	Canal Transit Tons 2003	CIF/Ton	CIF Value of Canal Transit Tons
Soybeans	27%	3,917,308	\$ 261	\$ 1,023,070,628
Fertilizers, misc.	15%	2,190,475	\$ 194	\$ 424,869,535
Scrap metal	4%	600,468	\$ 258	\$ 154,735,276
Iron & steel	3%	384,856	\$ 535	\$ 205,915,931
Chemicals	3%	405,425	\$ 1,631	\$ 661,174,130
Petroleum coke	1%	91,618	\$ 56	\$ 5,093,746
Container cargo	18%	2,672,882	\$ 790	\$ 2,110,806,785
Other	30%	2,187,903		
<b>Total CIF Value of Panama Canal Transit Tons</b>				<b>\$ 4,585,666,031</b>

Source: Mercer analysis, UN COMTRADE, US Waterborne Commerce 2003 database.

Exhibit 5-62

**Canal Relevant Imports Relative to Chinese Goods Imports and GDP**

(US\$ billions, current prices)



Source: International Monetary Fund World Economic Outlook Database (September 2004), UN COMTRADE, ACP database.

In 2003, China’s current account surplus was US\$60.1 billion, or 3.8 percent of GDP. An increase in import prices, due to an increase in Canal tolls, would diminish the surplus and reduce national income. Our analysis, however, determined that the impact would be very small – even if Canal tolls were increased by 200 percent for all Chinese imports that transit the Canal, the cost of total goods imports would grow by 0.007 percent, the current account would remain at 3.8 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 likely be imperceptible.

**6**

## **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 Chinese import and export commodities. In this section, we summarize the impacts of Panama Canal transit cost changes on the Chinese economy as a whole.

### **6.1 Impact of Transit Cost Changes for Exports**

Fourteen major Chinese export commodities (representing approximately 70 percent of China 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 Chinese economy as a whole:

- The portion of the exported commodity that transits the Canal
- The relative importance of the commodity to total Chinese exports
- The Canal transit cost impact on the final landed cost of the commodity (CIF)

#### **6.1.1 Exported Commodities that Transit the Canal**

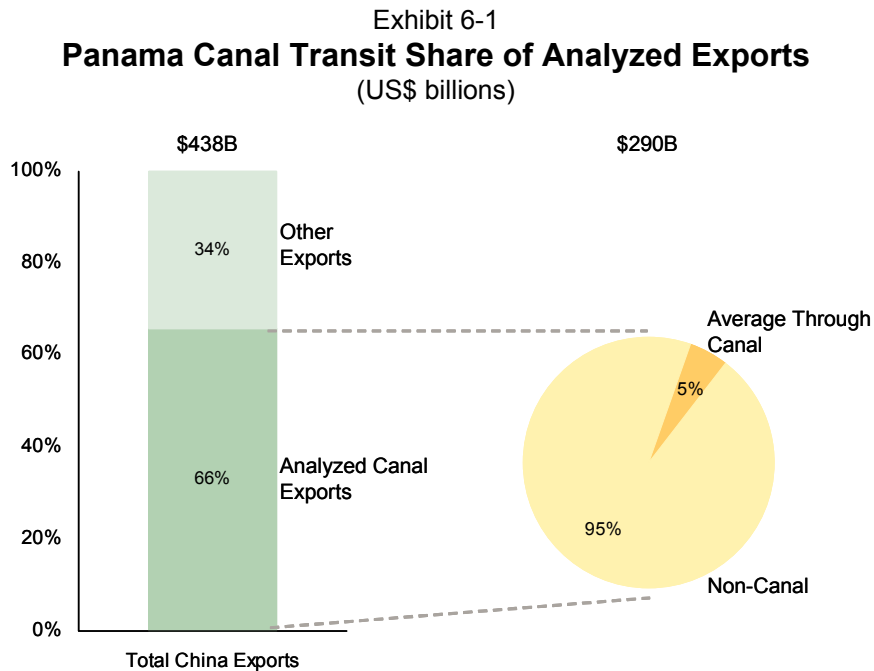
Overall, Panama Canal relevant exports, including all containerized cargo, make up only 3.1 percent<sup>66</sup> of total Chinese exports.

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<sup>66</sup> 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 66 percent of total Chinese export value in 2003; approximately 5 percent of this value transited the Panama Canal.

For thirteen of the fourteen commodities, the portion of exports that transit the Canal represents less than one-fifth of each commodity's total export value. Only one commodity has more than a fifth of export value moving through the Canal: toys, games & sports requisites (21.5 percent of exports by value).



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

### **6.1.2 Commodity Importance Relative to Chinese Exports**

Chinese exports are highly fragmented. In 2003, no Chinese export commodity constituted more than 1 percent of total Chinese exports. Of the fourteen Canal-relevant commodities analyzed, only three accounted for 0.5 percent or more of Chinese exports:

- Toys, games & sports requisites – 0.7 percent of total Chinese exports. Only 21.5 percent of toys exports transit the Canal.
- Furniture & lighting fittings – 0.6 percent of total Chinese exports. Only 19 percent of furniture & lighting fittings transit the Canal.
- Machinery & mechanical appliances – 0.5 percent of total Chinese exports. Only 3 percent of machinery & mechanical appliances exports transit the Canal

The small volume of each commodity's exports that transit the Canal reduces the impact of any transit cost changes on the Chinese economy as a whole.

### **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 none of the commodities have total Canal transit costs of more than 2 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 all of the commodities, none of these would experience an increase in total landed cost of more than 2.5 percent.

In the case of toys, games & sports requisites, furniture & lighting fittings, and machinery & mechanical appliances exports, for example, which as noted above are significant exports relative to total Chinese exports, a Canal toll increase of 200 percent would cause CIF to rise by only 0.3 percent for toys, 0.5 percent for furniture, and 0.1 percent for machinery & mechanical appliances. While these trades have high CIF values per TEU, making them significant to the Chinese economy overall, this also serves to reduce 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.

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 China Exports	5. Canal Transit Cost Share of CIF	6. 200% Toll Increase Impact on CIF
Natural coke	\$ 169	10%	\$ 1,675	0.4%	1.4%	2.3%
Iron & Steel: Bulk	\$ 92	1%	\$ 12,863	2.9%	1.0%	1.5%
Misc. Ores	\$ 107	19%	\$ 568	0.1%	1.2%	1.9%
Petroleum products (incl. gasoline)	\$ 147	3%	\$ 5,401	1.2%	0.9%	1.4%
Misc. Fertilizers	\$ 23	3%	\$ 738	0.2%	1.3%	2.1%
Coke Petroleum	\$ 16	19%	\$ 88	0.02%	1.6%	2.5%
<i>Containerized cargo</i>						
Furniture & Lighting Fittings	\$ 2,435	19%	\$ 12,899	2.94%	0.4%	0.5%
Toys, Games & Sports Requisites	\$ 2,852	21%	\$ 13,282	3.03%	0.2%	0.3%
Plastics & Plastics Products	\$ 861	9%	\$ 9,990	2.28%	0.2%	0.4%
Machinery & Mechanical Appliances	\$ 2,383	3%	\$ 83,406	19.02%	0.1%	0.2%
Electrical Machinery & Equipment	\$ 1,935	2%	\$ 89,040	20.31%	0.1%	0.2%
Footwear	\$ 1,007	8%	\$ 12,957	2.96%	0.1%	0.2%
Paper & Paperboard Articles	\$ 145	8%	\$ 1,709	0.39%	0.2%	0.3%
Articles of Apparel & Clothing Accessories	\$ 628	1%	\$ 45,772	10.44%	0.1%	0.1%
Iron and steel: Containerized cargo	\$ 602	5%	\$ 12,864	2.93%	0.2%	0.3%

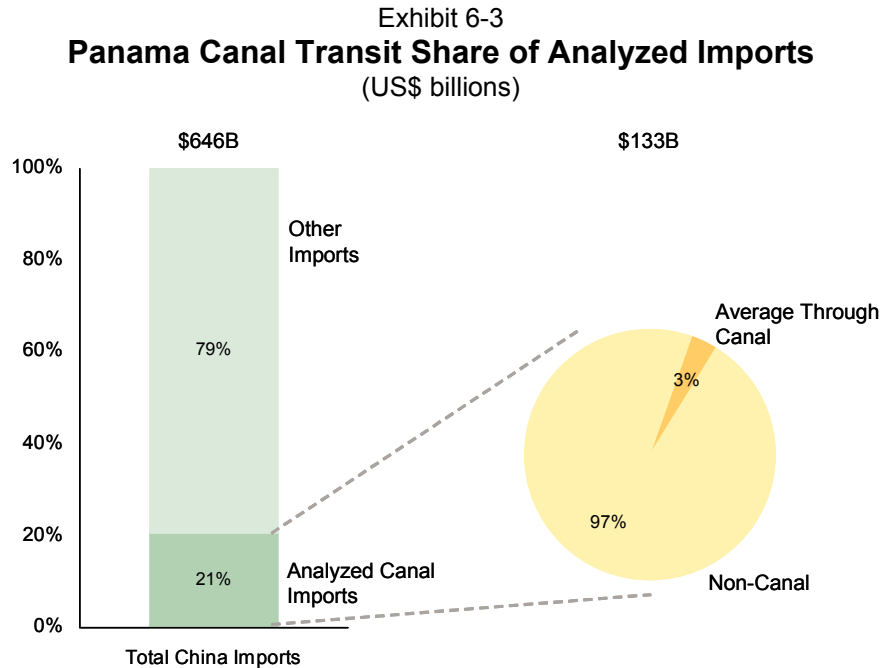
Source: ACP, US Waterborne Databank, UN COMTRADE.

Description of columns:

- 7 The merchandise value of the Canal-relevant portion of exports for each commodity
- 8 The percent of the total export value for each commodity that transits the Canal
- 9 The total value of all Chinese exports of each commodity, regardless of transportation mode or route
- 10 The percent of total Chinese exports FOB value accounted for by each commodity
- 11 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
- 12 The percent change in the CIF as a result of a 200 percent increase in the Panama Canal toll for ships carrying this commodity

## 6.2 Impact of Transit Cost Changes for Imports<sup>67</sup>

In 2003, only 0.6 percent of the total \$646 billion in Chinese import value transited the Panama Canal (Exhibit 6-3). An analysis of Chinese Canal-relevant import commodities determined that the effect of a Canal toll increase on the total cost of Chinese imports and on GDP would be negligible. If the toll were to increase by 200 percent, the cost of total Chinese imports would increase by only 0.007 percent, with a minimal impact on GDP of -0.003 percent.



Source: ACP, US Waterborne Databank, WTO, UN COMTRADE.

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 China, or on the principal industries that provide Canal-relevant export commodities.

<sup>67</sup> Includes mainland China and Hong Kong, China. Data includes trade between mainland China & Hong Kong.



For imports, the Canal toll represents a very small portion of the final landed cost (CIF) and the most significant Canal-relevant imports that were analyzed in the report only account for 0.7 percent of Total Chinese imports. Additionally, even a large Canal-toll increase would have virtually no effect on the cost of total Chinese imports or on GDP. For exports, thirteen of fourteen Canal-relevant commodities analyzed transit less than 20 percent of their value through the Canal, and of the commodity for which a significant portion does transit the Canal, it does not account for more than 0.007 percent of total Chinese exports.

Lastly, the larger question facing China 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 on the critical supply chains that serve China 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 consideration of adding capacity to the Canal - recognizing that the capital expense will have to be paid for through tolls - is the more critical issue facing China economy, rather than the essentially negligible impact of the transit cost increases examined in this study.

**MERCER**  
Management Consulting

Mercer Management Consulting, Inc.  
200 Clarendon Street, 12th Floor  
Boston, MA 02116-5026  
1 617 424 3200