

Changing Maritime Shipping Patterns between Asian Countries in the Asian-Pacific Economic Cooperation Agreement and the United States: Is There a Role for Short Sea Shipping on the Korean Peninsula?

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ABSTRACT

East Asia's emergence as the forthcoming center of global manufacturing is leading nations in the region to reconsider their current and future role in the world economy. For its part, the Republic of Korea is pursuing a strategy to transform the country into the business hub of Northeast Asia. A central aspect in this strategy is the development of a regional "Pentaport" in the city of Incheon, which will consist of five components: an airport, a seaport, a business port, a technoport, and a leisure port. Hopefully, the Port of Incheon will be able to specialize in moving both coastal cargoes and transshipment cargoes to and from China and Japan using Short Sea Shipping (SSS). The first section of this paper provides an analysis of recent trade patterns between the Asian countries of the Asian-Pacific Economic Cooperation (APEC) agreement and the United States, with an emphasis on the Republic of Korea. The second part of the paper discusses current intermodal coastal shipping practices in the United States along the Gulf of Mexico and offers suggestions to the developers of Korea's Pentaport initiative, based upon observations in the United States, to maximize the likelihood of their success.

Keywords: *Foreign Trade, Trade Patterns, Maritime Shipping, Asian-Pacific Economic Cooperation (APEC) agreement, Asia, Korea, United States, Short Sea Shipping, Container-on-Barge.*

I. INTRODUCTION

East Asia's emergence as the forthcoming center of global manufacturing is leading nations in the region to reconsider their current and future role in the world economy. For its part, the Republic of Korea is pursuing a strategy to transform the country into the business hub of Northeast Asia. A central aspect in this strategy is the development of a regional "Pentaport" in the city of Incheon, which will consist of five components: an airport, a seaport, a business port, a technoport, and a leisure port. The seaport component of this strategy includes the development of the Port of Incheon into a feeder port that will

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serve a network that includes other Korean ports, such as Busan and Gwangyang. Hopefully, the Port of Incheon will be able to specialize in moving both coastal cargoes and transshipment cargoes to and from China and Japan using Short Sea Shipping (SSS) (Chang 2003). Although the concept of SSS is not a new one, it has recently generated significant interest around the world as transportation agencies look for new ways to move freight quickly and cost-effectively, while reducing the demand for new road and rail infrastructure. This paper contributes to the discussion of the Korean Pentaport strategy in two ways. The first section provides an analysis of recent trade patterns between the Asian countries of the Asian-Pacific Economic Cooperation (APEC)¹ agreement and the United States, with an emphasis on the Republic of Korea. The findings of the next section demonstrate changing trade volumes and shipping patterns between Asia and the United States. The third section of the paper will discuss current intermodal coastal shipping practices in the United States along the Gulf of Mexico and will identify some of the hindering issues to a broader application of SSS. Hopefully, these observations from the United States will be useful to the development of the Republic of Korea's Pentaport initiative.

II. CHANGING TRADE VOLUMES AND SHIPPING PATTERNS BETWEEN ASIA AND THE UNITED STATES

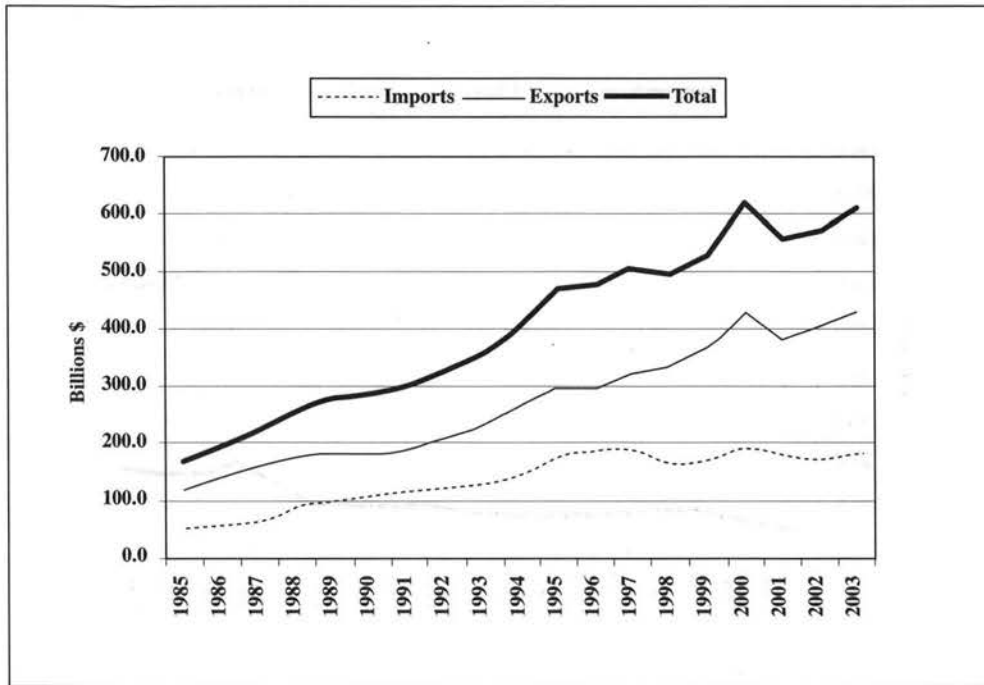
Growing Asian APEC-U.S Trade

Total trade between the Asian members of APEC and the United States grew significantly between 1985 and 2003, from \$170.1 billion to approximately \$609.1 billion or an increase of more than 250 per cent (See Figure 1).² Exports from the Asian APEC countries to the United States have led the overall growth in trade, increasing from \$122.1 billion in 1985 to \$428.5 billion in 2003. The value of goods imported by Asian APEC countries from the United States also grew, albeit more slowly, from \$48.0 billion in 1985 to \$180.6 billion in 2003. By 2003, the difference in the value of Asian APEC imports and exports to the United States produced a trade surplus for the region of approximately \$248 billion.

¹ The Asian members of the APEC are defined as: the Republic of Korea, Japan, China, Taiwan, Hong Kong, Thailand, Vietnam, Malaysia, Singapore, Indonesia, Brunei, Philippines, and Papua New Guinea.

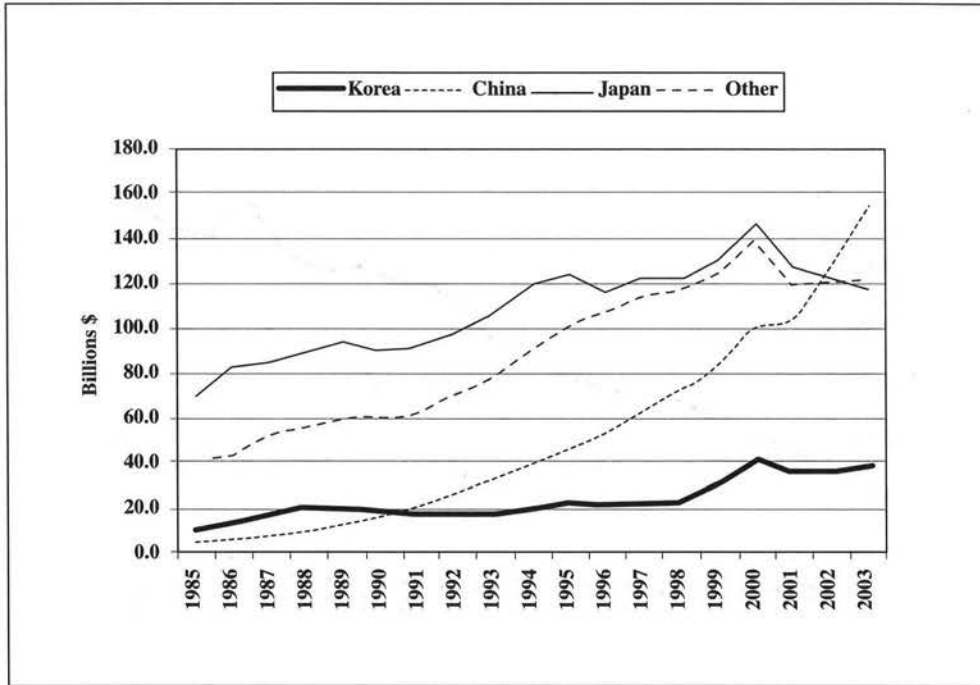
² The U.S. Census Bureau's trade data were available for all the APEC countries for the period between 1985 and 2003, with the exception of Brunei, Papua New Guinea, and Vietnam. The data for these three countries were only available for the period 1992-2003.

Figure 1. Total Asian APEC-U.S. Trade, 1985-2003



Source: U.S. Census Bureau, 2004.

Three countries dominate Asian APEC trade with the United States: China, Japan, and the Republic of Korea. Between 1985 and 2003, total trade between the Republic of Korea and the United States rose from \$10 billion to \$37 billion (See Figure 2). Other countries, however, demonstrated more variable trends. For example, until the 1990s, it was Japan that dominated the region's export trade but, even before China's entry into the World Trade Organization (WTO) in 2001, the value of China's exports to the United States was rising rapidly. In 2002, China became the region's largest exporter to the United States and by 2003 the value of its exports was approximately \$152.4 billion. Not only did China become the largest Asian exporter to the United States, it also became the second largest overall exporter to the United States (surpassing Mexico), and its third largest trading partner.

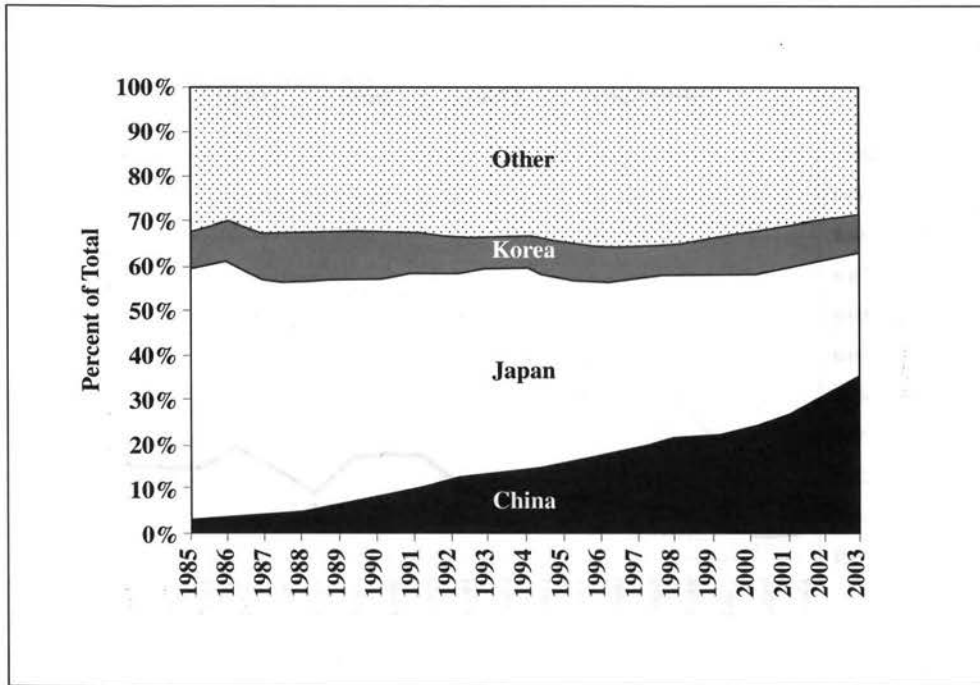
Figure 2. Value of Asian APEC Exports to the United States, 1985-2003

Source: U.S. Census Bureau, 2004.

Figure 3 shows these changes in terms of each country's share of total Asian APEC export trade with the United States. Generally, the Republic of Korea was able to maintain its share of regional export trade at roughly 9 per cent to 10 per cent between 1985 and 2003. China and Japan, on the other hand, have experienced more dramatic changes. In 1985, Japan's exports to the United States equaled 56 per cent of the region's total but by 2003 that figure fell to 28 per cent. During the same period, China's share of total regional exports to the United States rose dramatically from 3 per cent to 36 per cent.³

³ Perhaps, Japan's declining share of exports to the United States has been caused by some relocation of its manufacturing sector to China.

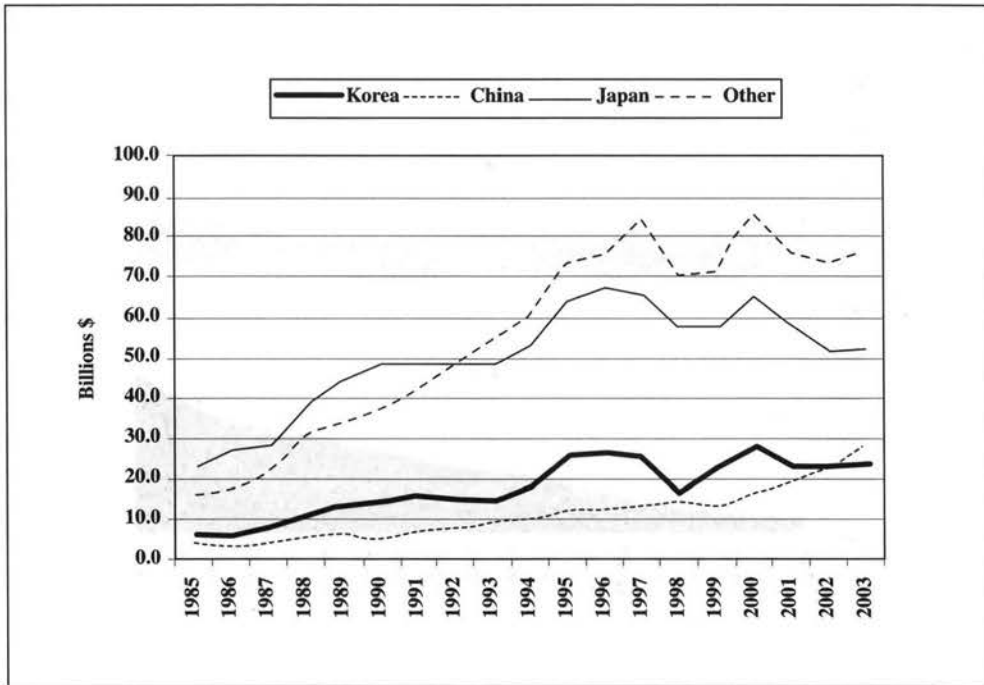
Figure 3. Country Share of Total Asian APEC-U.S. Export Trade by Value, 1985-2003



Source: Based upon data from the U.S. Census Bureau, 2004.

The total value of Asian APEC imports from the United States did not show the same vigorous trends as exports, although the Republic of Korea's imports of U.S. goods grew four-fold between 1985 and 2003 from \$6 billion to \$24 billion (See Figure 4). Korea's import of U.S. goods was, as were many of the other Asian APEC countries, affected by the regional currency crisis of 1998 and the consequences of the U.S.'s 2000-2001 economic recession. Japan remains the single largest importer of U.S. goods, which totaled \$52 billion in 2003, but this figure reflects a decline from recent years. The data show that Japan was also deeply affected by the region's 1998 currency crisis and its own endemic economic problems. China recently became the region's second largest importer of U.S. goods, which totaled \$28.4 billion in 2003.

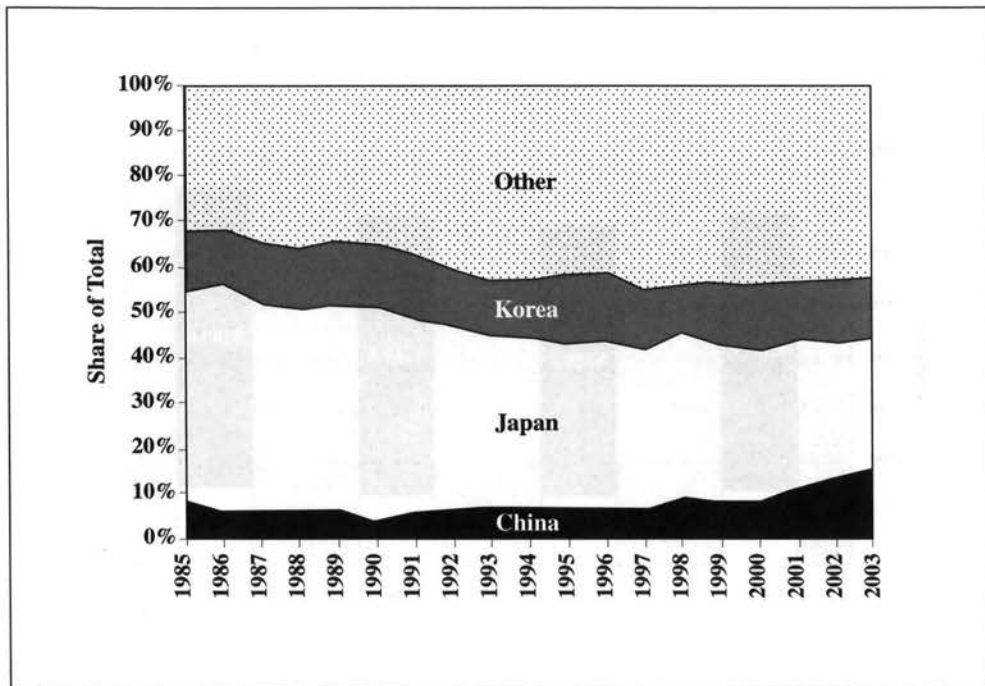
Figure 4. Value of Asian APEC Imports from the United States, 1985-2003



Source: U.S. Census Bureau, 2004.

Korea's share of the region's total imports from the United States has remained about the same between 1985 and 2003 (See Figure 5). As would be expected, Japan's share of total imports diminished, while China's moved upward. A growing share of the region's imports from the United States went to the other countries of the APEC. In fact, their combined share rose from 32 per cent to 42 per cent between 1985 and 2003.

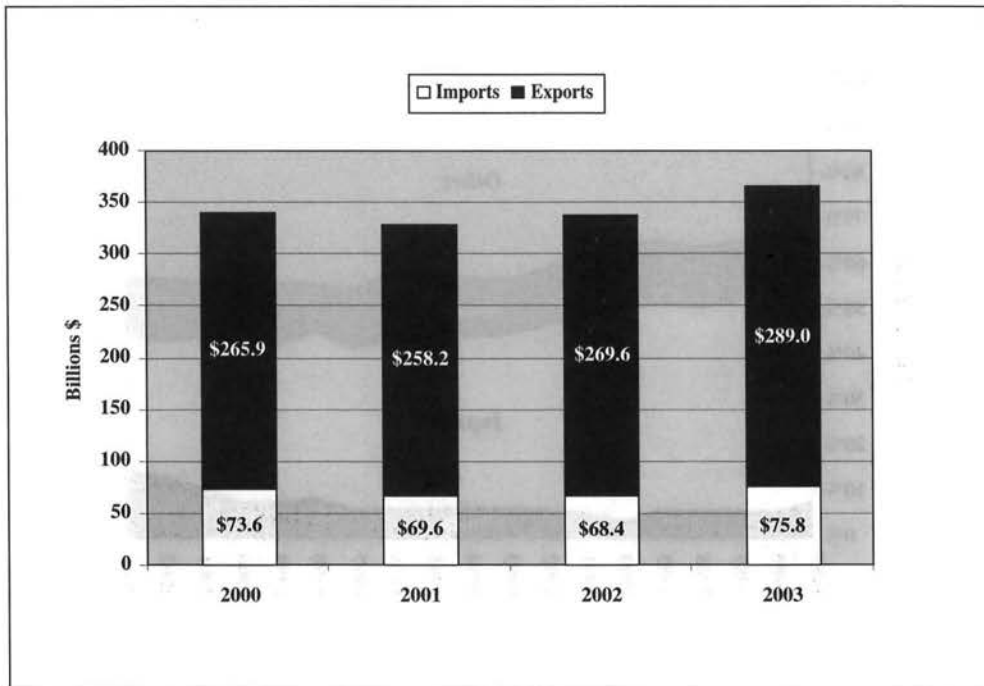
Figure 5. Country Share of Total Asian APEC-U.S. Import Trade by Value, 1985-2003



Source: Based upon data from the U.S. Census Bureau, 2004.

Asian APEC-U.S. Maritime Trade

As with total trade, overall Asian APEC-U.S. maritime trade demonstrated a positive growth rate between 2000 and 2003. However, maritime exports did fall in 2001, as did imports in 2001 and 2002. This was likely a response to the U.S. economic recession and the effects of the September 11, 2001 terrorist attacks (See Figure 6). In 2003, total maritime trade between the Asian APEC countries and the United States was approximately \$365 billion, with \$289 billion of this amount being export trade and almost \$76 billion consisting of imported goods.

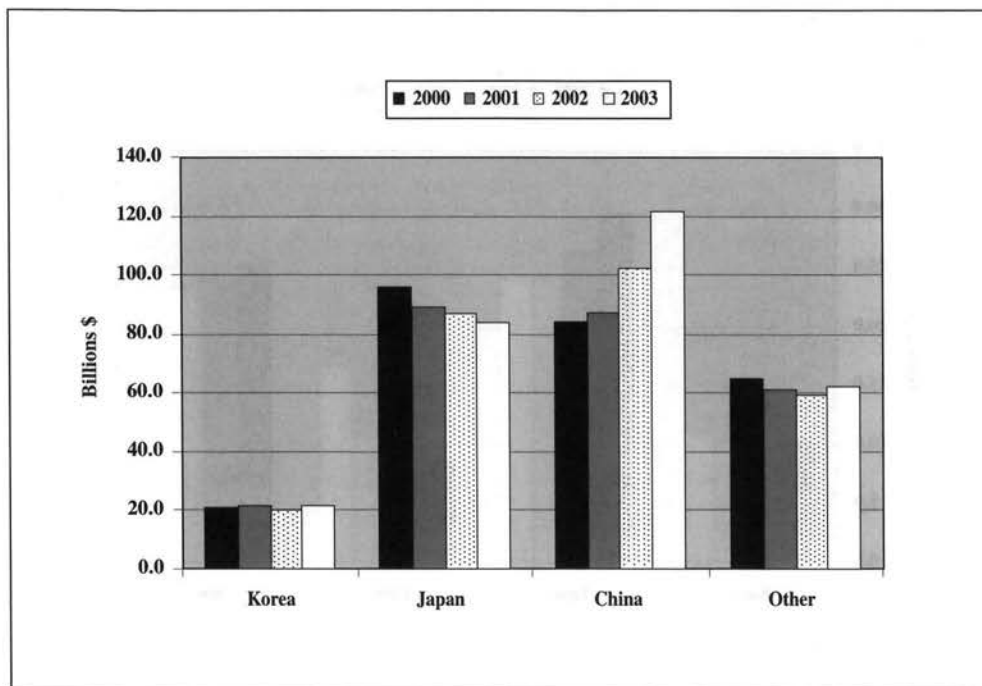
Figure 6. Total Exports and Imports of Asian APEC-U.S. Maritime Trade, 2000-2003

Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

The value of maritime export trade from the individual Asian APEC countries to the United States has produced varying trends over the past four years. The Republic of Korea's maritime exports to the United States have been relatively steady at approximately \$20 billion each year (See Figure 7). Japan, however, has seen the value of its maritime exports drop substantially from \$95.8 billion in 2000 to \$84.2 billion in 2003. Most of the region's growth in maritime export trade with the United States has been the result of growing export volumes from China. China's maritime exports increased from \$84.4 billion to \$121.2 billion or more than 40 per cent during this short, four-year period. The remaining APEC countries have shown a modest decline in the combined values of their maritime exports to the United States.

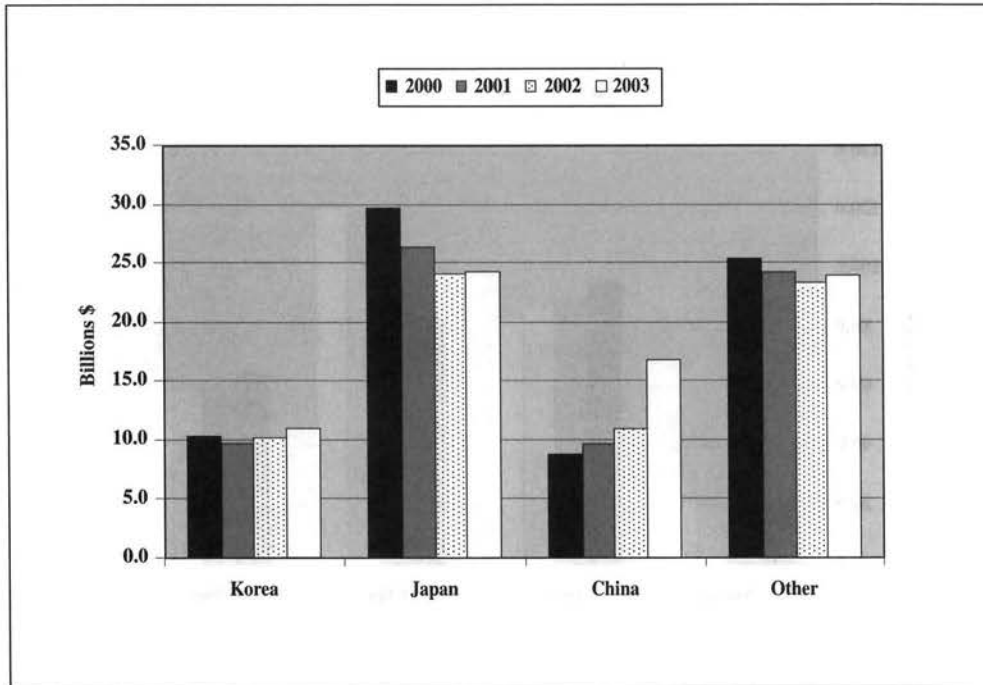
Figure 7. Asian APEC Members' Maritime Exports to the United States, 2000-2003



Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

The value of the Republic of Korea's maritime imports from the United States grew slightly between 2000 and 2003, from \$10.2 billion to \$11.0 billion (See Figure 8). Japan's maritime imports actually declined during this period from \$29.5 billion to \$24.2 billion. China's maritime imports, on the other hand, almost doubled from \$8.7 billion to \$16.8 billion, while the value of U.S. maritime imports destined to the remaining APEC countries fell from \$25.3 billion to \$23.8 billion.

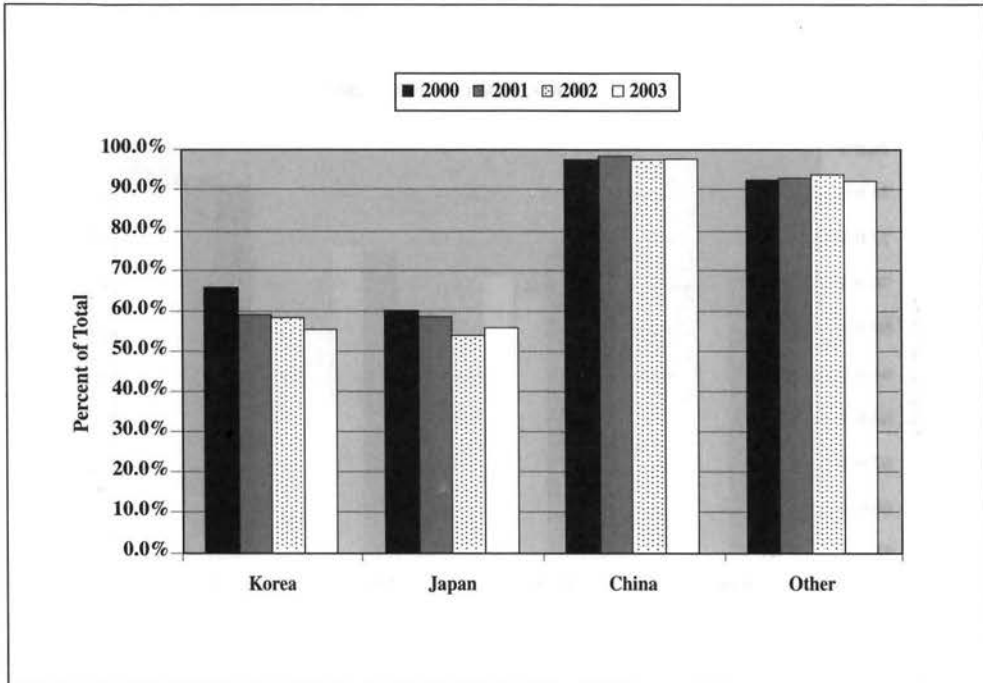
Figure 8. Asian APEC Members' Maritime Imports from the United States, 2000-2003

Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

The majority of goods shipped from Asian APEC countries to the United States are transported within intermodal containers. Figure 9 shows that roughly 55 per cent of the Republic of Korea's and Japan's exports to the United States were containerized. This is substantially lower than China, which shipped approximately 98 per cent of its exports in containers and the remainder of the APEC countries, which containerized more than 90 per cent of their exports. Korea's and Japan's lower percentage of containerized cargo is mostly likely explained by the large volume of Roll On/Roll Off (RO/RO) (primarily motor vehicles) and heavy machinery cargoes they ship to the United States.

Figure 9. Asian APEC Members' Containerized Maritime Export Trade with the United States, 2000-2003

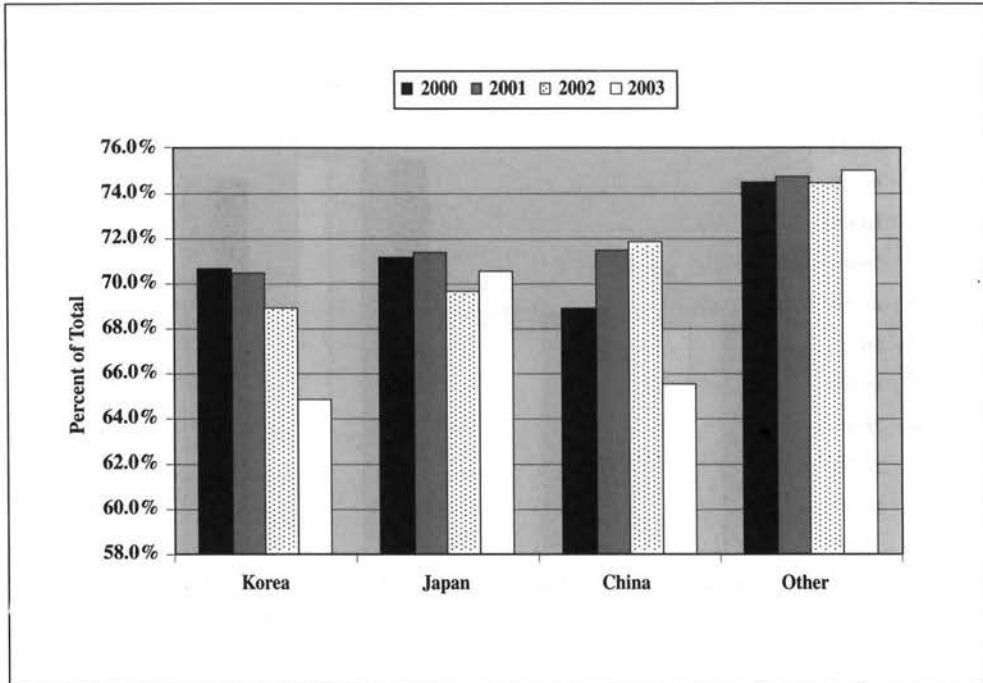


Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

Most of the Asian APEC countries' imports from the United States were also transported in intermodal containers, but the percentages fluctuate, depending upon the volume of trade and the commodities imported (See Figure 10). Many of the U.S. imports have become food products and raw materials for manufacturing, which tend to be handled as bulk cargo.

Figure 10. Asian APEC Members' Containerized Maritime Import Trade with the United States, 2000-2003



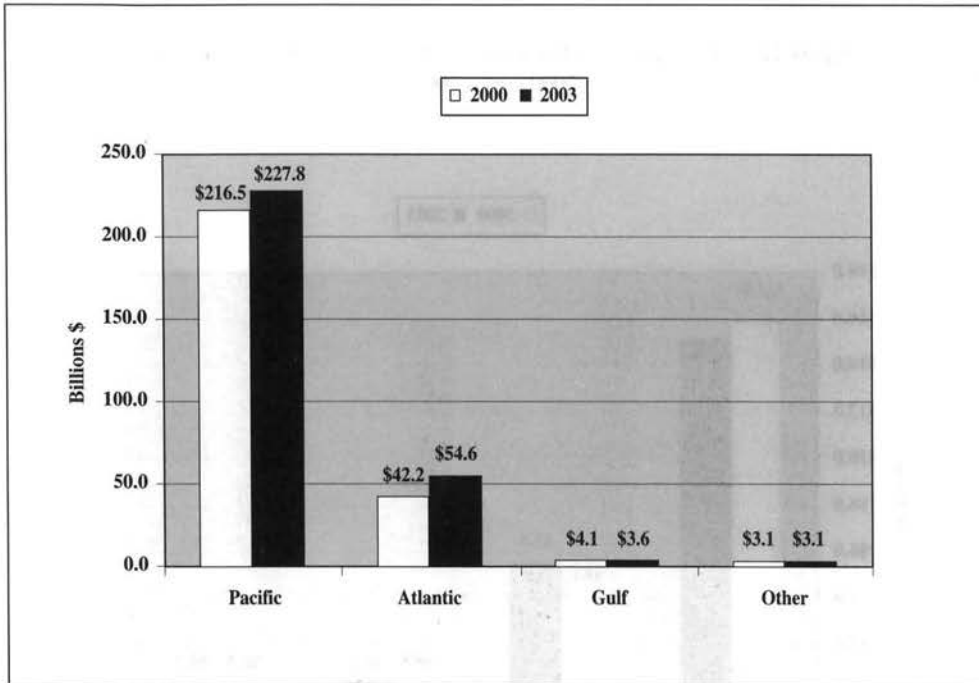
Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

Changing Asian APEC-U.S. Shipping Patterns

Growing Asian APEC-U.S. trade volumes, problems at Pacific coast ports, and congested rail infrastructure in the western United States have led to changes in the routes that shippers are using to transport goods between Asia and the United States. Although the Pacific coast of the United States remains the most popular destination of Asian APEC exports and as the origin of its imports, the volume of trade is also increasing at ports along the Atlantic coast of the United States. As evidence of this trend, consider that between 2000 and 2003 the value of Asian APEC exports sent to Pacific coast ports grew by \$11.3 billion, while the value of exported goods shipped to Atlantic coast ports increased by \$12.4 billion (Figure 11).

Figure 11. Value of Asian APEC Maritime Exports Shipped to the United States by Coast, 2000-2003



Note: 2003 figures are preliminary

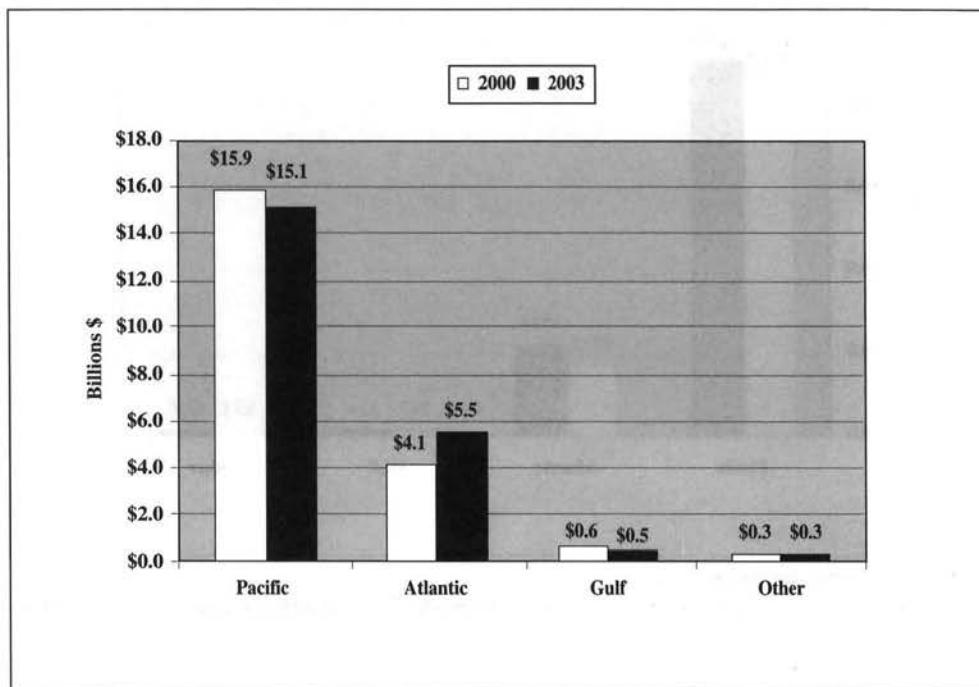
Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

Shippers have been shifting their cargo to Atlantic coast ports for several reasons. First, labor issues at Pacific coast ports have driven up the costs for cargo handling and slowed the implementation of technology and best practices that could make the ports more efficient. Two, rail carriers (but primarily Union Pacific) have been unable to efficiently handle the enormous volumes of goods that are arriving at the Ports of Los Angeles and Long Beach, primarily due to an inadequate supply of manpower and equipment. Third, shippers are finding that keeping cargoes on ocean-going ships, until they are closer to their final destination, reduces costs and uncertainty. Fourth, major retailers in the United States are streamlining their supply chain and big-box retailers like Wal-Mart, Target, Home Depot, Lowes, and others are buying their products directly from the manufacturers in Asia and shipping them directly to their regional distribution centers. Since a growing number of these distribution centers are located near ports, they can ship the goods to the port and dray the containers by truck to their distribution center, avoiding the need to coordinate long-distance moves using rail land bridges or long-haul trucks.

In the case of Korea's maritime export trade, this trend away from the Pacific coast ports is even more obvious since the volume of goods shipped there actually fell from \$15.9 billion to \$15.1 billion between 2000 and 2003 (See Figure 12). Atlantic coast

ports, on the other hand, increased the value of Korean exports they handled from \$4.1 billion to \$5.5 billion. Gulf coast and other U.S. ports experienced negligible changes, during this period.

Figure 12. Value of Korea's Maritime Exports to the United States by Coast, 2000 versus 2003

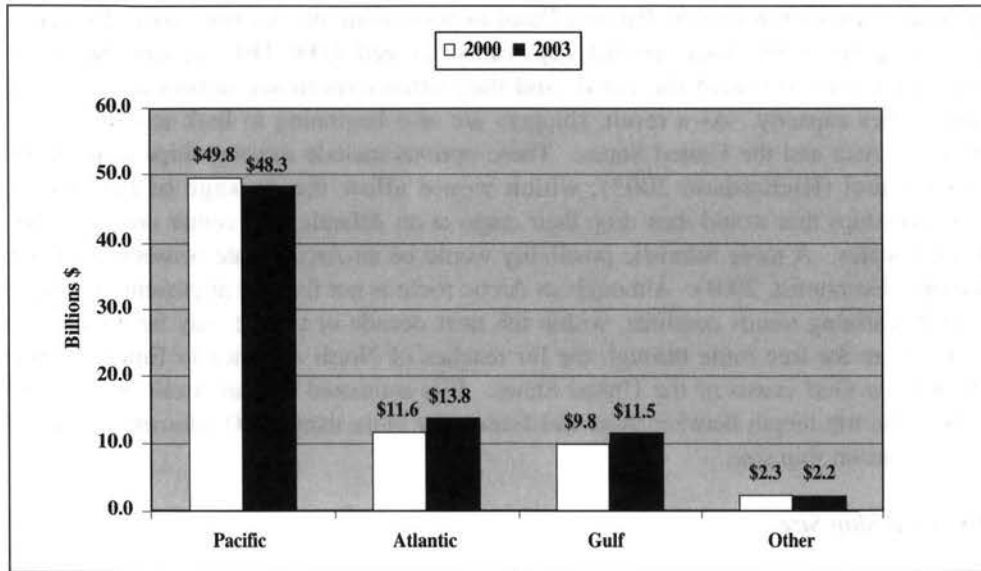


Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

The Asian APEC countries' maritime import trade demonstrated a similar pattern. The value of Asian APEC's imports from the United States that were handled at Pacific coast ports fell from \$49.8 billion to \$48.3 billion between 2000 and 2003, while the Atlantic coast ports sent \$13.8 billion worth of goods to Asia in 2003, up from \$11.6 billion in 2000 (See Figure 13). The volume of imports from Gulf coast ports also rose from \$9.8 billion to \$11.5 billion, during this same period. The figures for Korea's maritime imports show slight increases for ports along the Atlantic coast, Gulf coast and other U.S. ports, while a modest decline for Pacific coast ports (See Figure 14).

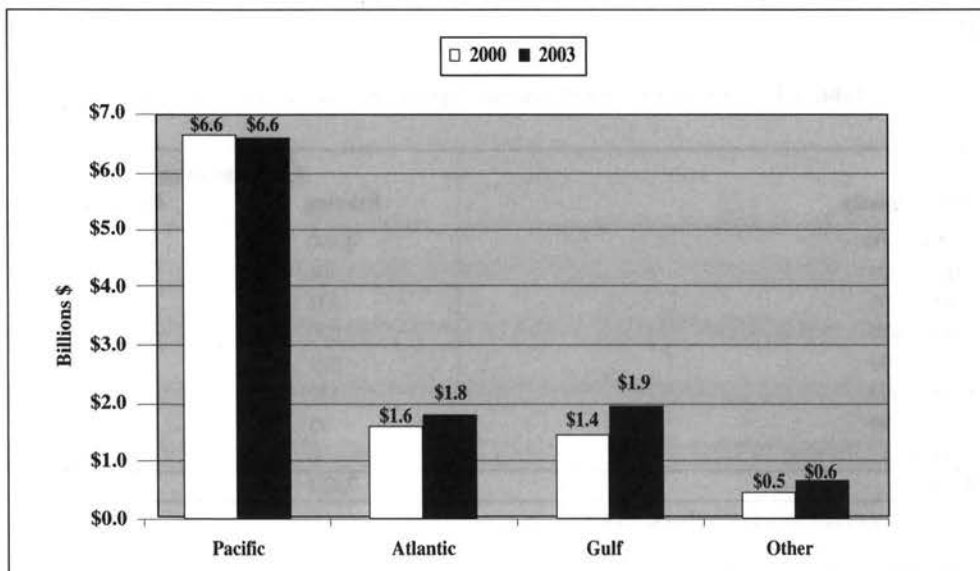
Figure 13. Value of Asian Maritime Imports Shipped from the United States by Coast, 2000-2003



Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

Figure 14. Value of Korea's Maritime Imports from the United States by Coast, 2000 versus 2003



Note: 2003 figures are preliminary

Source: Based upon data from the U.S. Maritime Administration's Waterborne Databank, 2000-2003.

Changing Shipping Routes

As the data in Figure 11 and Figure 12 show, shippers have become more willing to transport cargoes through the Panama Canal to ports along the Atlantic coast. However, the limitations of this route are that ships cannot exceed 4,000 TEUs in size, they must pay hefty fees to transit the canal, and they often experience delays as the canal approaches capacity. As a result, shippers are also beginning to look at other routes between Asia and the United States. These options include moving ships through the Suez Canal (Richardson 2003), which would allow the passage of the largest containerships that would then drop their cargo at an Atlantic load center outside of the United States. A more futuristic possibility would be an Arctic route between Asia and Europe (Economist, 2004). Although an Arctic route is not feasible at present, if current global warming trends continue, within the next decade or two, it may be possible to traverse an ice-free route through the far reaches of North America to Europe or the Atlantic or Gulf coasts of the United States. It is estimated that an Arctic route could reduce the trip length between Asia and Europe by more than 6,400 kilometers with no restrictions on ship size.

Growing Ship Size

As a direct result of growing Asian exports to the United States, Europe and other parts of the world, the shipping industry is currently in the midst of a large expansion in the number of shipping vessels. Table 1 shows that the largest number of vessels on order, as of October 2003, were in the "7,000 TEU and larger" category at 108 ships. Carriers have also ordered a large number of other Post-Panamax ships, while the number of smaller containerships on order was fairly modest, with the exception of the "2,000-2,999 TEU category".

Table 1. Existing and On Order Containerships by Ship Size as of October 2003

TEU Capacity	Containerships	
	Existing	On Order
Under 1,000	4,890	93
1,000-1,999	1,306	74
2,000-2,999	531	101
3,000-3,999	270	27
4,000-4,999	221	90
5,000-5,999	141	84
6,000-6,999	98	35
7,000 Plus	6	108
Total	7,463	612

Source: Containerisation Yearbook, 2004.

Because most of the new containerships constructed over the next few years will be in the larger categories, this will create a significant expansion in the overall capacity of the containership industry. At present, more than 2.4 million TEU slots are on order, which will increase the overall industry capacity by almost 30 per cent (See Table 2). Ships in the 7,000 TEU or larger category account for 35 per cent of this increase and with Post-Panamax ships included, these ships account for almost 80 per cent of new container slots.

Table 2. Number of Existing and On Order Slots by Ship Size as of October 2003

Ship TEU Capacity	Existing		On Order	
	TEU Slots	Percentage of Total	TEU Slots	Percentage of Total
Under 1,000	1,811,289	21.8%	70,401	2.9%
1,000-1,999	1,829,617	22.0%	109,402	4.4%
2,000-2,999	1,313,655	15.8%	256,070	10.4%
3,000-3,999	934,950	11.2%	85,590	3.5%
4,000-4,999	968,883	11.6%	391,183	15.9%
5,000-5,999	778,495	9.4%	447,745	18.2%
6,000-6,999	636,461	7.7%	231,932	9.4%
7,000 Plus	46,150	0.6%	873,226	35.4%
Total	8,319,500	100.0%	2,465,549	100.0%

Source: Containerisation Yearbook, 2004.

The movement towards these large ships not only represents the industry's expectation of growing trade volumes, it also represents the industry's strategy of concentrating trans-oceanic shipping onto very large containerships, which use economies of scale to increase carrier profitability. Due to their operating expense and physical dimensions, these ships will only call on a few ports with the proper channel dimensions and with the capability to quickly handle a massive number of containers. Cargo with origins and destinations outside of these load center ports will need to be shipped using feeder ships, rail, and trucks. Given the existing levels of road and rail congestion in Asia and in the United States and the large number of containers that must leave ports within a short time frame, SSS is considered by many transportation planners as a desirable option for moving cargo to and from transshipment centers without contributing to the congestion on both region's rail and roadway networks.

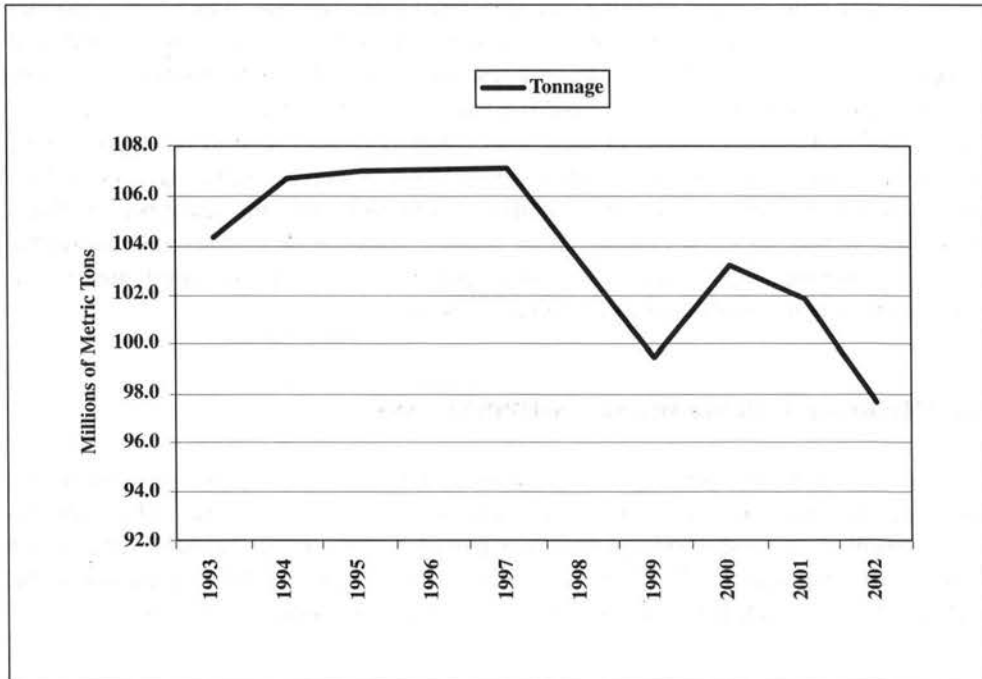
III. THE ROLE FOR SHORT SEA SHIPPING (SSS)

The Port of Incheon's strategic location in Northeast Asia offers it a competitive advantage to becoming a Pentaport and a regional transshipment center. However, the development of successful SSS operations as part of this system can be more difficult and elusive than they appear. This final section discusses intermodal SSS operations in the Gulf of Mexico and identifies potential lessons for Korea's Pentaport initiative.

Domestic Short Sea Shipping in the Gulf of Mexico

The term “Short Sea Shipping” can be used to describe the movement of a variety of cargoes between various origins and destinations. At present, when U.S. port personnel, carriers, and policymakers use the term, they are referring to the movement of intermodal containers between domestic ports or nearby foreign ports. However, a broader definition of SSS would be the movement of any product: bulk, roll-on/roll-off (RO/RO), or containerized cargoes. Using the restrictive definition, there is very little SSS in the Gulf of Mexico, but using the broader term, SSS is used extensively to move goods to and from public and private ports, as well as private terminals. Figure 15 shows the total tonnage of domestic SSS that occurred in the Gulf of Mexico between 1993 and 2002. In 2002, these movements totaled 97.6 million metric tons. Traffic flows between facilities on inland waterways within the contiguous United States accounted for more than 99 per cent of these moves, while less than one per cent of the total Gulf of Mexico cargo traveled over an ocean between ports (e.g. from an Atlantic coast port to a Gulf coast port). Petroleum products accounted for the largest share of domestic goods moved in the Gulf of Mexico, amounting to almost 50 per cent of the total in 2002 (See Table 3). Chemicals and crude bulk products were also important cargoes, accounting for 22.6 per cent and 16.9 per cent of all cargo moves in 2002, respectively. Higher value manufactured products, such as equipment and machinery, only accounted for about 1.0 per cent of the total SSS movements.

Figure 15. Total Tonnage of U.S. Short Sea Shipping in the Gulf of Mexico (Millions of metric tons), 1993-2002



Source: U.S. Army Corp of Engineers, 2004.

Table 3. Commodities Moved by U.S. Short Sea Shipping in the Gulf of Mexico (Metric tons), 2002

Commodity	Internal	Coastwise
Coal	4,269,208	0
Petroleum and petroleum products	47,602,666	364,688
Chemicals and related products	22,027,335	82,554
Crude materials, inedible except fuels (e.g. wood, ores, aggregates)	16,391,001	155,128
Primary manufactured goods	3,198,731	2,722
Food and farm products	1,656,518	104,326
All manufactured equipment, machinery and products	1,136,702	907
Waste and scrap	665,873	0
Unknown or not elsewhere specified	0	907
Total	96,948,033	710,325

Note: Cargo flows between facilities on inland waterways within the contiguous United States are considered internal flows, while movements over an ocean between ports (e.g. from an Atlantic coast port to a Gulf coast port) are considered coastwise shipping.

Source: U.S. Army Corp of Engineers, 2004.

At present, domestic intermodal SSS in the Gulf of Mexico has been limited to the movement of containers loaded onto hopper barges and pushed using a standard tug. This container-on-barge (COB) service is operated by a single company called the Osprey Line. The company was started in 2000 by a former Sealand-Maersk employee to move U.S. foreign aid shipments from Houston to Baton Rouge. Because U.S. cabotage laws prevented a foreign-owned company from moving the cargo between domestic ports, Sealand-Maersk supported the development of the Osprey Line as an alternate means of placing the cargo onto Maersk ships. Over time, the volume of containers grew for Osprey Line, as it acquired additional customers and began to reposition empty containers. The company now operates two weekly scheduled routes: Port of Houston-Port of New Orleans and Port of New Orleans-Port of Baton Rouge. Although the Osprey Line has been moving containers in the Gulf of Mexico for less than five years, it generated revenue of \$11.7 million in 2003. In 2004, the Kirby Corporation, one of the largest barge companies in the United States, bought a one-third interest in the company (Houston Business Journal, 2004). Observers saw this move as being very significant, because it demonstrated other private-sector interest in the COB concept and it provided additional resources for the expansion of Osprey Line's activities.

Despite the Osprey Line's success thus far, the future growth of COB activity in the Gulf of Mexico is constrained by several factors. Firstly, most ports in the Gulf of Mexico only handle bulk commodities, primarily petroleum, and only a few possess container-moving equipment, such as cranes and stackers. Without this equipment, it is difficult to move containers efficiently and cost-effectively and while many ports have an interest in offering a COB service, their potential container volumes are not sufficient to justify these purchases. In the case of the Port of Baton Rouge, Osprey Line addressed this problem by buying its own reach stacker. However, given the company's current resources, it could

not undertake this expense at every candidate port. Second, a barge moving containers travels very slowly, perhaps 16 kilometers an hour, which makes it too slow for time-sensitive products. The containers moved by Osprey Line tend to be either empty or contain items like food aid, agricultural products, or plastic pellets. As a result, only certain products are appropriate for a COB service in the Gulf of Mexico. Third, the United States' cabotage law, called the Jones Act, forbids foreign-built and foreign-owned vessels from operating between two U.S. ports. Although U.S. shipbuilders are capable of building barges and tugs cost effectively, it is uncertain whether they could build the more sophisticated vessels needed for SSS at a price that would make a SSS operation competitive. These restrictions also prevent COB and potential SSS operators in the United States from using vessels built in Europe and Asia, which are designed for more rapid and efficient coastal shipping. A fourth limitation to COB in the Gulf of Mexico is that the coastline is not heavily populated. As a result, there is not sufficient demand to move large amounts containerized cargo in most areas. Fifth, the drayage cost of moving containers can be significant, especially if drayage is required on both ends of a trip. This means for SSS operators to remain competitive, the barge costs have to be minimized, usually by making the trips longer, which results in longer transit times, increased inventory costs, and an added element of uncertainty. Finally, there has been only tepid support for COB operations in the Gulf of Mexico from the Port of Houston, which would be the region's most likely feeder port. This attitude towards SSS is unlike major ports in other parts of the country. It is not entirely understood why the Port of Houston has failed to embrace the idea, although the Port may consider it to be an issue of competitiveness or have concerns about bringing more traffic to a container terminal that is already operating above capacity. At present, the Osprey Line's COB operations are successfully serving a niche market in the Gulf of Mexico and the company is profitable doing so, but its or any other carrier's ability to shift large volumes of cargo from truck or rail to barge has yet to be realized.

IV. CONCLUSIONS

Growing trade volumes and changing shipping patterns between Asian countries of the APEC agreement and the United States are creating new economic opportunities for the Republic of Korea. The country's Pentaport initiative is a multifaceted approach for positioning Korea to take advantage of these opportunities and to expand the nation's infrastructure. The inclusion of SSS as part of this strategy is a complicated effort, as evidenced by the limited success of intermodal SSS in the United States along the Gulf of Mexico. The following suggestions are proposed to the developers of Korea's Pentaport initiative, based upon the researchers' observations, to maximize their likelihood of success:

- A SSS service must connect regions that maintain a large population and considerable manufacturing to generate enough demand to support it. The demand must sustain a regularly scheduled service for SSS to be effective.

- For coastal shipping to be a competitive option for time-sensitive goods, shippers must use faster vessels than barges with a tug. A competitive SSS service must use vessels that can transit between points within an acceptable time frame for shippers. At present, the European model probably provides the best example of efficient coastal and inland waterway shipping of containers.
- To efficiently handle containers, all SSS ports must possess container-handling equipment. Although certain cranes and other types of equipment (such as forklifts) can be used to move containers, their productivity levels are not adequate to sustain an intermodal operation.
- For SSS to work, the region's primary port must support the service. In the case of the COB operation along the Colombia and Snake Rivers, the Port of Portland provided older container cranes to upstream river ports to support the service. In the Gulf of Mexico, the Port of Houston has only offered feeble support to the COB initiative, which has diminished its viability along the Texas coast.

Inha University's recent effort to draw examples and lessons learned about SSS operations from other parts of the world has been a good one. This effort should be supplemented with the involvement of private-sector actors during future events, who could help guide the government planners in their development of a strategy that will have the greatest likelihood of achieving economic success.

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