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16. Abstract

This report examines the dynamics of U.S.-China trade, its implications for the economies of Texas and Mexico, and the role of trans-Pacific transportation supply chains. Part I of the report discusses the emergence of China as a major U.S. trading partner, the extent to which China has become a direct competitor with Mexico in terms of exports to the United States, and opportunities and challenges that this competition poses to the economic growth prospects of Texas. Part II addresses transportation infrastructure and logistics within China, trans-Pacific ocean shipping lines and their scheduled services, U.S. West Coast ports and connecting landbridge rail services, and alternative routes via the Panama Canal, Mexico's West Coast ports, and the Suez Canal. Two appendices contain information on trends in U.S. international trade and trans-Pacific maritime routes and services.

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The Impact of U.S.-China Trade on Multimodal Transportation Systems and the Economies of Texas and Mexico

by

Dr. Leigh Boske
Associate Dean
Lyndon B. Johnson School of Public Affairs
The University of Texas at Austin

Timothy Box, Moira Foreman, Abhay Kantak, Phillip Savio
Graduate Research Assistants
Lyndon B. Johnson School of Public Affairs
The University of Texas at Austin

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Southwest Region University Transportation Center
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Texas A&M University System
College Station, Texas 77843-3135

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ABSTRACT

This report examines the dynamics of U.S.-China trade, its implications for the economies of Texas and Mexico, and the role of trans-Pacific transportation supply chains. Part I of the report discusses the emergence of China as a major U.S. trading partner, the extent to which China has become a direct competitor with Mexico in terms of exports to the United States, and opportunities and challenges that this competition poses to the economic growth prospects of Texas. Part II addresses transportation infrastructure and logistics within China, trans-Pacific ocean shipping lines and their scheduled services, U.S. West Coast ports and connecting landbridge rail services, and alternative routes via the Panama Canal, Mexico's West Coast ports, and the Suez Canal. Two appendices contain information on trends in U.S. international trade and trans-Pacific maritime routes and services.

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EXECUTIVE SUMMARY

Introduction

The past decade has seen incredible developments in global trade. The opening of markets has increased the flow of goods throughout the world. Trade liberalization has allowed an increasing number of countries to take part in global trade. This expansion of the global economic pie is due in large part to the explosion of development occurring in emerging markets, in particular China and India.

The ever-growing appetite of American consumers has also fueled trade growth. Over the past decade, U.S. exports grew at an average annual rate of approximately 4.5%, while imports grew at an annual rate of 8%.[1] The trade imbalance does not take into consideration the growth of trade in U.S. services; but even with this growth, it is hard to deny the shifting trade patterns that have taken effect since the 1980s. The shift in the U.S. economy away from labor-intensive manufacturing towards capital-intensive production and services has increased the importance of imports in the economy. The shift was characterized by the migration of manufacturing from the northern United States to the southern United States and eventually south of the U.S. Border. Leveraging low labor costs and proximity to the U.S. market, Mexico became the second-largest exporter to the United States behind Canada, only to be supplanted by China in 2003.

At the same time, other Asian economies, in particular, Japan and South Korea, became major trading partners with the United States. The rising incomes in these economies have, however, eroded their competitive advantage in the manufacture of labor-intensive goods. While Mexico was able to benefit from the changes in Asia, perhaps the biggest winner was China. The development of the Chinese economy and its eventual integration into the World Trade Organization has led to an explosion of goods manufactured in China and exported throughout the world. For the United States, China emerged as one its fastest-growing trading partners, realizing a 14-percent average annual growth rate in imports between 1998 and 2003.

Despite China's ascendance, Mexico remains a major trading partner and trade flows with Mexico have continued to grow as the U.S. economy continues to expand. For the United States, the impact of both China and Mexico goes beyond the goods they produce, and the flow of trade into the U.S. has lasting impacts on the development of industries and transportation infrastructure throughout the country.

In 2003, measured in terms of value, 28% of all merchandise trade was shipped by land, 41% by water, and 26% by air.[2] Maritime transport continues to constitute the dominant share of trade to the United States. Three major types of vessels characterize maritime trade: containerized vessels, tanker vessels, and dry-bulk vessels. Containerships constitute the largest share of the

[1] U.S. Census Bureau, "Foreign Trade Statistics" database. Online. Available: http://www.census.gov/foreign-trade/statistics/historical/index.html. Accessed: March 1, 2005.

[2] America's Freight Transportation Gateways Connecting Our Nation to Places and Markets Abroad 2004 Available online http://www.bts.gov/publications/americas_freight_transportation_gateways/ accessed on May 18, 2005.

value of maritime trade, due in large part to the high proportion of manufactured goods that enter the United States.

The flows of maritime trade are determined by the sources of goods and the historical development of ports in the United States. For example, the Gulf ports, due in large part to the prevalence of oil in the region, have become the point of entry for the majority of tanker vessels. The growth in the trade of manufactured goods with Asia has positioned the West Coast ports to capture the majority of containerized trade shipped to the United States. Indeed, the top containerized imports to the United States were furniture, apparel, electronic products, toys, and computer equipment.[3] In each of these categories, China has become a major source of U.S. imports.

Contents

This report is composed of two parts. Part I focuses on trends in U.S. and Texas international trade, especially with China and Mexico. China's low-cost labor advantage is discussed, noting that the availability of low-cost labor is continuing to draw producers of low-skilled (or low-tech) goods away from Mexico. Nevertheless, Mexico's close proximity to the United States is allowing it to maintain a comparative advantage for producers of heavier goods who experience high transportation costs. Part I concludes by discussing the potential economic impacts that increased international trade may have on the economy of Texas.

Part II of this report examines the transportation supply chain from China to the United States in general, and to Texas in particular. It begins with a discussion of the transportation infrastructure and logistics network currently in place in China, as well as planned expansions of highway, rail, and port infrastructure that have been recently announced. Part II then highlights traditional trans-Pacific trade routes before describing alternative routes that have been proposed in response to Southern California port congestion: Pacific Northwest ports; Panama Canal; Mexico's West Coast ports and connecting railroads; and the Suez Canal. It concludes by describing the growth plans of air-cargo carriers, such as UPS, FedEx, and DHL.

In addition, this report contains two appendices. The first appendix examines global trade trends and the sources and shares of trade of countries exporting to the United States. The second appendix highlights the trans-Pacific container shipping routes used by the four major ocean carriers/alliances to transport freight from the Far East to the United States, as well as their transit times from origin to destination ports.

Findings

The prospect of continued growth in the Chinese economy presents a number of interesting challenges and opportunities. West Coast ports in the United States, specifically the ports of Los Angeles and Long Beach, are encountering increasing congestion in conjunction with the surge in trade from Asia. The ports are grappling with capacity, labor and infrastructure constraints

[3] *U.S.-China Trade Statistics and China's World Trade Statistics,* The U.S.-China Business Council. Online. Available: http:///www.usachina.org/statistics/tradeable.html. Accessed: September 16, 2005.

that can have an inhibiting effect on trade in the United States. The growth in trade has not been accompanied by a matching increase in terminal handling capacity and inadequate hinterland connectivity has obstructed the smooth flow of trade. The unreliable transit times and high costs posed by congestion have forced importers and shipping lines alike to explore alternate gateways. The all-water services to the East Coast and Gulf, the increased calls at West Coast ports in Mexico, and additional services directed to Pacific Northwest ports are some of the possible solutions to temporarily circumvent the congested ports of Los Angeles and Long Beach. There is, however, also an emphasis on evaluating these ports for the possibility that they could serve as longer-term solutions for the perennial congestion problems of Southern California.

Fueled by the creation of the North American Free Trade Agreement (NAFTA), the three countries of North America have created an integrated supply chain to facilitate and complement the traditional west-east flow of goods across the continent. In this changing trade landscape, the flow of goods is having an impact on state policy and transportation infrastructure throughout the United States. Nowhere is this truer than in the state of Texas, where increased trade flows with Mexico have benefited both partners.

The importance of Mexico to the Texas economy, in a number of industries, is well-documented, and is unlikely to dissipate in the foreseeable future. However, several global changes – in particular, China's challenge of Mexico's historical low-cost labor advantage – will greatly affect the future of Mexico's production. Thus, while Mexico appears to be maintaining its share of overall trade with Texas in a number of goods, China's growth is forcing Mexico to move its manufacturing up the value-chain and to shift towards high-technology and more capital-intensive production. In order for Mexico to move in this direction and remain competitive, it will need to make considerable investments in education and infrastructure, and develop an energy and tax policy that promotes growth in the country. Mexico will, however, always be able to maintain its most important trade advantage: proximity to the U.S. market, which engenders advantageous manufacturing flexibility, ease of management, and low transportation costs. Fortuitously for Mexico, these considerations are important to a number of major industries located in Texas. In particular, the state's emphasis on high-technology development, specifically, electronics and computer equipment, will continue to rely on manufacturing in Mexico in order to facilitate the constantly evolving manufacturing processes that characterize the industry. Texas's commitment to high technology should help counter the shift of low-cost manufacturing to China. Nevertheless, in low-cost industries where Mexico's advantages are not important to production and wages are the determining factor, they likely will continue to emigrate to China.

Yet, to the state of Texas, China poses not only a challenge, but also an opportunity. While losses in the maquiladora and other industries may hurt Texas, the state may be able to capitalize on the growing trade flows between China and the United States by leveraging its transportation sector to attract Asian trade. Several factors make the proposition more feasible, now, than it has been in the past. The growing congestion at West Coast ports because of inadequate capacity – with no long-term solution in sight – has forced importers and shipping lines to explore alternative routes. The global supply chains and just-in-time management requirements put a premium on the reliability and certainty of shipment schedules rather than on transportation

costs. This has forced imports to be routed closer to those alternative freight gateways with excess capacity and nearby space for regional distribution. One of the most successful of these alternatives, the port of Savannah, has become the second-fastest growing container port in the nation, perfecting this model for attracting traffic on the strength of 14 large, regional distribution centers, including a planned three-million-square-foot Wal-Mart distribution facility. In Texas, the port of Houston, with its well-developed and expanding infrastructure, and a large, captive, local consumer population like that of Southern California, may provide a similar, long-term solution to the perennial congestion problems of the West Coast ports, while infusing the state economy with freight transportation dollars.[4]

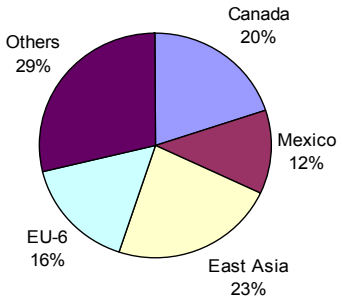
[4] *Ports of the Gulf,* Gulf Shipper, September 5, 2005, p. 15A.

PART I. THE DYNAMICS OF INTERNATIONAL TRADE

Introduction

The geographical locations of the countries that trade with the United States play a role in determining the level of demand for transportation infrastructure within the various freight gateways to the United States. In 2003, the United States' North American Free Trade Agreement (NAFTA) partners, Canada and Mexico, contributed about 32% of the overall value of U.S. international merchandise trade, comprising the vast majority of hemispheric, north-south trade. Meanwhile, the East Asian countries' contribution was 23%, while, by comparison, the share of the six-largest European Union trading partners was 16%.

Figure 1 - Trading Partners of the United States (In value)



Source: U.S. Census Bureau[5]

At the state level, the majority of Texas' trade historically has been, and continues to be, with Mexico. Texas and Mexico have leveraged their common, 1,254-mile border, establishing a relationship that has shaped local economies and policies on both sides. Over the past few decades, the trading partnership between the two countries has been strengthened by cooperative trade agreements, most notably the NAFTA empowerment zones, and free-trade areas.

Mexico continues to utilize its low-cost labor advantage to entice companies to establish manufacturing facilities south of the border. This migration of production has led to the creation of the maquiladora industry, perhaps the largest and most recognized residual of Mexico-Texas trade. The emergence of the maquiladora industry also makes up the largest component of U.S.–Mexico trade. Maquiladoras receive an estimated 78% of all goods (components and services) exported to Mexico from the United States. Furthermore, 79% of the maquiladora industry is owned by U.S. companies.[6]

[5] East Asia: China, Japan, South Korea and Taiwan; EU-6: Germany, UK, France, Ireland, Italy, Netherlands
[6] Federal Reserve Bank of Dallas, *El Paso Business Frontier*, Issue 2 p. 1 (2004). Online. Available: http://www.dallasfed.org/research/busfront/bus0402.html. Accessed: May 15, 2005.

The linkages between the United States and the maquiladora industry are strongest in the border-states. Texas clearly demonstrates these linkages not only in its overall trade with Mexico, but also in terms of the commodity mix traded between the two economies. The state imports 68% of the electric machinery exported from Mexico to the United States and 94% of its vehicles and parts.[7] These imports are typically assembled in Mexico after receiving substantial amounts of U.S. exports to supply and facilitate the production process. For example, in 2004, computer and electronic products represented 30% of all Texas exports to Mexico and transportation amounted for 13% of total exports.[8]

Despite the virtual historical monopoly on Texas trade enjoyed by Mexico, it is instructive to take a closer look at the past few years where, between 2000 and 2003, exports between Mexico and Texas decreased at an average annual rate of 3% while imports increased by 1%. During the same time period, total exports for the state of Texas decreased 1% and imports grew at an annual rate of 2%.[9]

There are a number of factors behind the lack of growth. The most notable factor, the slow growth rate of the U.S. economy for several years, may be fading as recent data indicate an up-tick in trade with Mexico as the U.S. economy and the Texas economy emerge from recession. Yet, the sluggish U.S. economy only goes so far in explaining recent trends in Texas-Mexico trade.

Another important factor is the changing global landscape caused by the emergence of China as a viable low-cost producer. Over the past decade, China has established itself as a center for manufacturing. The convergence of a local market made up of 1.3 billion Chinese and average wages almost one-third of those prevailing in Mexico makes China an attractive alternative for companies looking to service the U.S. economy and expand into new markets.[10] In the period between 2000 and 2003, Texas exports to China experienced average annual growth rates of 20%; and, in 2003, exports increased 48%. During that same period, imports from China grew at an average annual rate of 21%, with an increase of 56% in 2003.[11]

The economic dynamics that are driving this phenomenal growth have the potential to permanently alter the international trade landscape that has come to define Texas over the past few decades. Although Mexico will continue to be a major trading partner for the state, the emergence of Asia, especially China, will present Mexico with a number of challenges. In the next few years, Mexico will be forced to transition its economy away from that of a low-cost labor provider to North America, to that of higher-technology employing a more skilled labor

[7] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.
[8] Mine Yucel. *Regional Update,* Federal Reserve Bank of Dallas, April 2005. Online. Available: http://www.dallasfed.org/eyi/regional/archived/0504update.html. Accessed: May 15, 2005.
[9] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.
[10] Federal Reserve Bank of Dallas, *Southwest Economy*, Issue 5, p. 3 (2003). Online. Accessed: http://www.dallasfed.org/research/swe/2003/swe0305a.html. Accessed: May 15, 2005.
[11] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.

force. While it will continue to have the advantage of proximity to the United States, which will ensure the success of a number of manufacturing companies, the maquiladora industry will have difficulty regaining the strength and prosperity it once enjoyed in the late 1990s.

The give-and-take between the economies of China and Mexico in the current torrent of globalization has yet to play out in full. Although low-cost production has already begun to shift to China, diverting jobs and trade away from Mexico, understanding the factors that will shape both the short-term and long-term trade flows for these two economies, and what they mean for Texas, requires a closer look at the specific advantages and disadvantages of both countries. (Additional information regarding broader global trade trends can be found in Appendix A of this report.)

China

China's economy is powered by 750 million Chinese workers, out of a population of 1.3 billion, living in an area slightly smaller than the United States.[12] In 1978, the Chinese Communist government moved to institute a hybrid system of government, incorporating a centrally-planned governance structure and decentralized market economies throughout the country. The move has catapulted the Chinese economy, in terms of purchasing power parity, into the number 2 spot in the world economy, behind only the United States. Since 1980, China's economy has attained an average growth rate of over 9% per year, and has established itself as the largest global manufacturer of toys and clothes.[13]

China exported approximately 25% of its GDP in 2001 and continues to develop into a manufacturing-for-export economy.[14] China's top exports are all industrial products, ranging from office machines, data-processing equipment and electronics, to apparel and footwear. A majority of China's exports are produced by a seemingly unlimited source of low-wage, unskilled labor. In 2003, the average hourly compensation of production workers in the United States was almost 30 times greater than the compensation rate for workers in China; while in Mexico, hourly wages were three times greater than in China.[15] However, these wages do not take into consideration the cost associated with starting a business in China – specifically logistics, training, and the daunting task of managing a business from abroad. While these issues are factors in any international expansion, there is considerable anecdotal evidence that the experience in China is proving more difficult than originally expected.

[12] Georges Desvaux, "Spurring performance in China's state-owned enterprises," *The McKinsey Quarterly*, Special Edition (2004). Online. Available: http://www.mckinseyquarterly.com/article_abstract.aspx?ar=1492&L2=19&L3=69. Accessed: May 15, 2005.
[13] Emmanuel V. Pitsilis, "Checking China's Vital Signs," *The McKinsey Quarterly,* Special Edition (2004). Online. Available: http://www.mckinseyquarterly.com/article_abstract.aspx?ar=1483&L2=7&L3=8. Accessed: May 15, 2005.
[14] Ibid.
[15] Federal Reserve Bank of Dallas, *El Paso Business Frontier*, Issue 2 (2004). Online. Available: http://www.dallasfed.org/research/busfront/bus0402.html. Accessed: May 15, 2005.

Table 1
Average Labor Costs Across Industries

	Mexico	China	Hungary	Malaysia	California
Hourly Average Wage	$1.47	$0.47	$1.60	$1.39	$16.60
Benefits and Taxes*	101%	52%	61%	56%	26%
Total Integrated Wages	**$2.96**	**$0.72**	**$2.58**	**$2.17**	**$20.84**

Source: Dallas Federal Reserve. *Includes social security, saving fund transport, discount tickets, NFONSVIT, income sharing, Christmas Bonus, Afore (pension fund contribution), medical expenses, among others. Does not include payroll tax.

Yet, it is also important to note that the evolution of the Chinese industrial base has included an increase in the production of high-tech products. In 2003, approximately 25% of China's exports were high-tech products versus 1% in 1985.[16]

The growing share of China's GDP devoted to exports will lead to an increase in imports to meet its consumption needs. The country's principal imports include electrical machinery, petroleum-related products, telecommunications equipment, office machines, and data processing equipment. The growth in China's imports creates enormous opportunities for foreign producers, as imports as a share of GDP have grown from 2% in 1970 to 28% in 2002.[17]

The size of China's consumer market and the country's middle class is a subject of great debate, but estimates indicate a middle class approaching 58 million people with the potential to top 300 million by 2007.[18] The prospect of a middle-class market the size of the entire U.S. population will influence the future flow of global trade flows and play an important role in a firm's decision regarding the location of its manufacturing operations.

China and WTO

In 2002, China made the official overture towards its integration into the global economy by becoming a member of the World Trade Organization (WTO). It has been three years since China's accession, and according to observers, China is "largely on schedule" and moving towards compliance with the organization's requirements.[19] Most notably, China has made strides in opening up its financial and insurance industries, allowing greater retail opportunities for foreign companies by adopting more transparent regulations. Similarly, China has begun to relax restrictions on agricultural trade – in particular, genetically modified products – creating trade opportunities for farmers in the United States.

China has also begun to use the WTO's dispute resolution system, a further sign of integration, calling on the WTO to investigate foreign competitors in order to resolve trade disputes and

[16] Federal Reserve Bank of Dallas. *Southwest Economy*, Issue 5, p.7 (2003).
[17] Ibid. p. 3.
[18] Peter T. Leach, "Boom!," The Journal of Commerce, February 23-24, 2004.
[19] Gordorn R. Orr. "What executives are asking about China," *The McKinsey Quarterly*, Special Edition 2004. Online. Available: http://www.mckinseyquarterly.com/article_abstract.aspx?ar=1478&L2=7. Accessed: May 15, 2005.

increase China's access to foreign markets. China's dispute with the United States regarding refunds of value-added taxes on semiconductors was resolved in this manner.

The process of integration has had its share of caveats. For example, foreign retailers wishing to locate in China must adhere to each local government's financial and developmental programs. These programs vary across the country and are often "vague and open to subjective implementation."[20] Transparency is an issue in industries where there is not a clear separation of regulator and operator, as is the case in telecommunications.

Though the integration of China into the global economy has not been seamless, it has created several opportunities for increased trade. China has become the largest manufacturer and consumer of a number of industrial products. Since 2002, its exports and imports have experienced strong growth in demand from North American, European, Japanese and Southeast Asian markets. In the United States, exports to China have increased at an average annual rate of 30% since China's entry into the WTO.[21] While the mounting trade deficit between the U.S. and China is unlikely to change in the near future, the growth in U.S. exports in China is indicative of China's increased demand for manufacturing supplies and its growing consumer base.

Mexico

Any discussion of Mexico's economy inevitably revolves around its relationship with the United States. This is due largely to the integration of the two economies during recent decades, especially after NAFTA. Evidence of this integration lies in the lack of diversification in destinations exhibited in Mexico's exports and imports. In 2003, 91% of Mexico's total exports were sent to the United States, while Mexico purchased 62% of its total imports from its northern neighbor.[22]

This relationship has been shaped in large part by the maquiladora industry. Since the 1960s, maquiladoras have received supplies and parts from companies in the United States for assembly in Mexico. The finished goods are then exported back to the United States. The system was predicated on Mexico's proximity to the U.S. market and low-cost labor advantage.

In 1994, the implementation of NAFTA removed tariffs on equipment, machinery, supplies, and raw materials exported temporarily into Mexico. This further decreased the costs of manufacturing in the maquiladoras and encouraged growth. In the interim, electrical machinery and road vehicles became two of the largest U.S. exports to Mexico, while also representing two of the largest imports from Mexico.[23]

In recent years, the maquiladora industry has suffered from the effects of a slumping U.S. economy. In the period from 2000 to 2004, the industry lost approximately 290,000 jobs

[20] Ibid.
[21] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.
[22] Federal Reserve Bank of Dallas, *El Paso Business Frontier*, Issue 2 (2004). p. 2.
[23] El Paso Business Frontier, 2004 pg. 2 (9)

representing a 21% decline in employment.[24] Yet, as the U.S. economy continues to grow, the maquiladora industry has experienced an increase in employment. According to numbers released by the Dallas Federal Reserve Bank, maquiladora employment grew by 7.1% in 2004 after three straight years of declines.[25] The sectors that benefited most were services, chemicals, machinery and furniture. The Texas-Mexico border region accounted for 28% of the job growth, with the remainder spread throughout the interior of Mexico.[26] The employment growth pattern illustrates a southerly spread of the maquiladora industry, possibly explained by competitive pressures from China, which require firms to tap lower labor costs in the interior of Mexico, while transportation and logistics costs have been decreasing as well.

NAFTA

On January 1, 1994, the North American Free Trade Agreement was implemented. Over the past decade, there has been a great deal of debate regarding the success or failure of the agreement. In the United States, opponents complain that imports from Mexico have led to job losses in the manufacturing industry. Meanwhile, some Mexicans feel that NAFTA has disproportionately benefited maquiladoras at the expense of the agricultural sector. In Texas, there is also a feeling that NAFTA has failed to deliver on its promise to control illegal immigration across the border. Specifically, the economic benefits of NAFTA have not yet provided the necessary alternative jobs for Mexican laborers to induce them to stay and work in Mexico.[27]

There is some validity to the criticisms expressed by all parties; but, at the same time, data do indicate that NAFTA has achieved its fundamental goals. These goals include the expansion of trade among the three NAFTA countries and increased foreign direct investment in Mexico. In the period between 1993 and 2002, intra-NAFTA trade increased by 106%. During this same period, NAFTA trade with the rest of the world grew by only 46%.[28] Trade between Mexico and the United States experienced an average annual growth rate of 13% over this period, and the southern border states were the recipients of a majority of the economic benefits of this growth.[29]

The effects of NAFTA are also evident in the increase of foreign direct investment in Mexico. According to the Texas Business Review at the University of Texas, Mexico received, on average, $4 billion worth of foreign direct investment annually between 1980 and 1993. In the decade following NAFTA, investment increased to an annual average of $13 billion. And while the decrease in trade barriers that resulted from the agreement was not the sole source driving increases in trade and investment, it was a significant factor.

[24] Mine Yucel, *Regional Update,* April 2005.
[25] Ibid.
[26] Federal Reserve Bank of Dallas, *Hot Stats- Maquiladora Employment*, March 2005. Online. Available: http://www.dallasfed.org/data/hotstats/archive/maqempl0503.html. Accessed: May 15, 2005.
[27] Sidney Weintraub, *Texas Business Review,* Bureau of Business Research, June 2004. Online. Available: http://www.mccombs.utexas.edu/research/bbr/bbrpub/tbr/pdf/June_04.pdf. Accessed: May 15, 2005.
[28] Ibid.
[29] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.

Despite the considerable increases in exports and foreign direct investment, Mexico's economy has remained stagnant. Over the past decade, real per-capita GDP remained unchanged and, since 2001, has experienced three years of contraction.[30] The gains Mexico derived from NAFTA were largely negated by the devaluation of the peso in 1995, and the subsequent economic recession which plagued the economy throughout the mid-1990s. Mexico also failed to pass needed fiscal, tax and judicial system reforms.

The peso and Mexico's economy have since staged a comeback, but the period of poor GDP growth hampered job creation and undermined the success of NAFTA. Unfortunately, over this same period, the emergence of China has forever altered the international trade landscape. Despite the recent up-tick in the economy, Mexico will struggle to regain the low-cost trade advantage it once enjoyed.

Challenges

These changes equate to a number of challenges for Mexico's economy that must be addressed if the country hopes to evolve into a high value-added trade partner with the United States. In particular, Mexico must invest in education, energy, and legal reform in order to raise the skill levels of Mexican workers while decreasing the costs associated with operating in Mexico. Currently, Mexico's energy costs are, on average, 10% higher than energy costs in the United States and considerably higher than costs in China. Mexico also has a corporate income-tax rate of 34%, approximately twice as high as China's prevailing rate.[31] Integration and increased foreign direct investment will also require further Mexican government investment in transportation infrastructure to improve roads and railways and lower the cost of operating in Mexico.

The maquiladora industry is currently the main driver of Mexico's exports, but it is not integrated into other industrial sectors of its economy. Maquiladora firms import approximately 97% of the intermediate inputs used in their manufacturing.[32] The industry must work towards forward and backward integration into the local supply chain in order to create incentives for locating in Mexico. According to Jorge Carillo of El Colegio de la Frontera Norte (COLEF), Tijuana's maquiladora electronics sector is an example of the integration required by the industry. The sector benefits from high inter-maquiladora trade that results in local sales accounting for 54% of total sales and local purchases as high as 33% of total sales. Furthermore, 25% of the workforce is skilled labor, with most plants utilizing advanced technology, and all plants employing best practices in operations and management.[33]

Mexico's proximity to the United States, while an advantage, is no longer a determining factor in the production decisions of corporations. In order to retain its position within the supply chain, Mexico must prepare its workers to be skilled managers and engineers. The country can leverage its proximity to the U.S. market and advantageous delivery times by investing in

[30] Sidney Weintraub. June 2004.
[31] Alan M. Field, "No rest for the weary," The Journal of Commerce, February 21, 2005. pp. 20-22.
[32] Federal Reserve Bank of Dallas, *El Paso Business Frontier*, Issue 2 2004, p. 7.
[33] Ibid.

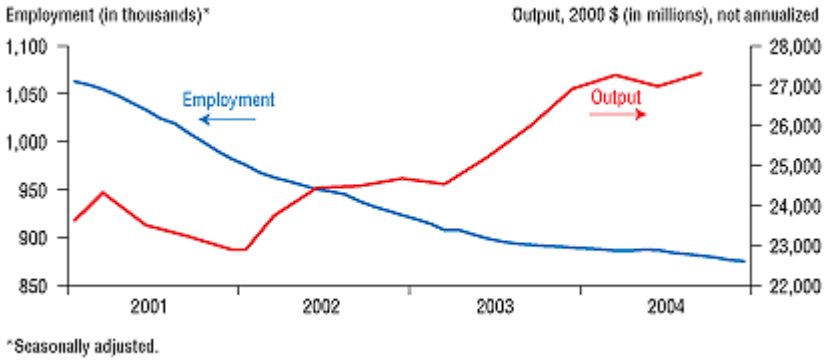
industries requiring high-tech processes, manufacturing flexibility, and just-in-time production. These investments can be enhanced by a focus on vertical integration in the local economy through investments in local R&D facilities, up-stream and down-stream suppliers, and education.

Economic Development and Opportunities for Texas

Texas is the second-largest state in the U.S. with a total population of 22 million in 2003. According to the U.S. Census Bureau, 82.5% of the population lives in metropolitan areas. Over the past decade, these metropolitan areas experienced considerable population growth, averaging 28.1% between 1990 and 2000. The Texas-Mexico border also experienced considerable growth and increased by approximately 30%. According to the Texas State Data Center at Texas A&M University, the population of Texas is expected to reach 35 million by 2040. It is also projected that Hispanics will account for 83% of the growth and become the majority ethnic group in the state by 2020.[34]

In 2004, the unemployment rate in Texas stood at 6.1%, down from 6.7% in 2003. The decrease in unemployment was driven mainly by the addition of approximately 125,000 non-agricultural jobs, 95% of which were in the services sector. Job growth occurred across all major sectors except information services and manufacturing. Manufacturing jobs continue to decline and suffered losses amounting to 14,000 jobs in 2004.[35] Yet, job losses in the manufacturing sector are occurring while manufacturing output in the state is increasing. This may be due in part to higher productivity levels in conjunction with a shift from labor-intensive production to capital-intensive manufacturing.[36]

Figure 2 - Texas Manufacturing Employment and Output



Source: *Texas Manufacturing,* Federal Reserve Bank of Dallas, Online. Available: http://www.dallasfed.org/eyi/regional/archived/0502update.html

[34] Texas State Data Center, "Texas Population Projections Program," database. Online. Available: http://txsdc.utsa.edu/tpepp/2004projections/. Accessed: May 15, 2005.
[35] Texas Economic Development, "Overview of the Texas Economy," Business and Industry Data Center. Online. Available: http://www.bidc.state.tx.us/overview/2-2te.htm. Accessed: May 15, 2005.
[36] Federal Reserve Bank of Dallas, *Regional Update*, February 2005. Online. Available: http://www.dallasfed.org/eyi/regional/archived/0502update.html. Accessed: May 15, 2005.

Exports

During the period between 1997 and 2003, growth in Texas trade outpaced the overall growth in U.S. trade. Over this seven-year span, U.S. exports grew at an average annual rate of 0.7%, while Texas experienced an average annual growth rate of 4%.[37] The state of Texas emerged as the leading exporter among its peers, representing 14% of all U.S. exports by 2003.[38] In that year, Texas exported $98 billion in merchandise to over 75 countries throughout the world; yet a majority of the state's trade was with Mexico and Canada.

Currently, 42% of all Texas exports are bound for Mexico, 11% are destined for Canada, and 18% are shipped to Asia. The remaining shares of Texas' exports are spread between Europe (11%), Latin America (8%), Africa (4%), and the Middle East (3%).[39] Export trade with Asia is driven predominately by China, South Korea, Taiwan, Japan, Singapore and the Philippines. Between 1997 and 2003, the average annual growth rate in exports to Asia was 5.4%. During the same period, exports to China grew from approximately $1.3 billion in 1997 to $3 billion in 2003.

The major commodities exported by the state of Texas include computer and electronic equipment, chemicals, machinery, transportation equipment, and petroleum and coal products.

Table 2
Top-10 Exports from Texas (2003)

Top-10 Exports 2003	Value
Computer and Electronic Products	28,378,198,276.00
Chemicals	17,125,246,559.00
Machinery, Except Electrical	11,407,672,253.00
Transportation Equipment	9,902,791,603.00
Petroleum and Coal Products	4,701,403,193.00
Electrical Equipment, Appliances, and Components	4,642,580,101.00
Fabricated Metal Products, NESOI	3,073,005,139.00
Food and Kindred Products	2,755,198,756.00
Agricultural Products	2,617,771,450.00
Plastics and Rubber Products	2,518,904,196.00

Source: Texas Economic Development, *Business and Industry Data Center*. Online. Available: http://www.bidc.state.tx.us/TXEXPORTS2004.pdf. Accessed: March 1, 2005.

[37] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.
[38] U.S. Census Bureau, "Foreign Trade Statistics" database. Online. Available: http://www.census.gov/foreign-trade/statistics/historical/index.html. Accessed: March 1, 2005.
[39] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.

Texas accounts for 19% of all U.S. computer and electronic exports, and the industry employs approximately 115,000 people in the state. The chemicals industry employs 75,000 Texas workers, machinery has a payroll of 76,000, transportation equipment employs 70,000 and the petroleum and coal products sector employs 24,000 people.[40] In total, the top-five industries, in terms of export value, employ 3% of the Texas workforce. Texas employment is concentrated in the services industry with professional services – government, education and health – capturing 40% of total employment. This trend is consistent with the loss of manufacturing jobs experienced throughout the United States and within Texas over the past decade.

Imports

Imports to Texas experienced 12% growth between 1993 and 2003, while U.S. imports, by comparison, grew at a compounded annual growth rate of 7%.[41] In 2003, Texas imports totaled $177 billion and represented 14% of all imports into the United States.[42] Texas imports are primarily sourced from Mexico, which has averaged approximately 56% of all imports into the state over the past decade. Asia has averaged 13% of all Texas imports and, similar to trends in the export market, the region is maintaining its share of the Texas market due to growth in imports from China, South Korea and Taiwan. Specifically, imports from China have grown at an annual rate of 23% since 1997, rising from $2.7 billion to $9.4 billion. The European market comprises 8% of all Texas imports, Latin America and the Middle East each make up 5%, followed by Africa which produces 3% of all Texas imports.[43]

Table 3
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Agricultural Products	2,617,771,450.00
Plastics and Rubber Products	2,518,904,196.00

Source: Texas Economic Development, *Business and Industry Data Center*. Online. Available: http://www.bidc.state.tx.us/TXEXPORTS2004.pdf. Accessed: March 1, 2005.

[40] Texas Economic Development, "Texas Nonfarm Employment Detail," Business and Industry Data Center. Online. Available: http://www.window.state.tx.us/ecodata/fcst04spr/4emp_cal.pdf. Accessed: May 15, 2005.
[41] U.S. Census Bureau, "Foreign Trade Statistics" database. Online. Available: http://www.census.gov/foreign-trade/statistics/historical/index.html. Accessed : March 1, 2005.
[42] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.
[43] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.

In 2003, Mexico comprised 55% of all imports into the state of Texas. China was a distant second with 7%. The dominance of Mexico in Texas imports is unlikely to dissipate, but it should be noted that it has fallen from a peak of 61% of Texas imports in 1999, to its current level of 55%, approximately equal to its share in 1995. China, on the other hand, has risen from a steady state of 2% in 1996, to a high of 5.3% in 2003. The ability of Texas to sustain this growth will depend in large part on its ability to attract trade from the East and encourage the geographic advantages of its neighbor to the south.

In reviewing the employment data, it is important to look at growth in the computer and electronic sectors along with the transportation equipment sector because of their place within the maquiladora supply chain. Both industries are slowly rebounding from losses in 2000 and 2001 and are fueling increases in maquiladora output. Yet, it should be recognized that while maquiladoras are on the rebound, as the U.S. economy grows, this may not bring the same benefits to U.S. suppliers that it did before 2000. In 2000, 90% of maquiladora inputs came from the United States, versus 9% from Asia, with China contributing 1% to the total. By 2003, the share of U.S. inputs to maquiladoras stood at 69%, while Asia had captured 28% of the market, with China contributing 8%.[44]

Opportunities and Challenges

The current Texas economy, in conjunction with a growing population, creates a number of economic opportunities and challenges for the state. Specifically, the state is an attractive source of labor, but resources must be dedicated to education and training. Infrastructure will strain to keep up with the state's growth, and proactive policies must be pursued to sustain competitive advantages in communications and transportation.

The Texas legislature recently passed the Texas Economic Development Act to stimulate growth throughout the state. The goal of the Act is to encourage and promote the expansion of companies and facilities, while also attracting new facilities to the state. In particular, Texas hopes to stimulate growth in lower income, rural, and border communities. The Act targets 'major projects,' for example a high-tech fabrication facility, because of its ability to generate large amounts of spending and provide substantial employment. These 'major projects' will create growth opportunities for the majority of small businesses that make up the Texas economy.

In 2002, Texas commissioned the Perryman Group, a private consulting firm, to analyze the state's competitive position with other states and in the larger, global economy. The report ultimately recommended the creation of a number of 'economic clusters' to attract investment and businesses, by leveraging the state's competitive advantages. The clusters also expand the global reach of the state in terms of increased trade. According to the report, two-thirds of the jobs created in Texas over the past decade were directly or indirectly tied to international trade. The major factor behind this growth was Mexico; but as Mexico's competitive position changes,

[44] Federal Reserve Bank of Dallas, *Business Frontier*, Issue 3 (2004). Online. Available: http://www.dallasfed.org/research/busfront/bus0403a.html. Accessed: May 15, 2005.

new opportunities are developing in other global markets and Texas must be poised to participate.

Table 4
Texas-Target Clusters

Emerging Biotechnology and Medical	Distribution, Transportation, and Logistics
Emerging Nanotechnology and Materials	Heavy construction
Electronics	Energy Cluster
Information Services	Petroleum Refining and Chemical
Communication and Computing Equipment	Transportation Equipment
Corporate Headquarters	Production Support Manufacturing
Business Services	Agricultural and Food
Tourism	

Source: Texas Economic Development, "Texas, Our Texas," report prepared by M. Ray Perryman, The Perryman Group, November 2002

The economic clusters advocated by the Perryman Report range from biotechnology and nanotechnology to distribution, transportation, and logistics. There are a number of recommended clusters that will play a major role in facilitating global trade in the state. The electronics cluster builds on a strong knowledge base already established in Texas. The industry is characterized by high wages and high value-added projects. Electronic components are typically supplied to Mexico or other low-cost countries for final assembly before being imported back into the United States for final sale. The transportation equipment cluster provides some of the same opportunities for components manufacturing due to the concentration of automotive manufacturing in Mexico. The communication and computing equipment cluster is tasked with attracting innovative companies and new entrepreneurs to the state. The development of new technologies has the potential to create manufacturing opportunities in both Texas and Mexico.[45]

Opportunities created in each of these clusters will also require a great deal of professional services to facilitate growth. In particular, the need for engineering, legal, accounting, consulting and call center services will allow the already large service sector of Texas to continue expanding, exporting business services to other states and countries. Distribution, transportation, and logistics services will also be crucial in facilitating the future growth of the Texas economy. According to the Perryman report, 30,000 firms in Texas are involved in distribution, employing approximately 500,000 people. The transportation sector consists of 14,000 companies and employs approximately 300,000 people.[46]

The success of these service industries will depend on the sector's ability to utilize advanced technology to aid businesses in developing efficient inventory and supply-chain management. The state's multimodal transportation facilities, particularly at the port of Houston and Fort Worth Alliance Airport, are attractive resources that can be leveraged to grow sophisticated manufacturing and distribution networks. The state's extensive highway system provides a vital

[45] Ibid.
[46] Ibid.

trade corridor and is estimated to have contributed 5.6% to the total output growth in Texas.[47] Yet, the transportation network is under considerable strain and is a hindrance to the flow of trade, especially from Mexico. Proposals for an expansion of the highway network – most notably, Interstate 69 – will help to alleviate the congestion and open up the port of Houston to the rest of the state. Unfortunately, the expansion of the transportation network in Texas will require a great deal of investment, which is hampered by the fact that the state ranks forty-seventh among states in per-capita highway spending and third in the diversion of motor-fuel tax revenues to other purposes.[48]

Conclusions about International Trade with the United States and Texas

In the United States, international trade has been a major source of growth for the economy. The nation's strong appetite for foreign goods has made it the largest importer in the world. Since 1993, imports have grown at a faster rate than exports, further widening the trade gap with the rest of the world and decreasing export's share of total trade from 44.5% in 1993 to 36.5% in 2003.[49] Meanwhile, the United States' geographical mix of trading partners has remained relatively unchanged over the past decade. Mexico and Canada continue to contribute 32% to total U.S. trade, East and Southeast Asia add approximately 27%, while Europe's share remains at 17%.[50] What has been striking over the last 10 years is the emergence of China as the third-largest trading partner of the United States. The growth in China's trade has come mainly at the expense of its East and Southeast Asian neighbors, as China has been able to provide an abundant supply of cheap labor, while other East Asian economies, specifically Japan and South Korea, have been experiencing wage growth. The development of China's economy makes it an immediate competitor to all low-wage manufacturers in Asia and throughout the world.

On the other hand, Mexico represents 11.9% of total U.S. trade, and the country's common border with the United States makes it a strategic partner in our economic growth.[51] Over the past few decades, Mexico's maquiladora industry has played a vital role in facilitating intra-industry trade. Originally, the country's low wages and proximity to the United States made it an ideal location for manufacturing goods, which has recently declined.

Surprisingly, though, the threat of China has not been as pronounced as one might expect in Mexico. While, undoubtedly, Mexico's economy has lost a number of jobs in the apparel, textiles and toy manufacturing industries to competition from China, in other industries, such as electric machinery and vehicles, Mexico has been able to identify sectors in which it has a competitive advantage over China. Utilizing the country's proximity to the U.S. market, its low labor wages relative to the United States, its increasing use of high-tech production processes,

[47] Ibid.
[48] Ibid.
[49] U.S. Census Bureau, "Foreign Trade Statistics" database. Online. Available: http://www.census.gov/foreign-trade/statistics/historical/index.html. Accessed: March 1, 2005.
[50] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.
[51] Ibid.

and its less tangible, yet equally important, cultural similarities, Mexico has kept these industries from shifting production to China.

In the coming years, the extent to which American companies make decisions regarding the outsourcing of certain manufacturing to China will hinge on the evolutionary stage of the specific product under review. As products become more standardized and require little oversight or change in production, they become candidates to move to China.

With these decision criteria in mind, Texas has also shifted the focus of its economic development policies in hopes of attracting industries such as biotechnology, nanotechnology, medical equipment, energy, and transportation equipment where production is capital-intensive and relies on high-technology production processes. Because these industries carry a higher chance of having to rapidly change the design and development of their respective products, the greater need for flexibility and managerial control, which are traditionally much more difficult to implement abroad, when combined with their anchoring capital outlays, make it more likely that these industries, once located in Texas or Mexico, will not relocate to China. For these industries, any future decision to locate manufacturing facilities in China will be driven by a desire to build a reputation and product in China to serve the local economy, as opposed to shipping products back to the United States.

Ultimately, the real impact of China on the Texas economy may be the opportunities for trade that it creates for the future, rather than just the threat it poses at present. Two of the state's largest private-sector employers, the professional services sector and transportation and distribution sector, have benefited greatly from the growth in trade with Asia. The flow of goods throughout the state has been facilitated by over 45,000 companies specializing in transportation and distribution. The state's multimodal transportation facilities are in a unique position to attract trade that is overflowing at congested West Coast ports.

In the new age of global supply chains, importers are looking at more than just the cost of transportation. Issues such as availability of warehousing space and reliability in transit times are now equally important factors in the choice of a port as a freight gateway. The ports of Los Angeles and Long Beach became preferred freight gateways because the state of California had a large local captive population for consumption of imported goods from East Asia, while also offering a cost-effective and reliable avenue to feed markets in the Midwest and along the East Coast. Today, shippers are increasingly looking at other ports when moving imports destined for the nation's hinterland. West Coast ports are no longer the only choice for handling imports from East Asia. Several ports which traditionally did not attract cargo from East Asia are now being considered as important freight gateways into the United States. One such port, the port of Houston, is increasingly being considered because space is not a constraint and the gateway serves the second-largest state in terms of population.

In order to ensure that Texas maintains its advantage in transportation, even as Mexico's economy develops its manufacturing industry and begins to source products from other parts of the world, the state should look for opportunities to expand its role in the nation's growing trade with China. Port congestion in other parts of the country presents an immediate opportunity to attract trade from China. The state can also leverage its large consumer population and its access to the Midwest and East Coast. In order to capitalize on these opportunities, state policymakers

and businesses must begin to view the advantages of trade with China as a means to expanding the state's share of global trade and transportation while retaining the state's close economic linkages with Mexico.

PART II. TRANSPORTATION SUPPLY CHAINS

Introduction

The inherent conflicts between capitalism and communism in the hybrid Chinese economic system have created major challenges for the country. As a result, the increasing disparity between rich and poor has become more and more evident over the past decade, and some regions remain abysmally poor.

A major source of the disparity lies in the disproportionate dispersion of the population throughout China. Approximately 800 million Chinese, 60% of the entire population, live in rural China; and, as the economy transitions from agricultural production to industrial production, the rural population will play a vital role in the success or failure of the economy. As the government develops its industrial base and promotes industrial production, the rural population is increasingly being lured to urban centers by higher wages. In 2001, urban workers earned an average annual wage of $829 compared to $286 for rural workers.[52]

The inability of the central government to provide enough jobs or economic growth to address the growing economic disparity could lead to major political ramifications that would seriously derail the China's economy. The migration of labor to cities is of major concern to the Chinese government and a major reason why state-owned enterprises are still supported, despite their inefficiencies.[53] It is a difficult balancing act for the Chinese government as the move to capitalism leads to greater efficiency and growth, but often creates job losses. In an effort to prevent layoffs, the Chinese government retains a presence in a number of industries through state-owned enterprises and strict regulation. Yet, according to a study by McKinsey & Company, state-run enterprises earn a return on assets of 3% compared to a return of 7% in the private sector.[54] It is not a coincidence that some of the most productive manufacturing sectors in the Chinese economy, in particular electronics and telecommunications equipment and electrical equipment and machinery, have the lowest levels of government control relative to other industries.[55]

The government must also contend with the adverse social effects of its "One Child" policy. In particular, the challenge of an aging population that is unable to depend on a large family network for care and support. Instead, the elderly will rely heavily on the state's pension and welfare system.

Furthermore, China must focus on the stability of its banking system and reliability of energy sources. Despite improvements in operating systems and risk-management, the country's banks are burdened with large loads of bad debt. The country's four largest banks are carrying $242

[52] Federal Reserve Bank of Dallas, *Southwest Economy*, Issue 5 (2003).
[53] Georges Desvaux, "Spurring performance in China's state-owned enterprises."
[54] Ibid. p. 1.
[55] Emmanuel V. Pitsilis, "Checking China's vital signs." p. 4.

billion in nonperforming loans and could be considered technically insolvent.[56] Additionally, bank deposits are controlled by approximately 2% of Chinese households which make them vulnerable to a liquidity crises should depositors withdraw their funds. With respect to energy, China's economic development has made the country a net importer of electricity and oil. Coal is the only basic material abundant in China, and the country's rising demand is becoming a driving force in shaping world commodity prices.[57]

This is by no means an exhaustive list of issues that threaten the economic success of China. There are a number of social, economic and environmental concerns that the government will struggle with in the coming years. Yet, each of these issues will play a vital role in determining China's ability to attract investment and sustain its recent economic growth.

Figure 3 - Pearl River Delta Region

Source: "The Pearl River Delta: A New Workshop for the World," *The Economist* (October 10, 2002).

In the end, the lack of logistics infrastructure throughout the country will require investment by the State to ensure an environment for continued development. This is especially important as

[56] Peter T. Leach, "Boom!" p. 16.
[57] Gordon R. Orr, "What executives are asking about China," p. 5.

firms look inland to locate manufacturing facilities and leverage sources of low-cost labor. As discussed earlier, there is an abundance of low-cost labor outside of the coastal cities, but the costs associated with working in these areas are a disadvantage for many firms. The transportation system is plagued by a lack of integration, which makes it difficult to coordinate the movement of products from the factory floor to coastal ports and city centers. Jurisdictions interested primarily in local development, duplicative infrastructure investments, overcapacity in the manufacturing industry, complex and inefficient bureaucracies, and minimal synergies among regional jurisdictions hamper overall network efficiency.[58] The Chinese government has made logistics a high priority and is currently investing almost 17% of GDP in expanding land transportation networks.[59] As competition among logistics providers intensifies, there may be a period of consolidation similar to those that occurred in the U.S. and European markets.

Transportation Infrastructure and Logistics within China

Infrastructure investment in China is significantly focused on the central and coastal cities and the exportation of Chinese goods. The Trade Development Council indicates the majority of economic development has been concentrated in three regions: the Yangtze River Delta (YRD), the Pearl River Delta (PRD), and the Bohai Rim.[60] As Chinese policymakers seek to reduce the development disparity between East and West, to stabilize internal population movements, and to develop more sophisticated industrial bases in its central and western provinces, the supply chain that supports goods movement to and from the country's internal regions is expected to improve. There is a delicate dance in progress between the improvement of interior transportation infrastructure and the wooing of foreign companies and multinationals to the central and western provinces. Improvements in the infrastructure and management for each of the various modes within China's transportation network are crucial. Of particular importance to goods movement is the enforcement of national regulations intended to streamline customs and clearance operations at the local and municipal levels. Companies often face inconsistent and, perhaps, illegal customs practices, but many consider this part of the cost of doing business in China.[61] "In some areas in China, local government officials even induce and persuade multinationals to violate the national customs laws and regulations… to attract foreign investment."[62] In addition to the policy and bureaucratic concerns, a company faces a significantly different distribution landscape, one that lacks Western-style warehousing facilities and standardization among trucks and other transport vehicles.[63] China's "railways, highways, waterways, deep-water berths, civilian airports and other infrastructure facilities can easily satisfy the basic needs of a modern logistics industry. However, the country still lacks a fully integrated transport network."[64] The China Federation of Logistics and Purchasing reported a fixed asset investment of $88 billion in

[58] Li & Fung Research Centre, "Recent Development of the Logistics Industry in China (2004-2005)," *China Distribution & Trading* (Issue 27, June 2005), p. 9.
[59] Peter T. Leach, "Open for Business?...Maybe," The Journal of Commerce, June 14-20, 2004. p. 14.
[60] Li & Fung Research Centre, "Recent Development of the Logistics Industry in China (2004-2005)," *China Distribution & Trading* (Issue 27, June 2005), p. 7.
[61] Chris Gillis, "China's Customs Law Needs Boost," *American Shipper* (July 2005).
[62] Ibid.
[63] William B. Cassidy, "Shippers' China Syndrome," *Traffic World* (June 20, 2005).
[64] Li & Fung Research Centre, "Recent Development of the Logistics Industry in China (2004-2005)," *China Distribution & Trading* (Issue 27, June 2005), p. 4.

2004, most of which represents government initiatives directed toward transportation sector development.[65]

Surface Transportation

For some U.S. and European companies, as they seek to take advantage of domestic Chinese consumer markets, the challenges presented by existing infrastructure are somewhat frustrating. Such companies are beginning to lay down supply lines and build the networks needed to develop markets within China. As these markets develop, Chinese retailers are beginning to pressure companies about specific delivery times and other delivery demands similar to retailer expectations in other parts of the world. The inability to locate enough trucks, or trucks of similar shape and size, as well as the lack of adequate warehousing, limits the ability to meet such expectations.[66] Truck licensing rules, borne of strong provincialism, are another source of logistics bottlenecks and transportation difficulty,[67] creating the need for a national truck license, a provincial license, and a local truck operational license.[68] Overloaded trucks pose another unanticipated factor, leading to accidents and damaged merchandise when shipping along China's roads. All told, China has 1,09,858 miles of roadways, of which only 245,697 miles are paved, compared to 2,597,364 miles of paved roads in the U.S. highway system.[69]

For companies that have outsourced manufacturing, the longer lead times and numerous links in the supply chain add uncertainty, especially for oceanborne goods that risk U.S. West Coast port and inland congestion. TNT, a third-party logistics (3PL) provider based in Shanghai, estimates "that Chinese companies hold an average 51 days of inventory – about six times the levels of European companies."[70] Government incentives to attract foreign multinationals further inland continue to suffer from the lack of smooth transportation logistics. The president of APL China has indicated that multinationals look for the "ease of doing business," and notes that "although the labor and land costs in the coastal areas are higher, customers still find it more effective to invest in the coastal areas and move labor to the coastal areas."[71]

Recently, the Minister of Communications has announced a proposed $242 billion investment in a network of 34 highways, seven of which will radiate from Beijing, creating new roads stretching a total length of 85,000 km (11,185 miles), which will be constructed over the next 30 years.[72] This network intends to connect all large and medium-size provincial cities with a population of at least 200,000.

[65] Ibid.
[66] William B. Cassidy, "Shippers' China Syndrome," *Traffic World* (June 20, 2005).
[67] Philip Damas, "Solving China's Logistics Paradox," *American Shipper* (July 2005).
[68] Ibid.
[69] Central Intelligence Agency, "Field Listing – Highways," *World Factbook*. Online. Available: http://www.cia.gov/cia/publications/factbook/fields/2085.html.
[70] Ibid.
[71] Ibid.
[72] Li & Fung Research Centre, "Recent Development of the Logistics Industry in China (2004-2005)," *China Distribution & Trading* (Issue 27, June 2005), p. 4.

Rail networks are also in need of improvements and expansions as "China's rail network spans about 45,000 miles, compared with the 144,000 miles of track in the U.S."[73] To do so, the Ministry of Railways created a new subsidiary called the China Railway Container Transport Centre (CRCTC) in 1995 to counter regional efforts to protect carload business, as well as to coordinate a comprehensive intermodal plan for the country. The CRCTC has developed its terminal operations and related container-leasing and freight-handling services, including some joint venture operations with overseas transportation providers such as Maersk Sealand and Canadian Pacific Railway.[74] Despite new developments, the pace of growth means a demand for 280,000 railcars per month on a system that can only accommodate 100,000 cars per month. Strategies to address this demand have included increasing freight train speeds to 99 mph. Strategies in progress are the restructuring of the rail network's 1,600 locations into three tiers of terminals: one tier of 18 facilities to be remodeled into advanced logistics centers under CRCTC management; a second tier of 40 container handling stations to increase volume according to industry specialization; and a third tier of 160 freight stations to handle remaining intermodal volume.[75] The success of this restructuring depends on the cooperation and integrated planning of the Ministry of Railways, the Ministry of Communications, the Ministry of Construction, the Ministry of Finance, and provincial and city governments. Strategies being considered for future improvement of network capacity include the development of separate networks for passenger and freight rail, increased train length (beyond the current 1,100 feet), track construction to accommodate double-stack trains, and investment in human resources to market the networks advantages to businesses and play a role in economic development.

At present, relatively small unit trains (of approximately 100 TEUs) make infrequent (once or twice a week) service trips to and from most major ports, including Hong Kong, Shanghai, Shenzhen, Qingdao, Tianjin, and Ningbo. The estimated rail share of China's inter-city freight is less than 5 percent.[76] "On-dock rail is a primary focus for the ports to eliminate highway movement in congested areas."[77] Rail improvements along the line from Chengdu to Shenzhen have cut transit time in half to three to four days.[78] Yet, these improvements are only the cusp of what is needed.

Port Infrastructure and Water Transportation

China contains four of the fifteen busiest ports in the world: Hong Kong, Shanghai, Yantian, and Qingdao.[79] Some of the most significant areas of port investment are at the Yangtze River Delta, along the Yangtze River, and at the Pearl River Delta. The navigable stretch of the Yangtze River covers 2,400 km from Chongqing in Sichuan Province to Shanghai on the East China Sea. The upper part of the river, from Chongqing to Yichang, is part of the Three Gorges Dam Reservoir. The Pearl River Delta includes the deepwater ports of Hong Kong and Yantian, the

[73] P.T. Bangsberg, "One-track Mind," *Journal of Commerce* (May 31 - June 6, 2004).
[74] Ibid.
[75] Ted Prince, "China: Past, present, and future," *The Journal of Commerce* (August 2-8, 2004), p. 24.
[76] Ibid.
[77] Ibid.
[78] Philip Damas, "Solving China's Logistics Paradox," *American Shipper* (July 2005).
[79] Intermodal Association of North American (IANA), *Industry Statistics (2003)*. Online. Available: http://www.intermodal.org/fact.html.

latter port being located in Shenzhen, a city with low-cost labor and proximity to manufacturing facilities in Guangdong Province.

Shanghai – mainland China's largest port, handling 11.3 million TEUs in 2003 – suffers from silting, shallow approaches, and narrow channels.[80] The port is expanding its Waigaoqiao terminal to accommodate 6 berths with an annual 700,000 TEUs capacity and seeking foreign, as well as private investment in the construction and operation of the public piers to help cover the $400 million cost.[81] One of the most dramatic investments in new port construction is occurring at Yangshan, an island located 17-20 miles from Shanghai and connected to the city by a tunnel and bridge link. Investment in the port at Yangshan is estimated to be $12 billion, with an expected 33 berths and annual capacity of 20 million TEUs.[82]

Along the Yangtze River, eight new terminals are under construction at Wanzhou, Yichang, Wuhan, Jiujiang, Nanchang, Nanjing, and Nantong.[83] The Chinese government is also investing in the renovation of 40 banks along the middle and upper reaches of the river. Several port authorities, such as the one at Wanzhou, are planning logistics parks to attract manufacturing industries. Some ports, such as Wanzhou, Fuling, and Chonqing, are forming collaborations and marketing themselves as a single port group. Increased river traffic depends upon significant river navigation improvements. In the three gorges reservoir, transportation during the winter dry season (November to March) is difficult. Wider navigation channels and five permanent sluice gates, when completed, will allow 10,000 dwt vessels to reach Chonqing. Problems with current barge transportation service include poor frequency, long waiting times at dams and foggy conditions.[84] Water transportation is cost-competitive, but "operating river barges is reserved for Chinese companies."[85] Major barge lines include Minsheng Shipping, Changjiang Shipping, and Jihai Shipping.

The port at Hong Kong is planning to save the industry $1.28 billion through the implementation of a logistics platform that will link importers, exporters, third-party logistics operators, carriers, the government, banks, financial organizations, and insurance companies for commercial transactions.[86] Discussions between officials in Hong Kong and Shenzhen to coordinate development of the Pearl River Delta are ongoing and may result in agreements that improve the truck delays at border crossings and inefficient single container trips. Growth at the nine ports in Shenzhen, including container throughput at Yantian, Shekou, and Chiwan, have come somewhat at the expense of Hong Kong. Some U.S. importers report savings of $300 per 40-foot container and inland transportation costs when shipping through Shenzhen instead of Hong Kong.[87] Shenzhen has plans to add 16 vessel berths over the next three years, install

[80] P.T. Bansberg, "In a Jam," *The Journal of Commerce* (August 2-8, 2004), p. 32.
[81] Ibid.
[82] P.T. Bansberg, "In a Jam," *The Journal of Commerce* (August 2-8, 2004), p. 32; and "China to Double TEU Traffic," *Traffic World* (July 4, 2005), p. 35.
[83] Neil Dekker, "Interior Motive," *Containerisation International* (March 2005), p. 69.
[84] Ibid.
[85] Philip Damas, "Solving China's Logistics Paradox," *American Shipper* (July 2005).
[86] P.T. Bansberg, "In a Jam," *The Journal of Commerce* (August 2-8, 2004), p. 30.
[87] Bill Mongelluzzo, "Shenzhen to Double Boxes by 2010," *TrafficWorld* (June 23, 2005).

computerized yard management system, doubling its container capacity by 2010 to 25 million TEUs.[88]

Table 5
Container Volumes at Major Yangtze River Ports

Port	TEUs (2001)	TEUs (2002)	TEUs (2003)	TEUs (2004)
Chongqing	35,030	81,367	90,000	139,144
Changsha	10,437	23,228	33,444	N/A
Wuhan	46,910	78,396	110,000	139,118
Wuhu	13,091	19,884	21,630	57,217
Zhenjiang	73,220	52,636	133,000	159,146
Nanjing	205,698	254,736	400,500	492,944
Yangzhou	60,000	98,981	136,000	N/A
Zhangjiagang	160,440	62,564	247,000	326,530
Nantong	183,545	170,128	247,000	282,940
Totals	**788,371**	**992,479**	**1,418,574**	**1,597,039**
TEUs Transshipped via Shanghai	*297,464*	*485,051*	*582,861*	*N/A*

Source: Adapted from "Interior Motive," Containerisation International (March 2005); data provided by Jon Monroe Consulting and OOCL Logistics.

Chinese policymakers may be reluctant to support the development of hundreds of new logistics parks, even at busy ports, when almost 1,000 such parks already exist and are underutilized. Alternatives already in operation include flow centers such as the one managed by APL Logistics near the port of Yantian in Shenzhen to offer onsite customs clearance, cross-docking, product assembly and bar-code scanning.[89] This point-of-origin inventory management operates in 298,000 square feet of space, giving customers the ability to call on or hold stock depending on market needs and to consolidate and ship free-on-board (f.o.b.) China rather than f.o.b. Hong Kong.[90]

According to the president of APL China, "Beyond 300 or 400 kilometers, the railway transportation mode is probably better than using trucks, but the rail is a very congested transportation mode in China." Another inhibitor is the lack of on-dock rail services at any existing Chinese terminal facility.

[88] Ibid.
[89] P.T. Bansberg, "In a Jam," *The Journal of Commerce* (August 2-8, 2004), p. 32.
[90] Gordon Feller, "Can China Keep Up?" *The Journal of Commerce* (August 2-8, 2004), p. 34.

Table 6
Transit Competitiveness Along Yangtze River

Place of Origin	Type of Transport	Distance to Shanghai (km)	Transit time	Cost (USD) 20ft	Cost (USD) 40ft
Nanjing	Road	320	5 hrs	378	512
	Barge	348	20 hrs	120	201
	Rail	317	2 days	138	256
Wuhan	Road	1,100	18 hrs	1,243	1,707
	Barge	1,043	4 days	163	287
	Rail	1,094	5 days	262	507
Chongqing	Road	2,425	40 hrs	2,756	4,012
	Barge	2,335	11 days	369	698
	Rail	2,324	7 days	510	1,004

Source: Adapted from "Interior Motive," Containerisation International (March 2005); data provided by Shanghai International Port Group.

Logistics

The value of domestic logistics in China in the first quarter of 2004 was worth $993 billion, and represented an almost 32% increase in value from the corresponding period in the previous year. Yet the proportion of logistics in GDP also rose 21.6% at this time, indicating that the logistics industry remains underdeveloped.[91]

The logistics industry in China, especially for third-party logistics (3PL), has been growing since China's accession to the WTO with the following identifiable trends:[92]

- The rapid economic growth increases demand for logistics services;
- The logistics industry's development is linked to China's economic development;
- The high logistics costs for transportation, inventory storage and management are beginning to stabilize as a share of GDP (an indicator of logistics industry efficiency); and
- The use of modern logistics services and techniques are becoming more prevalent.

Total logistics value (based on the total value of all final products) reached $4.46 trillion in 2004, a 30% increase from the previous year, and industrial products accounted for 85% of total logistics value in 2004.[93] The total cost for logistics in 2004 was $352 billion, of which 57% was due to transportation-related costs, 29% for inventory storage, and 14% for management. As a percentage of GDP, total logistics cost is often used an efficiency measure of the logistics

[91] P.T. Bansberg, "In a Jam," *The Journal of Commerce* (August 2-8, 2004), p. 30.
[92] Li & Fung Research Centre, "Recent Development of the Logistics Industry in China (2004-2005)," *China Distribution & Trading* (Issue 27, June 2005), pp. 2-3.
[93] Ibid. p. 2.

industry. In countries such as the U.S. and Japan, logistics accounts for roughly 10% of GDP, whereas in China, logistics accounted for 21% of GDP in 2004.

The Chinese government, since accession to the WTO, has gradually been opening up the Chinese market to both domestic and foreign logistics enterprises to achieve a marketization level of roughly 65% in 2004 (the remainder being state-owned enterprises).[94] An agreement with Hong Kong called the "Closer Economic Partnership Arrangement, allows global logistics companies with operations in Hong Kong to operate wholly owned freight-forwarding and logistics companies in China."[95] The potential of China's domestic market has encouraged many foreign logistics service providers to establish joint ventures or wholly foreign-owned enterprises in China. Some examples include SembCorp Logistics, Exel and Kerry Logistics in collaboration with local service providers such as St-Anda, Sinotrans and Beijing Holdings.[96] Rising customer demands within the Chinese market are encouraging the emergence of 4PL and 5PL (or e-logistics) services, with a single service provider managing the logistics activities along an entire supply chain. These services also carry the added value of expert logistics consulting on restructuring and streamlining, as well as advanced technology for electronic ordering, inventory tracking, and customer response solutions.

It can cost up to 50% more to transport goods to inland China with poorer quality of service, when compared to the United States and Europe. There are more than 700,000 enterprises offering various types of logistics services in China, though domestic enterprises have not realized the potential value to be gained from outsourcing. Only 3% of China's logistics industry belongs to 3PLs and the significant number of logistics enterprises centered on transportation, warehousing, storage and cargo-handling are rarely integrated through management and/or technology.[97] The deficit of integrated logistics services and experienced logistics professionals is reflected in the relatively high management cost of transporting goods.

One strategy adopted by APL Logistics has been to view China's market in separate segments of service need: international companies doing business in China; Chinese companies doing international business in China; international companies doing domestic business in China; and Chinese companies with domestic business in China.[98] The business needs of these various sectors far outpace the 3PLs growth at this time. Indicating one trend made possible by changes in governmental policy, two major global 3PLs (Kuehne & Nagel and UPS) have decided to create Chinese subsidiaries rather than partner with local companies.

[94] Ibid. p. 5.
[95] Jane Lanhee Lee, "Tortured Logistics Take Toll on Growth," *Wall Street Journal* (June 29, 2004), p. A12.
[96] Ibid.
[97] Ibid. p. 8.
[98] Alan M. Field, "Surviving the Slugfest," *Journal of Commerce* (June 27, 2005).

Table 7
Logistics Companies in the Chinese Market

	Advantages	Disadvantages
Traditional Chinese transportation companies: Cosco Sinotrans China Post / EMS China Shipping	• Strong transportation and warehouse assets • National transport networks • Good relationships with central and regional governments	• Overstaffing • Lack of customer orientation • Lower service levels • Less developed IT systems
Emerging Chinese logistics companies: Shanghai Industrial Holdings PG Logistics Jiuachuan Logistics	• Strong focus on customers • Industry expertise (usually in one or two key sectors) • Asset light and highly efficient	• Insufficient financial resources for growth • Issues attracting managerial talent • Need to develop organizational structure to sustain growth
Logistics divisions of Chinese companies: Haier Logistics Bright Dairy & Food Ding Xin Logistics Attend Logistics	• In-depth knowledge • Reasonable network coverage	• Weak marketing capabilities and resources for growth • Uncertainty about future
Foreign (non-Chinese) 3PLs: APL Logistics Maersk Logistics Exel UPS TNT Danzas NYK Logistics	• Advanced IT systems • Operational and managerial expertise • Strong global networks	• Limited presence in China and resources for growth • High-cost structure relative to Chinese companies • Lack of on-the-ground capabilities in China

Source: Alan M. Field, "Surviving the Slugfest," *Journal of Commerce* (June 27, 2005).

Major Trans-Pacific Ocean Shipping Lines and Scheduled Services

Maersk Sealand and three large alliances consisting of its closest 19 competitors account for 82% of the container traffic calling at ports in the United States. Maersk Sealand was the largest containership line with a 12.9% share of the container traffic at all U.S. ports in 2003. As of April 1, 2005, there were approximately 500 containerships having a total capacity of more than 2 million TEUs deployed on the East Asia to North America trade route.

Table 8
Major Containership Lines Calling at U.S. Ports

Shipping Line	Export	%	Import	%	Total	%
Maersk Sealand	*940*	*12.7*	*1802*	*13.0*	*2,742*	*12.9*
New World Alliance						
APL	408	5.5	934	6.7	1,342	6.3
Hyundai Merchant Marine	274	3.7	536	3.9	810	3.8
Mitsui OSK Lines	191	2.6	377	2.7	568	2.7
Subtotal	*873*	*11.8*	*1,847*	*13.3*	*2,720*	*12.8*
CKYH						
China Ocean Shipping	251	3.4	594	4.3	845	4.0
Hanjin Shipping	442	6.0	953	6.9	1,395	6.6
K-line	249	3.4	532	3.8	781	3.7
Yang Ming Line	267	3.6	459	3.3	726	3.4
Subtotal	*1,209*	*16.4*	*2,538*	*18.3*	*3,747*	*17.6*
Grand Alliance[99]						
P&O Nedlloyd	328	4.4	616	4.4	944	4.4
Orient Overseas Container Line	301	4.1	595	4.3	896	4.2
NYK Line	249	3.4	594	4.3	843	4.0
Hapag Lloyd	325	4.4	494	3.6	819	3.8
Subtotal	*1,203*	*16.3*	*2,299*	*16.5*	*3,502*	*16.4*
Grand Total of all Shipping Lines	**7,389**	**100.0**	**13,899**	**100.0**	**21289**	**100.0**

Source: Containerisation International and U.S. Department of Transportation Maritime Administration. Online. Available: www.ci-online.co.uk and http://www.marad.dot.gov/MARAD_statistics/index.html; Accessed: March 15, 2005.

Unlike Maersk Sealand, most competing shipping lines operate in alliance with one or more shipping companies for strategic reasons, and there are three large alliances providing shipping services from Asia to North America: New World Alliance, CKYH and the Grand Alliance. These three alliances accounted for 46.8% of the container volumes at U.S. ports in 2003. The members of the New World Alliance are APL, Hyundai Merchant Marine and Mitsui OSK Lines. This alliance had a 12.8% share of total containers handled by volume at U.S ports in 2003. China Ocean Shipping, K-Line, Hanjin Shipping and Yang Ming form the members of the CKYH alliance, which, in 2003, accounted for 17.6% share of the total container volumes at U.S. ports. The Grand Alliance has four members that serve North America - P&O Nedlloyd, Orient Overseas Container Line, NYK Line and Hapag Lloyd, and had a 16.4% share of the total container volumes at U.S. ports in 2003. [100]

Maersk Sealand currently operates ten services between China and the United States. Of these, six make calls solely along the U.S. West Coast, while two travel through the Panama Canal to

[99] The Grand Alliance's fifth member, Malaysia International Shipping Corp. (MISC), is primarily a tanker-vessel service, transporting oil and gas with plans to expand its containership operation in the near future. However, as of June 30, 2005, MISC had only four containerships with capacities greater than 3000 TEUs. MISC has been excluded from this analysis because it only serves Asia, Europe, and the Mediterranean.

[100] Maersk has purchased P&O Nedlloyd. And, as of February 2006, P&O Nedlloyd will no longer be a member of the Grand Alliance. On the other hand, the acquisition of CP Ships by Hapag Lloyd parent TUI may add CP Ships' vessels to the Grand Alliance.

make calls along the East Coast. The two remaining services, the TP-6 and the Suez Express Service, travel around-the-world and through the Suez Canal, respectively. (see Table 9)

The New World Alliance offers a total of ten services between China and the United States. While eight of these trans-Pacific services only call on ports along the U.S. West Coast, the other two services – the CNY and NYX – travel through the Panama Canal to make calls along the U.S. East Coast. (see Table 10)

The CKYH Alliance offers the most services between China and the United States of any of the shippers/alliances. Of its thirteen services between the two countries, seven are trans-Pacific services making calls only at U.S. West Coast ports; four travel through the Panama Canal to make calls along the U.S. East Coast; one travels through the Suez Canal and makes calls in Europe before traveling to the United States; while the last service travels around the world. (see Table 11)

Finally, the Grand Alliance offers seven services between China and the United States. Four of these services are trans-Pacific services exclusively serving the U.S. West Coast, while two other services traverse the Panama Canal to make calls along the U.S. East Coast. The Grand Alliance also offers a hybrid service, the PAX, which makes stops along the U.S. West Coast before passing through the Panama Canal to make calls at East Coast ports. (see Table 12)

In addition, a complete discussion of the trade routes employed by Maersk, the New World Alliance, CKYH, and the Grand Alliance can be found in Appendix B of this report.

Table 9 - Maersk Sealand			
Service Name	**Type of Service**	**Origin**	**Transit Times to U.S. Destinations**
TP-1	Trans-Pacific	Hong Kong, PRC	13 days to Tacoma, WA; 15 days to Oakland, CA; (eastbound) 20 days to Honolulu, HI (on westbound return)
TP-2	Trans-Pacific	Yokohama, Japan	16 days to Los Angeles, CA; 19 days to Tacoma, WA (eastbound)
TP-3	All-water through the Panama Canal	Kobe, Japan	32 days to Miami, FL; 33 days to Charleston, SC; 35 days to Norfolk, VA; 37 days to Port Elizabeth, NJ; (eastbound)
TP-5	Trans-Pacific	Dubai, U.A.E.	28 days to Oakland, CA; 29 days to Los Angeles, CA (eastbound)
TP-6	Around-the-world	Port Kiang, Malaysia	19 days to Los Angeles, CA (eastbound trans-Pacific leg)
TP-7	All-water through the Panama Canal	Hong Kong, PRC	25 days to Miami, FL; 26 days to Savannah, GA; 28 days to Charleston, SC (eastbound)
TP-8	Trans-Pacific	Yantian, PRC	15 days to Los Angeles, CA; 17 days to Oakland, CA (eastbound)
TP-9	Trans-Pacific	Ningbo, PRC	15 days to Los Angeles, CA; 17 days to Oakland, CA (eastbound)
Suez Express Service	All-water through the Suez Canal	Tanjung Peliepas, Malaysia	22 days to Charleston, SC; 24 days to Norfolk, VA; 26 days to Port Elizabeth (westbound)
Canadian Trans-Pacific	Trans-Pacific	Koahsiung, Taiwan	14 days to Tacoma, WA (eastbound)

Source: www.maersksealand.com

Table 10 – New World Alliance			
Service Name	**Type of Service**	**Origin**	**Transit Times to U.S. Destinations**
PS-1	Trans-Pacific	Singapore	16 days to Seattle, WA; 21 days to Oakland, CA
PS-2	Trans-Pacific	Hong Kong	13 days to Los Angeles, CA; 17 days to Oakland, CA
PS-3	Trans-Pacific	Shanghai, PRC	15 days to Los Angeles, CA; 17 days to Seattle, WA
GCX	Trans-Pacific	Xingang, PRC	14 days to Los Angeles, CA; 18 days to Oakland, CA
PSW	Trans-Pacific	Hong Kong	14 days to Long Beach, CA
PNW	Trans-Pacific	Hong Kong	14 days to Tacoma, WA; 15 days to Seattle, WA;
PCX	Trans-Pacific	Xingang, PRC	11 days to Oakland, CA
CNY	All water through the Panama Canal	Chiwan, PRC	26 days to Miami, FL; 28 days to Savannah, GA; 29 days to Charleston, SC; 31 days to New York, NY
NYX	All water through the Panama Canal	Shanghai, PRC	26 days to New York, NY; 28 days to Norfolk, VA; 30 days to Savannah, GA; 32 days to Miami, FL
SAX	Trans-Pacific	Laem Chabang, Thailand	17 days to Los Angeles

Source: www.molpower.com

Table 11 - CKYH Alliance			
Service Name	**Service Type**	**Origin**	**Transit Times to/from U.S. Destinations**
PSW-3	Trans-Pacific	Shanghai	9 days to Long Beach, CA; 12 days to Oakland, CA
PSW-1	Round-the – world	Hong Kong	12 days to Long Beach, CA; 16 days to Oakland, CA
HJ-PDE	Trans-Pacific	Long Beach (westbound only)	14 days from Seattle, WA to Hong Kong
HJ-PDS	Europe-Asia-U.S.	Le Havre, France	9 days from Tokyo, Japan to Long Beach, CA
PSW-4	Trans-Pacific	Ningbo, PRC	13 days to Los Angeles, CA; 16 days to Oakland, CA
CEN	Trans-Pacific	Qingdao, PRC	12 days to Long Beach, CA; 15 days to Oakland, CA
PSW-2	Trans-Pacific	Hong Kong	13 days to Los Angeles, CA; 18 days to Oakland, CA
AWE-2	All-water through the Panama Canal	Hong Kong	21 days to Charleston, SC; 23 days to New York, NY; 25 days to Boston, MA
AWE-3	All-water through the Panama Canal	Busan, South Korea	21 days to Savannah, GA; 23 days to New York, NY; 25 days to Wilmington, DE
AWE-1	All-water through the Panama Canal	Hong Kong	23 days to New York, NY; 25 days to Norfolk, VA; 27 days to Savannah, GA
AWE-4	All-water through the Panama Canal	Hong Kong	22 days to New York, NY; 24 days to Norfolk, VA; 26 days to Savannah, GA
PNW	Trans-Pacific	Shanghai, PRC	14 days to Tacoma, WA
PNX	Trans-Pacific	Koahsiung, Taiwan	11 days to Seattle, WA; 13 days to Portland, OR

Source: www.kline.com

Table 12 - The Grand Alliance			
Service Name	**Service Type**	**Origin**	**Transit Times to U.S. Destinations**
PNX	Trans-Pacific	Singapore	21 days to Seattle, WA
ECN	All-water through the Panama Canal	Busan, South Korea	28 days to New York, NY; 31 days to Norfolk, VA
ECS	All-water through the Panama Canal	Busan, South Korea	29 days to Savannah, GA; 31 days to Charleston, SC
PAX	Trans-Pacific with continuing all-water service through the Panama Canal	Kaohsiung, Taiwan	15 days to Seattle, WA; 18 days to Oakland, CA; 19 days to Long Beach; 30 days to Savannah, GA; 32 days to Norfolk, VA; 33 days to New York, NY
JCX	Trans-Pacific	Shanghai, PRC	13 days to Oakland, CA; 15 days to Los Angeles, CA
CKX	Trans-Pacific	Ningbo, PRC	15 days to Long Beach, CA; 21 days to Seattle, WA
SSX	Trans-Pacific	Hong Kong	12 days to Long Beach, CA

Source: www2.nykline.com

U.S. West Coast Ports

West Coast ports have served as the primary U.S. gateways for trans-Pacific trade. In 2004, 65.4% of containership capacity deployed on the Far East-North America trade lane was bound for the West Coast of North America (see Table 13). The capacity deployment on the West Coast has increased from 62.9% in 2001, reaching its peak of 66.7% in 2002.

Table 13
Regional TEU Capacity Deployment

NA imports TEUs	2001	%	2002	%	2003	%	2004	%
Far East- NA West Coast	1,405,387	62.9	1,526,051	66.7	1,496,081	65.1	1,611,278	65.4
Far East – NA East Coast	663,385	29.7	621,229	27.1	655,037	28.5	724,384	29.4
Far East – NA Gulf Coast	165,837	7.4	141,102	6.2	145,556	6.3	128,050	5.2
	2,234,609	**100.0**	**2,288,382**	**100.0**	**2,296,674**	**100.0**	**2,463,712**	**100.0**

Source: www.ci-online.co.uk; Average TEU deployment during the year; NA-North America

The ports of Los Angeles and Long Beach handled 42.6% of container traffic at U.S. ports. The focus on containerized trade explains why these two ports, when combined, rank first by value and ninth by weight among U.S. ports. In 2003, the top containerized imports were furniture, apparel, electronic products, toys, and computer equipment. In each of these categories, China is a large source of U.S. imports. The growing imbalance in U.S. international trade is reflected in the fact that 70% of the container traffic handled is inbound traffic. The container handling volumes increased at a compounded annual growth rate of 15.8% during the period.

Landbridge Service from the West Coast

Landbridge service – defined as the overland rail and truck services transporting goods from the U.S. West Coast ports to the nation's hinterland – has traditionally been the dominant method by which Asian goods were brought to the U.S. Midwest and East Coast. Two rail carriers have come to dominate these landbridge services from West Coast ports, and especially from the ports of Los Angeles and Long Beach: the Union Pacific Railroad Company (UP) and the Burlington Northern Santa Fe Railway (BNSF).

The Union Pacific Railroad Company (UP)

The Union Pacific Railroad Company (UP) "operates 33,000 route miles in 23 states across the western two-thirds of the country."[101] UP offers three types of service: bulk service, which is "primarily the shipment of coal, grain, rock or soda ash in unit trains"; manifest service, transporting carloads of commodities like lumber and steel; and premium service, which typically transports finished products in intermodal containers.

[101] *Union Pacific Corporation 2004 Analyst Factbook*

Of the three services offered by UP, intermodal service is typically the one employed by shippers looking to move Asian products inland from the West Coast. In 2004, intermodal container loads were up 5% and intermodal revenue was up 8% over the year before. International intermodal traffic – representing 54% of all intermodal container loads and "driven primarily by the continued growth of imports from East Asia to the U.S." – grew 7% in volume terms and 9% by revenue in 2004. Overall, intermodal traffic constituted 19% of UP's total commodity revenues for the year.

UP is expanding its premium intermodal service to be more competitive with truck services and capture more of the market. Its truck-competitive *Blue Streak* service more than doubled the number of shipments from the year before, handling 24,000 containers in 2004, with another "doubling" forecasted for 2005. To further reduce costs to shippers, UP also increased the average length of its intermodal trains by 5% in 2004, and double stacked over 90% of all containers shipped along the network.[102] Meanwhile, due to continued increases in demand, average revenue per intermodal car has been on the rise: from $676 in 2002, to $716 in 2004.

For each of UP's services, the carrier is seeking to increase train velocity and reduce transit times by employing several techniques. One technique, titled the Unified Plan, is taking a "clean sheet" approach to network scheduling. In so doing, it hopes to reduce the number of train stoppages ("work events") per train. At the beginning of 2005, the average numbers of work events per train were broken down as: zero events (33% of all trains), one event (29%), two events (20%), three events (10%), four events (5%), and five or more events (3%). Thus, according to these statistics, 18% of all UP trains were required to make three or more stops to pick up or drop off cars before reaching their destination.[103] UP's Unified Plan seeks to lower the average number of work events per train by examining the entire network and "blocking" trains so that cars with similar destinations can remain connected at interchanges, improving network velocity.

Normally, UP routes the vast majority of its Asian freight along the Sunset Corridor from Los Angeles to El Paso, before routing it to its final Midwest and East Coast destinations. The stretch of the Sunset Corridor between Los Angeles/Long Beach and El Paso has been heavily utilized in recent years, averaging between 50 million and 99 million gross ton miles per year.[104] However, in early January 2005, storms in California and Nevada caused UP to temporarily shut down five of the six routes that it operates in and out of Los Angeles, and two of the routes, the Coastal and the Caliente, required "extensive reconstruction".[105] With shippers already worried about delays within West Coast ports, these additional delays were highly unwelcome and forced many shippers to examine UP's main rail competitor, the Burlington Northern Santa Fe (BNSF), as well as trucks and alternative maritime routes and ports, all of which are discussed later in this report.

[102] Ibid. p. 23.
[103] Ibid. p. 9.
[104] Ibid. p. 11.
[105] Ibid. p. 6.

Burlington Northern Santa Fe (BNSF)

The Burlington Northern Santa Fe (BNSF) has been experiencing substantial growth in demand for its services, and currently receives 39% of its total revenues from international freight.[106]

In its intermodal business, BNSF increased the average number of containers per train from 103 in 2003, to 114 in 2004. On stack trains, BNSF increased the number of intermodal units per stack train from 196 to 211 during the same time period. The majority of BNSF's intermodal traffic is routed along its Southern Transcontinental (Transcon) route. This stretch of track – which travels east from California through Texas and then on to Chicago – has 2,068 miles of double-tracked lines, and BNSF plans to double track 63 additional miles in 2005, and 86 more miles in 2006. When these projects are completed, the entire Transcon route from Southern California to Chicago will be double tracked.[107] BNSF's Los Angeles Hobart intermodal facility, along with various on-dock facilities at the ports of Los Angeles and Long Beach, are the major points of origin for Asian freight traveling along BNSF's network. Between 2003 and 2004, BNSF implemented tougher dwell time restrictions at Hobart, which reduced the allowable inbound unit dwell time from 38 hours to 30 hours, resulting in 24% more inbound parking capacity and 10,270 additional parking slots per month at the yard.[108] The additional capacity at Hobart is helping to improve the "blocking" of container units as they are prepared for trains, ultimately raising efficiency along the route.

Typically, freight from the ports and the Hobart facility is placed on one of three different types of trains heading east out of the Southern California region. The first type of train is internally referred to as an "S-train." S-trains handle the majority of eastbound intermodal freight from Asia that travels along BNSF's network. Thirty-two eastbound S-trains depart Southern California from on-dock facilities at the ports of Los Angeles and Long Beach. From Long Beach, all 15 weekly S-trains depart for Chicago. Seventeen weekly S-trains originate from BNSF's port of Los Angeles on-dock facilities: nine are destined for Chicago; seven are destined for the routing hub at Clovis, NM; and one, a Maersk-Sealand service, departs pier 400 at the port of Los Angeles for Barbour's Cut, TX.[109]

The second type of train is a "Q-train", which consists of "domestic stack and international stack [containers] mixed in," and can be up to 8,000 feet long.[110] Forty-six eastbound Q-trains leave the Hobart facility each week. Twenty-two of these trains are destined for the Chicago-area, while Alliance, TX and Birmingham, AL receive six trains apiece. The transit times for Q-trains are considerable, with the average trip from Barstow to Chicago taking 71 hours.[111] Q-trains, typically, have the second-highest priority on the Transcon route.

[106] *BNSF Corporation 2004 Financial Analysts' Meeting.* PowerPoint. November 11, 2004. Online. http://www.bnsf.com. Accessed: August 15, 2005.
[107] Ibid.
[108] Ibid.
[109] Notes and addendums e-mailed from Rick Wilson, Director, BNSF Port Business Development.
[110] Phone interview with Rick Wilson. August 25, 2005.
[111] Ibid.

Finally, the third type of train that BNSF offers, referred to internally as a "Z-train", consists of UPS and less-than-truckload (LTL) trailers. By designation, Z-trains are the "hottest" trains on the tracks, meaning they have priority over all other freight trains on the route, deferring the right of way only to Amtrak passenger trains. Z-trains are, typically, 5,500 to 6,000 feet long, and are designed to be competitive with team truck driving. These trains are kept shorter because "you can accelerate faster with a smaller train in and out of your terminal" and the additional weight of the truck chassis means Z-trains typically "weight out before they length out."[112] Each week, 35 eastbound Z-trains depart Southern California: 8 destined for Alliance, TX; 6 destined for Kansas City, KS; and 21 destined for Chicago, IL. The fastest of the Z-trains, those handling UPS freight, can make the trip from Los Angeles to Chicago in "about 49 hours", which compares favorably with the average team truck driving time of 48 hours.[113] For this speed, Z-train customers typically pay 2 to 3 times the rates charged for BNSF's "S" and "Q" services.[114] While it is important to note that Z-trains consist almost entirely of *domestic* freight, their priority over all other trains along the Transcon route can occasionally slow the time of the other two types of trains, which handle more international, and specifically Asian, freight. The resulting delays, however, are considerably shorter along BNSF's Transcon route than along UP's competing Sunset route because of BNSF's extensive double-tracking efforts.

Southern California Port Congestion and Alternative Routes

The dominant position of the West Coast ports has been gradually undermined by port congestion and unreliable transit times, which have forced shipping lines to look for alternatives. Container traffic volume between the United States and East Asia has grown 15% over the 2002-2004 period. [115] Cargo from China has grown by 34% during that time, and the trans-Pacific vessel capacity deployment has increased at a higher pace than the total global fleet capacity expansion in general during the same period. About two-thirds of the total Asia-U.S. container traffic arrives on the West Coast, and most of that moves through the ports of Los Angeles and Long Beach. These two ports handled about 82% of the container traffic calling at U.S. West Coast ports.[116]

However, the increases in vessel deployment to West Coast ports have not been accompanied by matching capacity increases in terminal handling. This has put tremendous strain on the physical infrastructure of West Coast ports. The problem of inadequate capacity is compounded by antiquated practices in terminal handling. In addition, the recent shortage of trained dockworkers at West Coast ports only exacerbated the problem.

[112] Ibid.
[113] Ibid.
[114] Ibid.

[115] Brian M. Conrad, Deputy Executive Director Transpacific Stabilization Agreement (TSA) before the Women in Transportation Outlook 2005 Meeting Newport Beach, CA / February 10, 2005. http://www.tsacarriers.org/pf_040104.html Accessed on March 25, 2005
[116] , U.S. Department of Transportation Maritime Administration. Online. Available: http://www.marad.dot.gov/MARAD_statistics/Con-CD-98-03.pdf, Accessed online on May 18, 2005

Not only were West Coast port and terminal authorities caught off-guard during the 2004 peak season for trade, but rail carriers were also finding themselves scrambling to increase capacity as quickly as possible. This resulted in acute traffic congestion, unreliable transit times, and increased costs. The reasons for cost increases have been twofold: first, the premium on already scarce storage space is leading to higher demurrage costs; and second, higher terminal handling costs are being driven by the overtime wages paid to dockworkers during extended hours of operation. This has nullified the time advantage that the ocean and "landbridge" (eastbound overland routing to the Midwest and East Coast) service traditionally has had over alternative services.

Table 14
Container Traffic at West Coast Ports (millions of TEUs)

U.S. Ports	1998	1999	2000	2001	2002	2003	2004
Los Angeles, CA	2,293	2,552	3,228	3,428	4,060	4,664	4,875
% change		*11.3*	*26.5*	*6.2*	*18.4*	*14.9*	*4.5*
Long Beach, CA	2,852	3,048	3,204	3,195	3,184	3,091	3,764
% change		*6.9*	*5.1*	*-0.3*	*-0.3*	*-2.9*	*21.8*
Oakland, CA	902	915	989	963	979	1,064	1,197
% change		*1.4*	*8.1*	*-2.6*	*1.7*	*8.7*	*12.5*
Tacoma, WA	496	581	647	612	769	931	1,049
% change		*17.1*	*11.4*	*-5.4*	*25.7*	*21.1*	*12.7*
Seattle, WA	976	962	960	824	850	815	940
% change		*-1.4*	*-0.2*	*-14.2*	*3.2*	*-4.1*	*15.3*

Source: U.S. Department of Transportation, Maritime Administration

Port authorities and terminal operators failed to forecast and plan for the huge 2004 peak-season demand placed on their infrastructure and resources. The gateway ports of Los Angeles and Long Beach experienced the brunt of the increase in Asia-related traffic on account of inadequate capacity expansions. In addition, several port and terminal operators appear to be slow in adopting infrastructure improvements capable of handling the increased number of ever-larger container vessels entering service.

The average capacity of a containership calling at Southern California ports in 2003 was 3,494 TEUs compared to 2,917 TEUs in 1999. [117] The larger vessels spend more time in port as the import/export/trans-shipment exchanges consist of greater cargo volumes which put pressure on both berth and yard space. [118] An estimated 140 super-post-Panamax vessels (with a capacity of

[117] Vessel Calls at U.S. Ports 2003, U.S. Department of Transportation Maritime Administration
[118] "Global Port Congestion - No Quick Fix", Shipping Markets HVB Drewry Research February 2005 Available Online: http://fk.hypovereinsbank.de/pdf/studie_hafenengpass_en.pdf Accessed on May 18, 2005

7,500 TEUs and over) aggregating 1.13 million TEUs are scheduled for delivery over the next three and a half years (2005 through 2008).[119]

The congestion at the ports of Los Angeles and Long Beach can be gauged by the fact that at the height of the of the peak season in 2004, a record 94 ships were in Los Angeles-Long Beach harbor concurrently. This compares with a daily norm of between 35 and 50 vessels. A third of those vessels were containerships, often waiting at anchor between four and five days for a berthing assignment. A shortage of trained longshoreman to operate equipment led to additional delays of 4 to 5 days when discharging a ship. This resulted in fewer cranes being assigned to individual ships, slower turnaround times, and extended stays at the berth. This situation was made worse in some ports by the low productivity of terminal operations as compared to Asian ports, caused by constraints in the growth of labor resources and the slow adoption of technology.

Pacific Northwest Ports

Shipping lines are increasingly looking at alternatives in order to circumvent the congestion at Southern California ports. One of the alternatives being considered is diversion to Pacific Northwest ports. According to the Marine Exchange of Southern California (MESC), in the June-December period of 2004, approximately 100 ships were diverted away from Los Angeles and Long Beach to alternative ports because of the congestion issue.[120] However, MESC believes that this figure vastly underestimates the true situation and that as many as 2,000 ships were actually rescheduled from Southern Californian ports during the second-half of 2004.[121] As proof, MESC highlights the port of Seattle, which experienced a 12.5% rise in container traffic in 2004, compared to an average decline of 3.5% during the previous five years.[122]

APL and Mitsui OSK Lines (MOL) are among the ocean carriers that have diverted ships from Southern California to Seattle. The two carriers added a temporary additional China/Taiwan/U.S. West Coast service in August 2004 that featured Seattle as the only port of call in North America. This TP5-PS5 service was completely booked during the peak season.

In late October 2004, Hanjin moved some of its largest trans-Pacific ships away from congested Long Beach to reduce the disruption caused by port delays. The Korean line's U.S. West Coast/Asia/Europe/Asia/U.S. West Coast weekly PDE service stopped calls at Long Beach and Oakland and instead started calling at Vancouver and Portland. The PDE service employs 12 Hanjin ships of about 5,400 TEUs. Hanjin will redirect its PNX Asia/Pacific Northwest service to Pacific Southwest ports and rename the service PSW (Pacific southwest). This revised service, which uses smaller vessels of about 4,000 TEUs, will pick up the Long Beach and Oakland calls of the PDE service. The reshuffle means that the larger 5,500-TEU ships on the PDE service will no longer become caught in delays in California. Grand Alliance carriers Hapag-Lloyd, NYK

[119] Ibid.
[120] "Global Port Congestion - No Quick Fix", Shipping Markets HVB Drewry Research February 2005 Available Online: http://fk.hypovereinsbank.de/pdf/studie_hafenengpass_en.pdf Accessed on May 18, 2005
[121] ibid
[122] U.S. Department of Transportation Maritime Administration Available Online: http://www.marad.dot.gov/MARAD_statistics/index.html Accessed May 18, 2005

Line, OOCL and P&O Nedlloyd have upgraded to 5,600-TEU capacity ships in their joint PNX service calling at Seattle and Vancouver, British Columbia. Similarly, New World Alliance carriers APL, Hyundai and MOL now use vessels of about 5,200-TEU average capacity in their joint PNW loop to Tacoma, Seattle and Vancouver, instead of ships of about 4,400 TEUs. These capacity upgrades have meant increased container traffic for Pacific Northwest ports. The port of Seattle reported a 12.5% growth in container volume in 2004, after experiencing an average growth rate of -3.3% in the previous five years.

Mexican West Coast Ports

Congestion at West Coast ports has increasingly led shippers of Asian cargo to reevaluate alternative ports in Mexico to see if they can offer a degree of relief. Mexico increasingly appears to be on its way towards becoming a viable option for shippers. In 2004, Mexican ports handled 1.9 million TEUs, 17% more than the 1.7 million TEUs handled in 2003.[123] While officials at the shallower ports of Matzatlan and Ensenada have made plans to dredge to a depth of 40 feet to accommodate larger ships, they will not be able to handle the large ships diverted from ports along the U.S. West Coast until these projects are completed. On the other hand, the two major Pacific Mexican ports, Manzanillo and Lazaro Cardenas, have been making several improvements to further increase their attractiveness to shippers, leaving them in a strong position to benefit from increased Asian traffic and U.S. West Coast congestion.

The port of Lazaro Cardenas

Traditionally, industry wisdom has held that "Lazaro Cardenas is an industrial port and Manzanillo is a commercial port," according to Cesar Reyes, general coordinator of ports and merchant marine in Mexico. However, Reyes believes that current projects at Manzanillo and, particularly, Lazaro Cardenas (with nearly 8,000 acres of available land for container operations) will "siphon" some container business away from the West Coast. "Manzanillo now moves about 800,000 TEUs by itself per year," and Reyes hopes that, "in two years, Lazaro Cardenas will move around 300,000 or 400,000 TEUs,"[124]

Considering that Lazaro Cardenas, operated by Hutchison Port Holdings, only handled 2,670 TEUs in 2003, the forecasted rapid growth in container traffic at Lazaro Cardenas, the deepest Pacific port in Mexico at nearly 50 feet, has raised some concern at larger ports such as Los Angeles. These concerns where strengthened after at least five ships were diverted to Mexican ports and then moved by rail to their U.S. destinations during times of heavy congestion at Southern California ports between June and November of 2004.[125] To facilitate growth in the coming years, the port of Lazaro Cardenas is currently constructing a new $200 million container

[123] *Shippers Daily Newswire - June 10, 2005,* (daily e-mail report) American Shipper. Online. http://www.americanshipper.com. Accessed: June 10, 2005.
[124] Steinberg, Moura, *West Mexican Ports Vie for Asia Business: A faster, less-congested alternative?* Gulf Shipper, November 1, 2004, p. 8
[125] Nall, Stephanie, *Some Vessel Diversions to Manzanillo from Southern California Ports,* Gulf Shipper, November 1, 2004, p. 57

terminal, which, when completed, will be able to handle two million TEUs annually.[126] The project will increase the port's total area from 15 to 85 acres, and will increase the total berth length from 286 to 1350 meters.[127]

The port of Manzanillo

Meanwhile, the port of Manzanillo continues to move 42 percent of the containers that come into Mexico, 90 percent of the containerized traffic at Mexican West Coast ports; it experienced a 17 percent increase in cargo volume in 2004.[128] The port received over 1,200 ships last year, and over 650 trucks enter the port daily on the six-lane highway entrance. Rail carriers are also able to move double-stack containers trains leaving on daily service routes, the only port in Mexico with double-stack capability.[129]

Officials at the port of Manzanillo have been trying to modernize their port's infrastructure to facilitate higher container volumes in the future. The port recently implemented an electronic payment system and has drastically cut its on-paper operations, which had been generating up to 70,000 paper copies per month. Port officials have also reduced drayage times from nine to five days, with the goal of reducing the total to 2 or 3 days, according to Hector Mora, general director of the port authority of Manzanillo.[130] Dredging projects at the port will take the port depth to 52 feet in 2005, from its current depth of 45 feet. Finally, on February 28, 2005, the Mexican government announced plans to invest $250 million at the port of Manzanillo to add a container terminal with four docking positions, which is expected to take four to six years to complete.[131]

Mexican Rail Infrastructure and Current Rail Services to the United States

Many port officials at U.S. West Coast ports have taken note of port developments in Mexico and statements by Mexican officials – such as Cesar Patricio Reyes, Mexican merchant marine and ports coordinator – that with continued congestion they foresee "around 10% of the 20 million containers that U.S. ports manage could be brought to Mexico in a period of three to four years."[132] However, U.S. West Coast port officials have "scoffed" at these notions because they

[126] *A Mexican Alternative,* Traffic World, Online. http://www.seaportspr.com/viewportnews.cgi?newsletter_id=7&article_id=268. Accessed: May 2, 2005.
[127] *Lazaro Cardenas Terminal Facilities,* Hutchison Port Holdings Corporate Website. Online. http://www.hph.com.hk. Accessed: August 11, 2005.
[128](90% of Mexican Pacific container traffic) *Business Opportunities – The Port of Manzanillo*, Online. http://www.apimanzanillo.com.mx/asp/puerto/oportunidades.asp. Accessed: August 11, 2005; (42% of total Mexican containerized traffic and 17% increase) *A Year of Growth at Manzanillo,* Gulf Shipper, November 1, 2004, p. 10
[129] *Business Opportunities – The Port of Manzanillo*, Online. http://www.apimanzanillo.com.mx/asp/puerto/oportunidades.asp. Accessed: August 11, 2005.
[130] *A Year of Growth at Manzanillo,* Gulf Shipper, November 1, 2004, p. 10
[131] *Mexico – Government to Invest US$ 250 million in Manzanillo Container Terminal,* ATAS – Asociacion TRAINMAR de America del Sur (newswire report), February 28, 2005; *A Year of Growth at Manzanillo,* Gulf Shipper, November 1, 2004, p. 10
[132] *Mexico – Government to Invest US$ 250 million in Manzanillo Container Terminal,* ATAS – Asociacion TRAINMAR de America del Sur (newswire report), February 28, 2005.

do not believe Mexico has the landside rail or road infrastructure to move large volumes of containers. Reyes agrees with their current evaluation of Mexico's rail lines, but sees potential, saying, "Now, it is not marvelous, but it is possible to work with them […] in a few years, we will have very good trains to connect the ports."[133]

Several rail carriers in Mexico operate services from the Mexican ports of Lazaro Cardenas and Manzanillo to the U.S. border. The two, main Mexican rail carriers – Ferrocaril Mexicano (Ferromex) and Transportacion Ferroviaria Mexicana (TFM) – transport the majority of the northbound traffic originating from these ports. In recent years, both of these carriers have partnered with railroads in the United States to offer a more complete south-north service. The agreements allow these rail carriers to transport freight from Mexican ports to numerous points in Texas as well as to key hubs like Kansas City, which is becoming one of the key inland transportation destinations and international trade processing centers (ITPCs) in the United States.

Finally, Mexican rail officials have developed a model for delivering Asian goods, destined for the United States, through Mexico more securely and efficiently. The system, titled the Trans-pacific Multimodal Security System (TPMSS), works by completing Customs inspections at the Asian ports-of-origin, which streamlines inspections at U.S.-Mexico border rail crossings.

Ferrocarril Mexicano (Ferromex) and Transportacion Ferroviaria Mexicana (TFM)

Ferromex operates the *Interwest* rail service between the port of Manzanillo and Ciudad Juarez/El Paso. The service route travels through Guadalajara, Irapuato, Silao, Aquascalientes, Torreon, and Chihuahua on its way to the border. The daily service carries freight from the port of Manzanillo to the border towns of Ciudad Acuna and Piedras Negras where it interchanges with UP and then continues its freight movement to San Antonio.

Through interchange agreements with UP and the Texas Mexican Railway (Tex-Mex), Transportacion Ferroviaria Mexicana (TFM) is able to offer a broad array of services to shippers. TFM operates rail services from the port of Lazaro Cardenas to U.S. border crossings at Nuevo Laredo and Matamoros. At Nuevo Laredo, an interchange agreement with UP routes traffic north towards San Antonio, while TFM's agreement with Tex-Mex routes traffic towards Robstown and Corpus Christi. TFM also sends freight to Corpus Christi through a similar agreement with Union Pacific at Matamoros. Most importantly, TFM's recent acquisition by the Kansas City Southern Railway has created a single railroad, titled "the NAFTA Railway," for transporting freight from the port of Lazaro Cardenas to the U.S. Midwest.

Union Pacific's and Burlington Northern Santa Fe's Interchange Agreements at the U.S.-Mexico Border

Union Pacific (UP) and Burlington Northern Santa Fe (BNSF), the two main rail carriers with major rail lines in the Southwestern United States, have both entered separate interchange agreements with Ferromex and TFM to move goods from Mexican ports into the United States.

[133] Steingberg, Moura, *West Mexican Ports vie for Asia Business,* Gulf Shipper, November 1, 2004, p.8.

With a total annual land transportation market for Mexico estimated at greater than $6 billion (including trucking), both rail carriers have identified NAFTA-related traffic from Mexico as a strong area for growth.[134]

In 2004, UP handled 708,700 Mexican carloads (70% from TFM, 30% from Ferromex), up 5% over 2003, resulting in revenues of $970 million. These carloads were handled at six U.S.-Mexico border crossings, albeit at very uneven distributions, as Laredo handled 67% of all UP carloads from Mexico; followed by Eagle Pass and Nogales, both with 11%; El Paso with 6%; Brownsville with 3%; and Calexico with 2%.[135] The growth in UP's Mexico traffic in 2004 was fueled by "Industrial product growth – up nearly 15,000 units or 15 percent, and Intermodal – up 10,000 units or nearly 8 percent" on strong conversion of truck to rail.[136] Overall, UP's Mexico carloads in 2004 were split as: 40% automotive, 21% intermodal, 16% agricultural, 16% industrial, 6% chemicals, and 1% energy.[137]

Meanwhile, the Burlington Northern Santa Fe (BNSF) has also entered into contracts with TFM and Ferromex, and additionally has signed interchange agreements with the Ferrosur and Tex-Mex railroads.

BNSF operates the intermodal part of these agreements through its *Mexi~Modal* service at two Texas border crossings. The first crossing at Laredo, allows BNSF to exchange intermodal containers with TFM. This service, known as the *MexiStack*, provides a single bill for service from ramps at Pantaco (Mexico City), Monterrey, Queretaro, and San Luis Potosi to U.S. destinations, and points further north in Canada. The MexiStack door-to-door service offers transit times from Pantaco (Mexico City) to the Dallas/Fort Worth area of approximately 5 days (125 hours) and service to Chicago in just over 7 days (173 hours).[138] BNSF also offers two other, similar container services from Mexico to the United States through Laredo. The first, MidBridge, transports containers from within Mexico by truck to Laredo where they are then loaded onto BNSF trains, then trucked to the customer's door upon arrival at their destination. The other alternative service under the *Mexi-Modal* banner is known as the Laredo, which allows Mexican shippers to move cargo by whatever third-party means they wish to a warehouse in Laredo, where BNSF will then truck it to its Laredo railyard for northbound transport by rail, followed by to-door service by truck.

The other half of BNSF's *Mexi~Modal* service consists of interchanges at El Paso, Texas. There, BNSF has contracted with Ferromex to create the *Interwest* service (comparable to the *MexiStack* service), offering a door-to-door intermodal service where truck and rail are employed on both sides of the border to move freight northward from Mexico. The *Interwest* service offers transit times from Pantaco (Mexico City) to the Dallas/Fort Worth area of just over 5 days (125 hours) and service to Chicago of just over 7 days (173 hours), similar to the *MexiStack* service.

[134] *Union Pacific Corporation 2004 Analyst Factbook,* p. 25.
[135] Ibid. p. 25.
[136] Ibid. p. 25.
[137] *Union Pacific Corporation 2004 Analyst Factbook,* p. 25.
[138] *Mexi~Modal Interwest Transit Times.* Online. http://www.bnsf.com/business/mexico/meximodal/assets/pdf/BNSF_Schedules_North.pdf. Accessed: September 7, 2005.

BNSF also offers the *El Paso* service, similar to the *Laredo* service, providing service from El Paso warehouses to BNSF rail facilities by BNSF-contracted trucks, BNSF rail service to U.S. destinations, and truck service to the customer's door. BNSF does not offer a *MidBridge*-type service in El Paso.

Similar BNSF services exist under the *Mexi~Rail* designation for industrial, agricultural, and automotive carload (non-containerized) products.

Kansas City Southern's 'NAFTA Railway' and Kansas City's International Trade Processing Center (ITPC)

The long-delayed, recently-completed *NAFTA Railway* agreement between three different rail carriers seeks to move containers from Lazaro Cardenas to Kansas City, Missouri along a seamless network known as the *NAFTA Railway*. The effort to combine the three networks has been spearheaded by the Kansas City Southern Railway (KCS). In April 2005, KCS completed the purchase of a long-sought controlling interest in Grupo Transportacion Ferroviaria Mexicana S.A. de C.V. (TFM) after several court hearings had delayed the sale for nearly two years. Utilizing the tracks of the Texas Mexican Railway Company (owned 100% by Mexirail, which in turn is owned 51% by Kansas City Southern and 49% by TFM)[139], the deal gives KCS a much stronger market position for capturing the potential growth in northbound Mexican container traffic from Lazaro Cardenas, slated to increase as the port expands. According to KCS officials, cargo received at the port of Lazaro Cardenas can now reach the U.S. border at Laredo in 85 to 90 hours, which KCS believes can be reduced to 35 hours if certain improvements can be made.[140]

KCS officials are aggressively marketing the service's merits to shippers, estimating that it is 15% cheaper to bring containers to the Midwest through Mexico than through Los Angeles or Long Beach.[141] To further entice shippers, decrease costs and improve velocity, many improvements are being undertaken along the combined network. In August 2005, one such improvement got underway when the Texas Mexican Railway secured a $50 million Railroad Rehabilitation and Improvement Financing loan from the Federal Railroad Administration to improve 146 miles of track and 26 bridges along a stretch of rail between Laredo and Corpus Christi, which is expected to greatly increase train velocity along that corridor.[142]

The NAFTA Railway agreement between the three carriers also bolsters the goals of Kansas City's transportation and economic planners, who have been attempting to market Kansas City as a hub for international trade. Competing with similar efforts in the Dallas/Fort Worth-area, Chicago, and Denver, Kansas City has three main attributes to promote. First, Kansas City is served by nine railroads (seven of which have intermodal facilities in Kansas City), making it the second-largest rail center in the United States. Second, Kansas City has more freeway miles per

[139] *The Texas Mexican Railway Company,* Kansas City Southern Corporate Website, Online. http://www.railserve.com/jump/jump.cgi?ID=3945. Accessed: August 16, 2005.
[140] Hendricks, David, *San Antonio Could Well Cash-in on Mexican port's Future Prominence,* San Antonio Express-News, July 7, 2005, Section E, Pg. 1.
[141] Biederman, David, *The Next 'Coast'?,* Traffic World, June 6, 2005, p. 21.
[142] *Texas Mexican Railway Lands Loan to Enhance Infrastructure,* Gulf Shipper, August 8, 2005, p. 9.

capita than any other U.S. city, and is one of only five U.S. cities where three interstates converge. Third, Kansas City ranks first in the country in Foreign Trade Zone space with 17.6 million feet, while U.S. Customs in Kansas City processed $9 billion in international goods in 2004.[143]

In addition, a planned international trade processing center (ITPC) means "[g]oods would be pre-screened for export […] in Kansas City, and would speed through the Mexico border entry points with little or no further inspection," and vice versa, according to Chris Gutierrez president of non-profit Kansas City SmartPort.[144] The ITPC, which has already received clearance from Mexican customs officials, is expected to open in November 2005.

Finally, Kansas City officials recently signed a pact with city officials in Lazaro Cardenas and Manzanillo which "will allow the three cities to jointly market themselves to shippers," and which will route a significant amount of traffic from these ports to Kansas City.[145] The port of Brownsville had been seeking signature pacts with these ports and had hoped to receive the extra traffic, but KCS's completion of the NAFTA Railway purchase, along with the ITPC, made Kansas City the better option according to officials close to the deal. Kansas City officials have said that their next move is to sign similar pacts with Mexican port officials in the Gulf of Mexico.[146]

Mexico's Trans-Pacific Multimodal Security System (TPMSS)

In addition to infrastructure problems, security concerns have also kept many shippers from moving high-value cargo through Mexican ports and on Mexican railways. In 2002, while hosting the Asian Pacific Economic Cooperation meeting, Mexican officials, recognizing problems with their domestic supply-chain's security, demonstrated the Trans-Pacific Multimodal Security System (TPMSS). The system eliminates the need for Mexican Customs' inspections and reduces transit times when shipping Asian cargo to the United States through Mexico.

According to TPMSS officials, the system "was designed to use advanced surveillance systems and information technologies to monitor and inspect [Asian] cargo as it proceeded along its path to the final destination" in the United States.[147] The system relies on a "pre-clearance" at ports in Asia. Thus, when they arrive in Mexico, freight containers "proceed through X-ray or gamma ray arc inspection, but they do not clear Mexican Customs."[148] When cargo arrives at the U.S. border, it passes through X-ray or gamma ray arc inspection once again, and "clear U.S. Customs through the electronic manifesting system." Then, "[u]nder GPS tracking, cargo travels non-stop on Kansas City Southern or Union Pacific trains to inland trade processing centers [ITPCs],"

[143] Biederman, David, *The Next 'Coast'?,* Traffic World, June 6, 2005, p. 21.
[144] Ibid. p. 21.
[145] *Kansas City Reaches Out to Mexican Ports*, Gulf Shipper, April 4, 2005, p. 11.
[146] Ibid. p. 11.
[147] *Freight Transportation: The Latin American Market,* U.S. DOT – Federal Highway Administration. p. 48. Online. http://www.international.fhwa.dot.gov. Accessed: August 16, 2005.
[148] Ibid. p. 49.

where Customs inspections occur.[149] This system ends the double assessments that have traditionally occurred when shipments from Asia bound for the United States were assessed by Customs officials in both Mexico and the United States. The double assessment problem has often been cited by shippers as one of the main deterrents to their routing U.S.-bound cargo through Mexico.

The 2002 demonstration of TPMSS consisted of three "dry runs" which showed that, under ideal conditions, the system could deliver substantial transit-time improvements for Asian shippers. One test transported containers between the port of Manzanillo and Mexico City "in a record 31 hours (including clearing customs)."[150] A second test was able to move containers by rail from the port of Lazaro Cardenas to Laredo, Texas in 96.5 hours." While a third test "moved 62 containers off a ship in Manzanillo, cleared them through customs […] and transported them via doublestack rail cars to Nuevo Laredo in a record 71 hours."[151] However, the designers of the TPMSS note that, in order to reap the efficiency gains of the demonstration in a broader implementation, the vast majority of trains would have to be following TPMSS procedures. This is because the majority of U.S.-Mexico border rail crossings are single tracked and, if one train is stopped or delayed at the border for inspection, all trains behind it must often wait for the problem to be resolved before proceeding along the track. Thus, TPMSS officials advocate that customs assessments and security inspections take place far away from the border, or double-tracking projects be undertaken at border crossings to avoid these delays. In short, large infrastructural and procedural improvements will need to be undertaken before the potential benefits of the TPMSS could be realized; however, the benefits of these improvements, according to proponents, would far outweigh their costs.

All-Water Services through the Panama Canal and the Suez Canal

In response to the persistent congestion at U.S. West Coast ports, several maritime carriers have developed routes that forego calls along the U.S. West Coast altogether to improve transit times from Asia to the Gulf, utilizing either the Panama Canal or Suez Canal. Between July 1, 2004, and Oct. 1, 2004, capacity from Asia to the North America West Coast rose 5% to about 236,000 TEUs.[152] By contrast, eastbound trans-Pacific capacity from Asia to the East and Gulf Coasts of North America increased 9% to about 56,000 TEUs a week during the same three-month period.[153]

Because of the delays at U.S. West Coast ports, transit-time differences between all-water and landbridge services have narrowed considerably. In addition, a perceived lack of competition among rail carriers transporting containers eastward from the West Coast means that landbridge service is more expensive than all-water service, particularly for freight bound for Texas and the Midwest. For instance, the Burlington Northern Santa Fe Railway quotes a price from San

[149] Ibid. p. 49.
[150] Ibid. p. 48.
[151] *Freight Transportation: The Latin American Market,* U.S. DOT – Federal Highway Administration. p. 48. Online. http://www.international.fhwa.dot.gov. Accessed: August 16, 2005.
[152] www.compairdata.com
[153] ibid

Bernardino, California to the Dallas/Fort Worth-area of $1,689 and a door-to-door transit time of 5.5 days, making the total cost (including trans-Pacific shipping to the West Coast) nearly $500 more than all-water service.[154] Thus, in certain instances, all-water service (particularly through the Panama Canal) has become a cheaper, faster and more reliable option for moving goods to certain points in the United States.

All-water through the Panama Canal

One alternative to West Coast congestion that is being closely scrutinized by shippers of Asian freight is the use of all-water service to the Gulf of Mexico through the Panama Canal. The canal handles "about 4 percent of world trade, and 13 to 14 percent of total U.S. seaborne trade."[155] However, the further growth of all-water service through the Canal is faced with several problems. The largest problem is that the canal is already operating at 95% capacity.[156] Panama Canal officials have discussed constructing new locks that could accommodate ship widths of 19 containers across, as opposed to the current maximum width of 14 containers across. However, these locks would not be operational until at least 2012, according to William Coffey, president of Beaufort Maritime Group in Newport, R.I.[157] Ships too large or too heavy to pass through the Canal must off-load all or some containers on the Pacific Coast and ship them on Panama Canal Railway Company trains, or by any other available means, to the Atlantic Coast. The rail transfer cost of one TEU is three times more ($270) than what it cost to move a container through the canal by ship ($90). While the rail transfer service, which takes 50 minutes coast-to-coast, is currently operating near capacity, infrastructure investments will increase its capacity in coming years.[158]

Another possible hindrance to growth is that, with the increased traffic through the Canal, the higher demand for transit slots is driving a rise in tolls. At present, it costs $125,000 to move a 4,300 TEU ship through the Canal, and another toll increase is scheduled in late 2005.[159] Officials have also adopted a system which allows shippers to reserve a slot in the queue of ships waiting to pass through the Canal by paying an additional fee.[160] At the same time, high utilization from clients and their frustration with West Coast congestion has allowed some all-water ocean carriers to increase their rates by up to $500 per container to bring them closer to the total cost of landbridge services, negating most of the cost savings to clients. Given that the

[154] *BNSF: Domestic Intermodal Presentation* (Corporate Client PowerPoint presentation)
[155] *Freight Transportation: The Latin American Market,* U.S. DOT – Federal Highway Administration. p. 40. Online. http://www.international.fhwa.dot.gov. Accessed: August 16, 2005.
[156] Mongelluzzo, Bill, William Armbuster, and Bill Dibenedetto, *West Meets East,* The Journal of Commerce, June 14-20, 2004, p. 40.
[157] Ibid. p. 40.
[158] *Freight Transportation: The Latin American Market,* U.S. DOT – Federal Highway Administration. p. 41. Online. http://www.international.fhwa.dot.gov. Accessed: August 16, 2005.
[159] Mongelluzzo, Bill, William Armbuster, and Bill Dibenedetto, *West Meets East,* The Journal of Commerce, June 14-20, 2004, p. 40.
[160] *Freight Transportation: The Latin American Market,* U.S. DOT – Federal Highway Administration. Online. http://www.international.fhwa.dot.gov. Accessed: August 16, 2005.

transit times are now comparable to landbridge service, such an increase is probably inevitable, and will remain in place until congestion along the West Coast improves.[161]

In late 2004, the CKYH alliance introduced a fourth Asia/U.S. east Coast all-water weekly service via the Panama Canal. The AWE-4 added about 3,700 TEUs in weekly nominal capacity on the Asia to U.S. East Coast route.[162] Several shipping lines have followed suit in early 2005 by upgrading capacity on existing all-water services from Asia to the U.S. East Coast. The Grand Alliance has started the ECS and AEX services to the East Coast. The ECS is a weekly service connecting Busan with the East Coast ports of Norfolk, Charleston, Savannah and Miami via the Panama Canal. It provides non-stop service from Hong Kong to Miami in 24 days. This served an average weekly capacity of about 3,100 TEUs on this route.[163]

All-water through the Suez Canal

Given the delays at U.S. West Coast ports, and the near-capacity utilization of the Panama Canal for the near future, shippers have also begun offering services to the U.S. East Coast and the Gulf of Mexico from China through the Suez Canal. Shipping through the Suez Canal has several obvious advantages. Because there is no sea-level difference and no elevation changes, the Canal is lockless, meaning that ships can travel at faster average speeds through the Suez Canal than through the Panama Canal. The Suez Canal handles 25,000 ships annually, approximately 14% of total world shipping, and can handle ships with 62-foot drafts. Planned dredging efforts will increase the maximum allowable draft to 72 feet by 2010.[164]

The AEX service of the Grand Alliance serves the U.S. East Coast via the Suez Canal. The eastbound journey from Laem Chabang, Thailand to the first major port of call on the U.S. East Coast, New York and New Jersey, takes 35 days. There are nine vessels deployed on this weekly service with an average weekly capacity of 4,400 TEUs. The eastbound voyage takes 33 days while the westbound voyage takes another 30 days.[165]

Comparison of Panama Canal and Suez Canal all-water services

While the Panama Canal can only handle "PANAMAX" ships (50,000 to 80,000 deadweight tons), the Suez Canal can currently handle ships of up to 200,000 deadweight tons, and will be able to handle ships of up to 350,000 deadweight tons after the planned dredging projects are completed in 2010.[166] Currently, shippers traveling through the Suez Canal can, therefore, operate vessels with capacities of 5,500 TEUs or greater (as opposed to PANAMAX vessels with 4,400 TEU-capacities), allowing Suez Canal shippers to offer lower per-slot costs to clients.

[161] Mongelluzzo, Bill, William Armbuster, and Bill Dibenedetto, *West Meets East,* The Journal of Commerce, June 14-20, 2004, p. 40.
[162] www.ci-online.co.uk Accessed March 12, 2005
[163] ibid
[164] *World Oil Transit Chokepoints,* Department of Energy, Online. http://www.eia.doe.gov/emeu/cabs/choke.html. Accessed: August 18, 2005.
[165] ibid
[166] *World Oil Transit Chokepoints,* Department of Energy, Online. http://www.eia.doe.gov/emeu/cabs/choke.html. Accessed: August 18, 2005.

Nevertheless, shipping all-water through the Panama Canal still has the advantage of shorter transit times from Asia to the U.S. East Coast. The fastest all-water Panama Canal services have transit times of 20 days from Asia to the East Coast, while the fastest Suez service, Maersk Sealand's *Suez Express Service,* takes 22 days to travel from Malaysia to South Carolina. By comparison, the fastest West Coast landbridge services currently take 18 days.

The greater time-dependability of all-water service, particularly through the Panama Canal, is highly valued by clients, overriding the ever-shrinking difference in transit times for many customers. However, these two types of all-water services may grow at different rates in the future because it is more difficult for ocean carriers to operate an all-water Suez Canal service as the number of ships required to operate a weekly service is greater. Thus, while a carrier can operate a trans-Pacific service with five ships and an all-water Panama Canal service with eight or nine vessels, a Suez Canal all-water service requires twelve vessels, creating a greater start-up cost and higher barriers to entry.

Nevertheless, the size of the global shipping fleet is growing rapidly, significantly improving the growth prospects of both types of all-water services over the next several years. By the end of 2006, "dozens of 5,000-TEU-plus vessels are to enter the Asia-Europe and trans-Pacific trades, doubling the size of the global container fleet."[167] By 2007, "792 ships with a combined 3 million TEU capacity are scheduled for delivery […], bringing the global container fleet to a 9.3 million-TEU capacity."[168] Industry analysts believe this expansion of the global fleet will "create a surplus with a cascading effect in which smaller vessels [will] be redeployed" to routes in the Gulf of Mexico, among other places.[169] This means that while a greater number of newer and larger ships will be available for all-water Suez Canal services, the smaller, older vessels with shallower drafts will now be available for use in all-water Panama Canal services.

All-water to Texas (Port Freeport and the port of Houston) from Asia

The containerized trade of the United States with the rest of the world is concentrated on the U.S. Atlantic and Pacific coasts. The exposure of the Gulf Coast ports to containerized trade and hence East Asia is very limited. Thus, while the port of Houston has an 80% share of the containerized trade on the Gulf Coast, it has only a 4% share of the overall containerized trade of the nation. It is therefore important to understand how imports from East and Southeast Asia find their way to Texas. There are two ways in which maritime trade with these regions get to Texas: direct shipping services, or feeder services that originate from major ports that trade with these regions.

There is considerable potential for East Asian trade to be routed through Texas, given the congestion-prone ports along the West Coast. The attractiveness of the California ports as freight gateways to the United States for imports from East and Southeast Asia is influenced by the fact that there is a large local captive consumer population of over 35 million in California. It is estimated that 50-55% of the imports entering into the United States from the Southern

[167] Plume, Janet, *A Gulf Coast Boom?,* Traffic World, May 31, 2004, p. 40.
[168] Ibid. p. 40.
[169] Ibid. p. 40.

California ports remain within the state of California. Given the high level of congestion at these ports, there is a strong incentive for shippers to route cargo not destined for California to ports where there are other large, nearby consumer populations for imports from East Asia. Currently, the port of Houston is not saddled with the same degree of congestion problems that plague the California ports. In terms of productivity per acre, the port of Houston ranks higher than the ports of Los Angeles and Long Beach, and the port of Houston has space for additional distribution centers.

The cost of transportation is no longer the sole determinant in the choice of a freight gateway. The presence of distribution centers in and around the port area are important drivers for a port to attract shipping lines. Also, the state of Texas has the second-largest population in the nation. This fact, alone, is a strong reason for shippers to call on the port of Houston. What Houston has traditionally lacked, a large-scale distribution center that will compel shippers to call on the port, will be remedied by Wal-Mart's two-million-square-foot distribution center. With a second phase that will double its size ultimately to four million square feet, the distribution center is a strong enough reason for a larger number of containerships to call on the port of Houston, which may serve to anchor the distribution centers of Wal-Mart's suppliers as well.

Air Cargo to the United States

The Chinese government has enacted several measures in recent years to promote the manufacture of high-value goods, which, traditionally, have been the domain of air-cargo services. The world's three-largest air-cargo services – United Parcel Service (UPS), FedEx, and DHL – are all seeking to position themselves to reap the benefits of China's "high-value" manufacturing expansion. Moreover, these three companies are also planning for the pending changes in the consumption patterns of Chinese citizens, as the middle class continues to grow and its appetite for foreign goods, increasingly purchased on-line and elsewhere, expands.

When the three air-cargo carriers began operations in China in the 1980s: "[T]hey knew that policy-related factors and government relations had more bearing on their success in China than market opportunities in other parts of the country, and without exception, established their headquarters in Beijing."[170]

This was because government policy in China mandated that only Chinese carriers could deliver domestic shipments. However, the legal loophole of "foreign-domestic joint ventures" allowed international carriers to skirt this rule and expand operations in mainland China by taking a domestic partner. With few options to choose from, UPS and DHL both partnered with Sinotrans, the large state-owned monopoly, while FedEx chose Chinese logistics company EAS.

Although this mandatory partnering undoubtedly led to some degree of inefficiency in the carriers' operations in China, the three companies are said to have benefited from their Chinese

[170] Ke, Liu, *"Big Day" Draws Near for International Express Delivery Giants*, China Today, Online. http://www.chinatoday.com.cn/English/e2005/e200505/p36.htm. Accessed: August 1, 2005.

partners' "local market knowledge, contacts, and resources" that "were priceless to the international players as they were getting up and running in China."[171]

In 2004, discussions between the international carriers and Chinese officials led to an agreement whereby, on December 11, 2005, China will allow international express delivery services to operate in China without a domestic partner, opening a market that was worth $600 million in 2004.[172] With this reduction in state control, the need to locate in Beijing has waned. Industry analysts now believe that the most important operations for these three carriers will be the ones that they establish in Shanghai, where incoming and outgoing goods have been increasing "50-percent year on year," according to Shanghai Customs. Some analysts believe that Shanghai will, or may have already, become the major express airfreight hub for the entire Asian-Pacific region.[173]

United Parcel Service

Currently trailing its two rivals with 15% of the Chinese express delivery market, UPS has announced plans to open a hub in Shanghai at Pudong International Airport in 2007 to better compete with its rivals in mainland China.[174] UPS already operates Asian hubs in Hong Kong, Taiwan and the Philippines; however, receiving "hub" status in mainland China will allow the company to "divide incoming cargoes into smaller shipments and send them on to different destinations inside China" in accordance with government regulations.[175] In the meantime, UPS is also developing a domestic Chinese express service, which is being marketed exclusively to corporate clients, but will be expanded to include shipments from individuals by the end of 2005. In order to operate this domestic service, UPS paid Sinotrans "$100 million for its business in 23 big commercial cities in China, paving the way for an eventual takeover."[176] After comparing the stated plans of the three shippers, this route buyout by UPS will leave it as the only foreign operation without a domestic partner when the new policy takes effect in December.

FedEx

In second place among the three shippers is FedEx, controlling 20% of the Chinese shipping market and witnessing growth in China-related traffic of 50% annually.[177] When FedEx's contract with EAS expired in 1999, FedEx chose the domestic shipper, DWT, fueling speculation that it had done so in hopes of eventually taking over its new, smaller partner – a strategy FedEx denies.

Regardless, FedEx's leadership readily admits that growth in China will be key to its business in the future. As FedEx founder and CEO Frederick Smith states, "It would not surprise me if, fast-

[171] Ke, Liu, *"Big Day" Draws Near for International Express Delivery Giants*, China Today, Online. http://www.chinatoday.com.cn/English/e2005/e200505/p36.htm. Accessed: August 1, 2005.
[172] Ibid.
[173] Ibid.
[174] Stanley, Bruce, *United Parcel Service to Open a Hub in Shanghai,* The Wall Street Journal, July 8, 2005, p. 32
[175] Ibid. p. 32
[176] Damas, Philip, *China Drives Air Cargo Boom,* American Shipper, June 2005, p.69.
[177] Stanley, Bruce, *United Parcel Service to Open a Hub in Shanghai,* The Wall Street Journal, July 8, 2005, p. 32

forward 10 years, the international portion of FedEx Express is a bigger revenue generator that the domestic [U.S. express] part of the business" with China being a major contributor.[178]

Unlike UPS, FedEx's "Shanghai strategy" is already off and running: Its 6,000-square-foot-sorting facility at Pudong Airport (where UPS will begin operations in 2007) already "moves, x-rays, checks and clears thousands of parcels per hour" and "the goods, arriving on 36 weekly flights, move swiftly through the state-of-the-art facility."[179]

DHL

Among the three-largest air-cargo carriers, however, DHL is the leader in China with an estimated market share of between 33% and 40%.[180] The DHL-Sinotrans partnership has been so successful that DHL's parent company, Deutsche Post, bought a 5-percent stake in Sinotrans for $57 million in 2003, and recently renewed a 50-year contract with the company. Jerry Hsu, president of DHL Greater China and Korea, has lauded his company's partnership with Sinotrans, citing the profitable "myriad of relationships that, for foreign companies, are very difficult to do" in China.[181]

In the last 12 months, the company has experienced domestic annual growth in demand in China of "between 50% and 60%" and predicts "China will become [DHL's] largest market in the Asia-Pacific region in the next few years."[182] The major competitive advantage arising from DHL's Sinotrans partnership is that it is already operating in China's domestic express market, while the other international carriers will be seeking to do this after the December rollback.

[178] *Delivering the Goods at FedEx,* Business Week, June 13, 2005, p. 60.
[179] *International Couriers Deliver in China*, China International Business, June 3, 2005, Online. http://www.cityweekend.com.cn/en/beijing/cib/2005_06/S1117804248. Accessed: August 1, 2005.
[180] (DHL market share = 33%) Stanley, Bruce, *United Parcel Service to Open a Hub in Shanghai,* The Wall Street Journal, July 8, 2005, p. 32; (DHL market share = 40%) Damas, Philip, *China Drives Air Cargo Boom,* American Shipper, June 2005, p.69.
[181] Damas, Philip, *China Drives Air Cargo Boom,* American Shipper, June 2005, p.69.
[182] Stanley, Bruce, *United Parcel Service to Open a Hub in Shanghai,* The Wall Street Journal, July 8, 2005, p. 32

Appendix A: GLOBAL TRADE TRENDS

Trends in Global Trade

The top-10 exporting countries saw their share of world export trade decline from 60.5% in 1993 to 55.8% in 2003. This decrease implies that benefits of trade liberalization are being shared by a larger number of countries in 2003 compared to 1993. The U.S. share of world merchandise exports declined from 12.3% in 1993 to 9.6% in 2003. China experienced the largest growth, as its share of world exports increased from 2.4% to 5.8% in this same period.

Table A.1
Top-10 Exporters in the World (in millions $)

	Country	1993	%	1998	%	2003	%
1	Germany	380,096	10.1	543,752	9.9	748,320	10.0
2	United States	464,773	12.3	682,138	12.4	723,805	9.6
3	Japan	362,244	9.6	387,927	7.1	471,817	6.3
4	China	91,744	2.4	183,712	3.3	437,899	5.8
5	France	221,619	5.9	320,631	5.8	386,699	5.2
6	United Kingdom	181,381	4.8	273,949	5.0	304,596	4.1
7	Netherlands	140,245	3.7	213,977	3.9	294,051	3.9
8	Italy	169,229	4.5	245,801	4.5	292,052	3.9
9	Canada	145,178	3.8	214,327	3.9	272,739	3.6
10	Belgium	127,580	3.4	181,910	3.3	255,320	3.4
	Top-10 Total	**2,284,089**	**60.5**	**3,248,124**	**59.1**	**4,187,298**	**55.8**
	World Total	**3,777,000**	**100**	**5,496,000**	**100**	**7,503,000**	**100**

Source: World Trade Organization

Table A.2
Top-10 Importers in the World (in millions $)

	Country	1993	%	1998	%	2003	%
1	United States	603,438	15.6	944,353	16.7	1,303,050	16.8
2	Germany	342,611	8.8	471,474	8.3	601,691	7.7
3	China	103,959	2.7	140,237	2.5	413,062	5.3
4	United Kingdom	209,318	5.4	321,231	5.7	390,774	5
5	France	217,351	5.6	307,771	5.4	390,528	5
6	Japan	241,624	6.2	280,484	5	382,930	4.9
7	Italy	148,095	3.8	218,465	3.9	290,811	3.7
8	Netherlands	126,270	3.3	195,639	3.5	262,816	3.4
9	Canada	139,035	3.6	206,066	3.6	245,021	3.2
10	Belgium	118,021	3	168,995	3	235,370	3
	Top-10 Total	**2,131,701**	**55**	**3,085,720**	**54**	**4,280,683**	**55**
	World Total	**3,874,000**	**100**	**5,664,000**	**100**	**7,778,000**	**100**

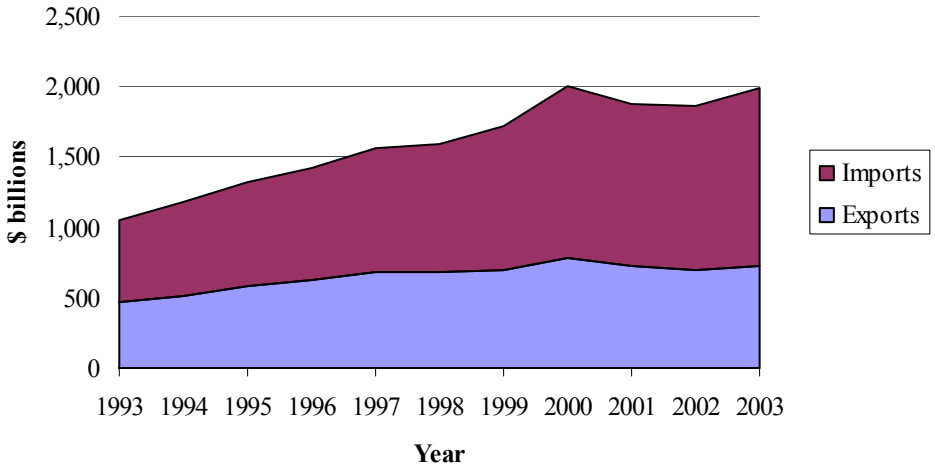
Source: World Trade Organization

The share of top-10 world importers as a percentage of total world imports remains almost the same. Over the past decade, the U.S. share of total world merchandise imports increased from 15.6% in 1993 to 16.8% in 2003. China increased its share of imports from 2.7% to 5.3% over the same period.

Trends in U.S. Trade

U.S. international trade grew at a compounded annual growth rate of 6.6% during 1993-2003. Imports grew at a higher rate of 6.4% compared to exports at 4.8%. Consequently, the share of U.S. exports in total trade declined from 44.2% in 1990 to 36.5% in 2003.

Figure A.1
U.S. Merchandise Trade



Source: Bureau of Transportation Statistics

During the period 1998-2003, China emerged as one of the fastest growing trading partners of the United States. Trade with China grew at a compounded annual growth rate (CAGR) of 16.2%. Consequently, it constituted 9.1% of the overall international trade of the United States in 2003 compared to 5.4% in 1998. Canada continued to be the largest trading partner of the United States, but its share of overall trade declined marginally during the period under review. Canada and Mexico maintained their share of U.S. international trade at around 31%. Similarly, the shares of the EU and Asian countries have more or less remained at the same level of 17% to 18% and 27% to 28%, respectively.

Table A.3
Top-20 U.S. Trading Partners
(exports and imports in millions $)

Country	1998	%	2003	%	CAGR (1998-2003) %
Canada	329,860	20.7	393,936	19.9	3.6
Mexico	173,402	10.9	235,531	11.9	6.3
China	85,410	5.4	180,798	9.1	16.2
Japan	179,676	11.3	170,093	8.6	-1.1
Germany	76,499	4.8	96,895	4.9	4.8
United Kingdom	73,896	4.6	76,562	3.9	0.7
Korea, South	40,427	2.5	61,062	3.1	8.6
Taiwan	51,289	3.2	49,088	2.5	-0.9
France	41,745	2.6	46,289	2.3	2.1
Malaysia	27,957	1.8	36,358	1.8	5.4
Italy	29,950	1.9	36,007	1.8	3.8
Ireland	14,048	0.9	33,539	1.7	19.0
Singapore	34,049	2.1	31,734	1.6	-1.4
Netherlands	26,577	1.7	31,675	1.6	3.6
Brazil	25,244	1.6	29,102	1.5	2.9
Belgium	22,358	1.4	25,359	1.3	2.6
Saudi Arabia	16,761	1.1	22,665	1.1	6.2
Hong Kong	23,464	1.5	22,393	1.1	-0.9
Thailand	18,675	1.2	21,022	1.1	2.4
Venezuela	15,697	1.0	19,984	1.0	4.9
Top-20 Trading Partners	**1,306,984**	**82.0**	**1,620,092**	**81.7**	**4.4**
Grand Total	**1,594,034**	**100**	**1,981,892**	**100**	**4.5**

Source: U.S. Census Bureau

Exports

In 2003, U.S exports to the world were $724 billion. According to the World Trade Organization, U.S. exports represented 9.6% of the total world exports.

Table A.4
Top-20 Countries for U.S. Exports (in millions $)

Country	1998	2003	CAGR (1998-2003) (%)
Canada	156,603	169,924	1.65
Mexico	78,772	97,412	4.34
Japan	57,831	52,004	(2.10)
United Kingdom	39,058	33,828	(2.83)
Germany	26,657	28,832	1.58
China	14,241	28,368	14.78
Korea, South	16,486	24,073	7.87
Netherlands	18,978	20,695	1.75
Taiwan	18,164	17,448	(0.80)
France	17,729	17,053	(0.77)
Singapore	15,694	16,560	1.08
Belgium	13,918	15,236	1.83
Hong Kong	12,925	13,520	0.90
Australia	11,918	13,088	1.89
Brazil	15,142	11,211	(5.83)
Malaysia	8,957	10,914	4.03
Italy	8,991	10,561	3.27
Switzerland	7,247	8,656	3.62
Philippines	6,737	7,987	3.46
Ireland	5,647	7,696	6.39
Top-20 Importers	**551,695**	**605,065**	**1.86**
World Total	**682,138**	**724,771**	**1.22**
Top-20 as % of Total	**80.9**	**83.5**	

Source: USA Trade Online[183]

[183] According to the USA Trade Online 'Guide to Foreign Statistics', data on exports are compiled from the Shipper's Export Declarations (SEDs) and SED data from qualified exporters, forwarders, or carriers. The United States is substituting Canadian import statistics for U.S. exports to Canada. Exports measure the total physical movement of merchandise out of the United States to foreign countries whether such merchandise is exported from within the U.S. Customs territory or from a U.S. Customs bonded warehouse or a U.S. Foreign Trade Zone. Imports are compiled from forms and automated reports filed initially with the U.S. Customs Service or, in some cases, directly with the Census Bureau, for virtually all shipments leaving (exports) or entering (imports) the United States. Products are categorized using the Harmonized Commodity Description and Coding System (Harmonized System). Imports are compiled primarily from automated data submitted through the U.S. customs' Automate Commercail System. Data are compiled also from import entry summary forms, warehouse withdrawal forms and Foreign Trade Zone documents. Imports of merchandise include commodities of foreign origin as well as goods of domestic origin returned to the United States with no change in condition or having have been processed and/or assembled in other countries.

Exports grew at an average annual rate of 1.22% between 1998 and 2003. Exports to China grew at an average annual rate of approximately 15% and the United States increased its exports to South Korea by an average annual rate of approximately 8%. During this same period exports to Japan, the United States third-largest export destination, decreased by an average annual rate of 2%. The importance of Canada and Mexico is exhibited by their large share of U.S. exports. Approximately 37% of all U.S. exports go to Canada and Mexico. Furthermore, in the five-year period between 1998 and 2003, trade with Mexico grew at an average annual rate of 4% from a total of $78 billion to $97 billion in 2003.

Imports

Table A.5
Top-20 Countries for U.S. Imports (in millions $)

Country	1998	2003	CAGR (1998-2003) %
Canada	173,256	224,166	5.29
China	71,169	152,379	16.45
Mexico	94,629	138,073	7.85
Japan	121,845	118,029	(0.63)
Germany	49,842	68,047	6.42
United Kingdom	34,838	42,667	4.14
Korea, South	23,942	36,963	9.07
Taiwan	33,125	31,600	(0.94)
France	24,016	29,221	4.00
Ireland	8,401	25,841	25.20
Malaysia	19,000	25,438	6.01
Italy	20,959	25,437	3.95
Saudi Arabia	6,241	18,069	23.69
Brazil	10,102	17,884	12.10
Venezuela	9,181	17,144	13.30
Thailand	13,436	15,181	2.47
Singapore	18,356	15,158	(3.76)
India	8,237	13,053	9.64
Israel	8,640	12,770	8.13
Sweden	7,848	11,125	7.23
Top-20 Importers	**757,063**	**1,038,245**	**6.52**
World Total	**911,896**	**1,257,121**	**6.63**
Top-20 as % of Total	**82.8**	**82.5**	

Source: USA Trade Online

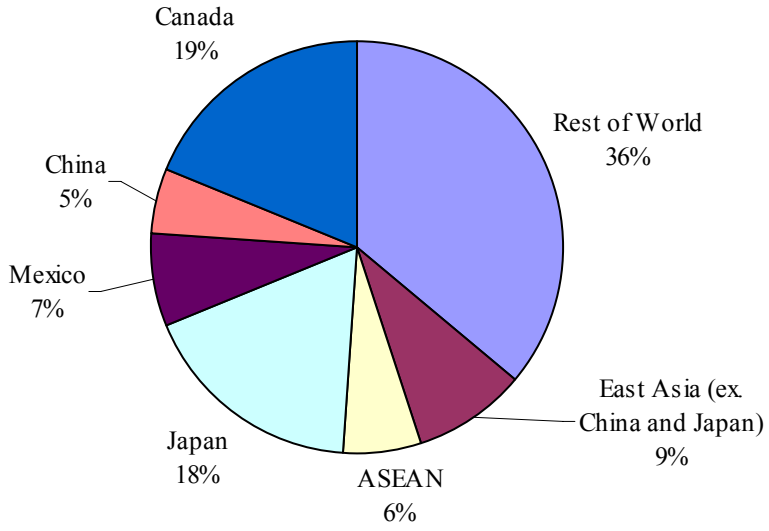
The United States imported $1.26 trillion dollars worth of goods in 2003.[184] Over the past ten years, imports have grown at a compounded annual growth rate (CAGR) of 8%.[185] During this

[184] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed: March 1, 2005.

period, Canada remained the United States' largest trading partner. In 2003, Canada provided 18% of all U.S. imports. Mexico has consistently remained one of the top-three U.S. trading partners, and in 2003 accounted for 11% of all U.S. imports. The flow of goods in North America has been facilitated by a strong U.S. economy, liberal trade policies, and the importance of distance in responding to technological innovations and local markets. The advantage of geography has played a large part in preserving the strong trade relationship that the United States enjoys with Canada and Mexico, but a review of the changes in the country's other large trading partners illustrates the realities of globalization and indicates a continued shift in U.S. trade.

In 1993, Japan was the United States' second-largest trading partner. East Asia[186], excluding mainland China and Japan, constituted 9% of all U.S. imports and ASEAN [187] countries represented 6%. The technological innovation and operational excellence of Asia, in conjunction with low-cost labor costs, have contributed to the growing importance of the region in U.S. trade. Over the past decade, the development of the Japanese and South Korean economies led to rising labor wages, which were reflected in higher import prices in the United States.

Figure A.2
Share of U.S. Imports (1993)



Source: USA Trade Online

These factors created an opportunity for other low-cost producers to capture a larger share of the U.S. market: specifically, Mexico and China. Mexican imports, encouraged by NAFTA, have

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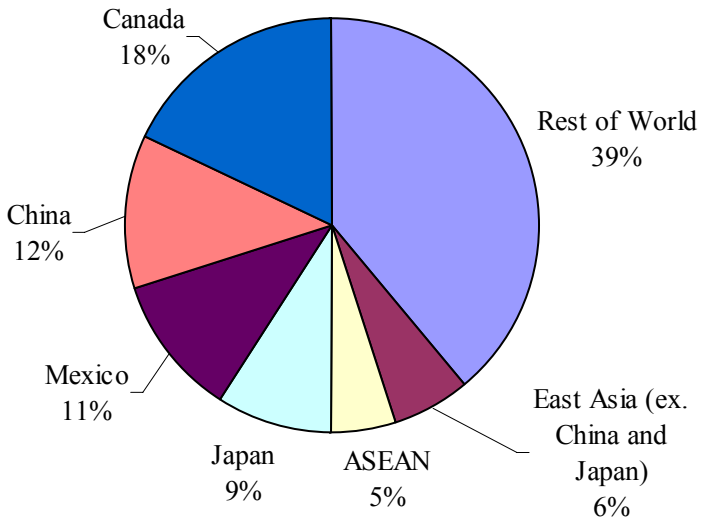
[185] USA Trade Online, "U.S. Foreign Trade Data" database. Online. Available: http://www.usatradeonline.gov/. Accessed : March 1, 2005.
[186] In this instance East Asia includes: South Korea, Taiwan, Hong Kong
[187] ASEAN: Malaysia, Singapore, Philippines, Indonesia, Vietnam, Laos, Cambodia, Burma (Myanmar), Brunei, Thailand

increased from 7% of all U.S. imports in 1993 to 11% in 2003. Even more spectacular, however, is the emergence of China as a major trading partner. In 1993, China represented 5% of all U.S. imports. In 2003, China had increased its share to 12% and ranks second amongst all U.S. trading partners.

Figure A.3
Share of U.S. Imports (2003)



Source: USA Trade Online

The ability of both countries to sustain or grow their respective market shares in various commodities has been predicated, in large part, on the low-cost of labor in each country. Yet, wages in Mexico are three times greater that wages in China. Mexico's proximity to the U.S. market and the emergence of the maquiladora industry has allowed it to stay competitive in the face of China's competition; but, as China's wage advantage persists, and the development of transportation and logistics continues, Mexico is being confronted with a difficult challenge.

A glance at the top-10 exports from China and Mexico to the United States illustrates the current advantage that each country has in providing manufactured goods for U.S. businesses and consumers. China provides 77% of all 'Toys, Games & Sports Equipment; Parts & Accessories' and 68% of all 'Footwear, Gaiters Etc.' to the United States. The remainder of the top Chinese exports range from a 21% share of the market for 'Articles of Iron and Steel' to 40% for 'Furniture; Bedding Etc.'.

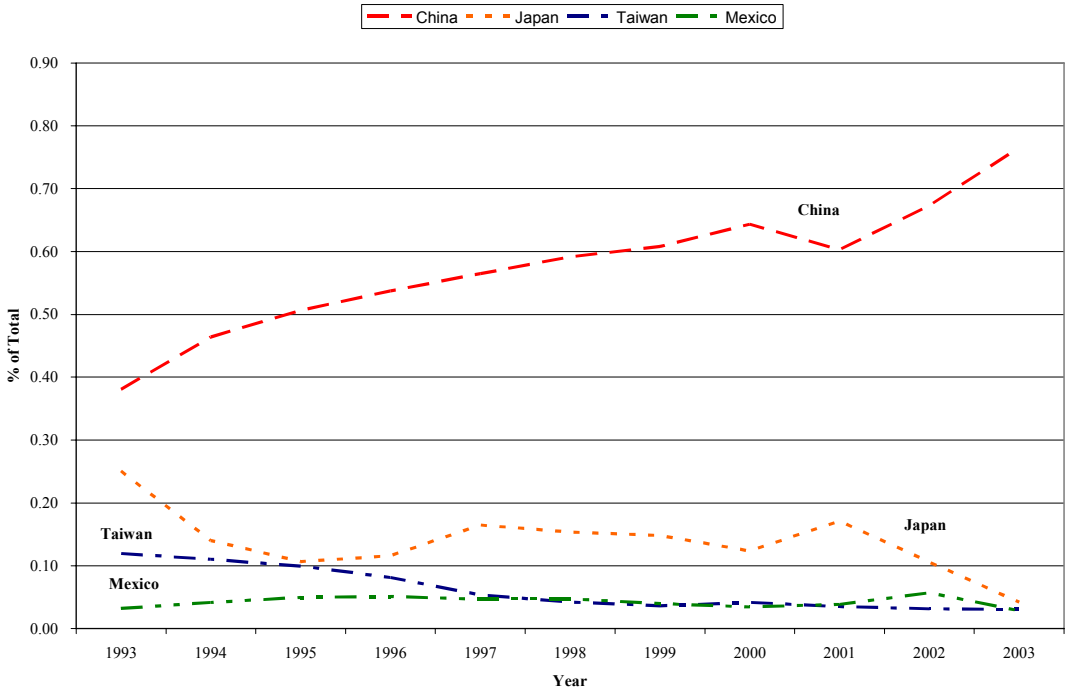
Mexico, on the other hand, does not control as large a share of the market in its respective commodity mix, but it does contribute significantly in 'Electric Machinery Etc' (21%), 'Vehicles' (14%), 'Optic, Photo Etc., Medic or Surgical Instruments Etc' (15%) and 'Furniture; Bedding Etc" (17%).

Table A.6
Top-10 U.S. Imports from China and Mexico

Top-10 Commodities Imported into U.S. from China (2003 - 78% of China's Exports to the United States)	Top-10 Commodities Imported into U.S. from Mexico (2003 – 84 % of Mexico's Exports to the U.S.)
84 Nuclear Reactors, Boilers, Machinery Etc.; Parts	85 Electric Machinery Etc; Sound Equip; Tv Equip; Pts
85 Electric Machinery Etc; Sound Equip; Tv Equip; Pts	87 Vehicles, Except Railway Or Tramway, And Parts Etc
95 Toys, Games & Sport Equipment; Parts & Accessories	84 Nuclear Reactors, Boilers, Machinery Etc.; Parts
94 Furniture; Bedding Etc; Lamps Nesoi Etc; Prefab Bd	27 Mineral Fuel, Oil Etc.; Bitumin Subst; Mineral Wax
64 Footwear, Gaiters Etc. And Parts Thereof	90 Optic, Photo Etc, Medic Or Surgical Instruments Etc
62 Apparel Articles And Accessories, Not Knit Etc.	94 Furniture; Bedding Etc; Lamps Nesoi Etc; Prefab Bd
42 Leather Art; Saddlery Etc; Handbags Etc; Gut Art	98 Special Classification Provisions, Nesoi
39 Plastics And Articles Thereof	62 Apparel Articles And Accessories, Not Knit Etc.
90 Optic, Photo Etc, Medic Or Surgical Instruments Etc	61 Apparel Articles And Accessories, Knit Or Crochet
73 Articles Of Iron Or Steel	07 Edible Vegetables & Certain Roots & Tubers

Source: USA Trade Online[188]

Figure A.4
Share of U.S. Imports
Toys, Games & Sport Equipment; Parts & Accessories – HS 95

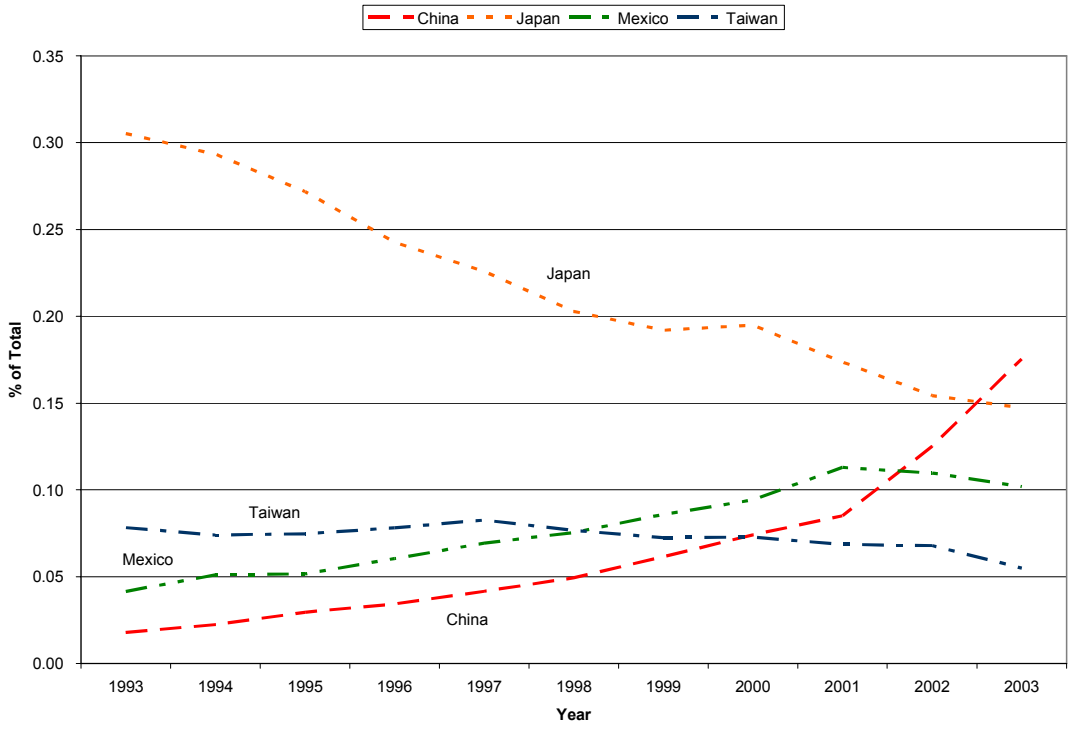


Source: USA Trade Online

[188] Industries are classified using the 2-digit Harmonized Commodity Description and Coding System

The growth of imports from China and Mexico over the past decade has come mainly at the expense of Japan and the other East Asian economies. A review of some of the major exports to the United States from each country illustrates this pattern. China has been the largest producer of toys, games and sports equipment imported into the United States. China's share of the market has grown consistently over the past decade, while Japan and Taiwan have decreased from shares of 25% and 12%, respectively, to a low of 5% in 2003.

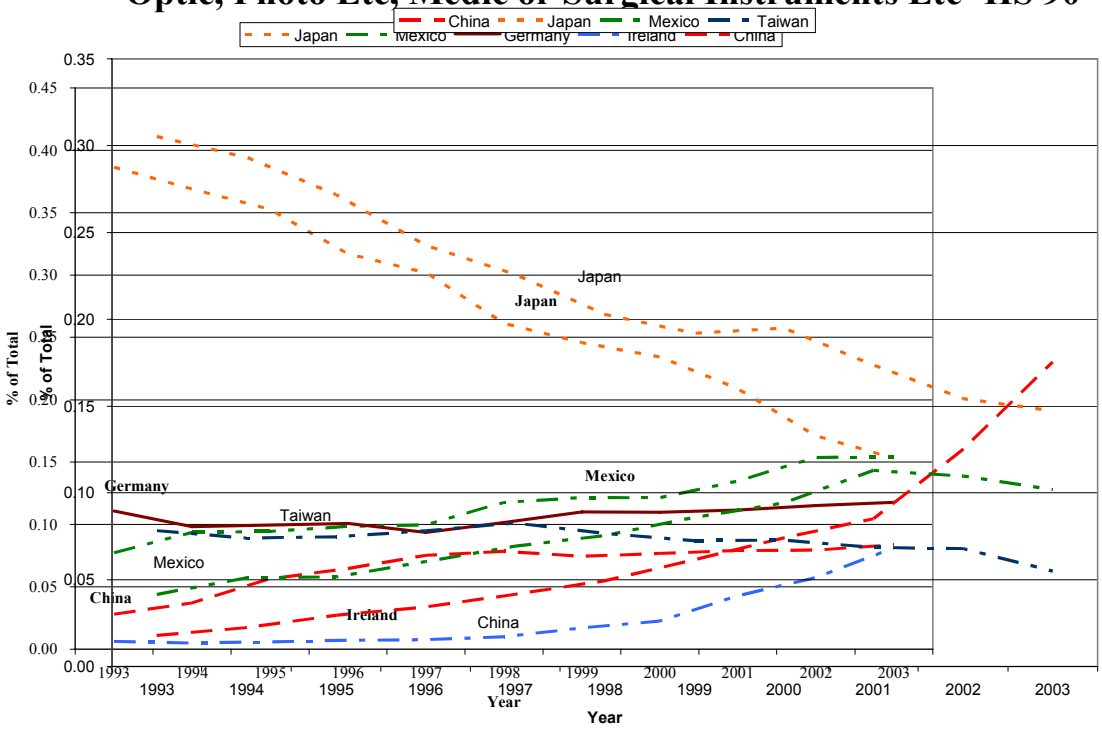
Figure A.5
Share of U.S. Imports
Nuclear Reactors, Boilers, Machinery Etc.; Parts – HS 84



Source: USA Trade Online

In the nuclear reactors, boilers, and machinery segment, Japan's share of U.S. imports dropped from 31% in 1993 to 15% in 2003. During this same period, Mexico grew its market share from 4% to 10%, and China became the market leader rising from a low of 2% to 18%.

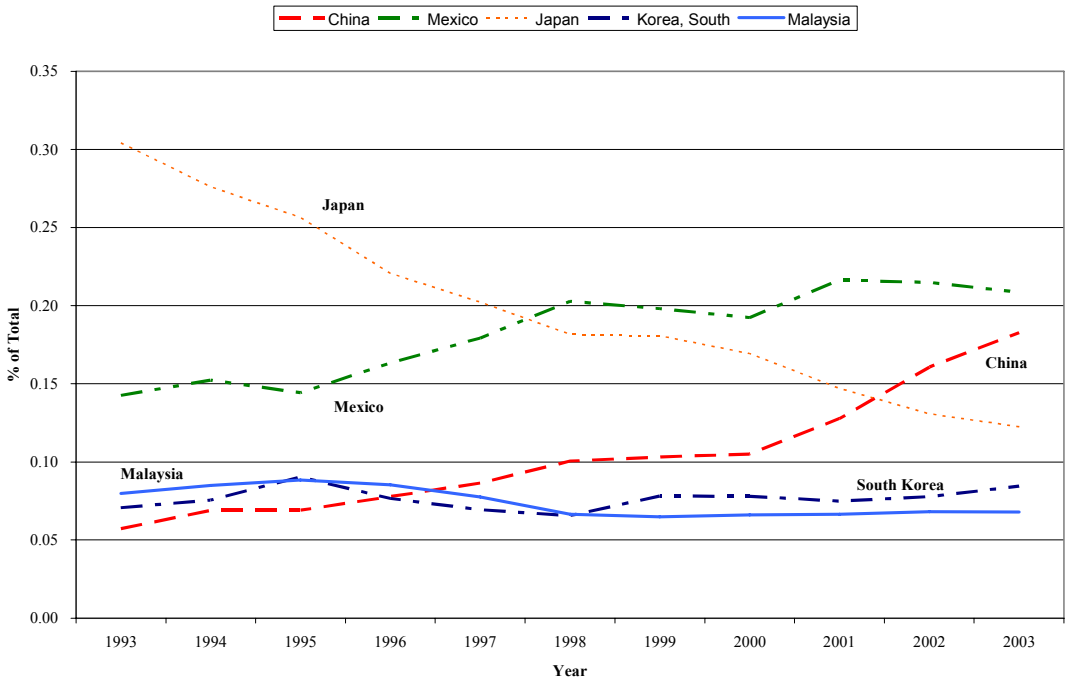
Figure A.6
Share of U.S. Imports
Optic, Photo Etc, Medic or Surgical Instruments Etc- HS 90



Source: USA Trade Online

In the optic, photo, medic or surgical instruments segment, Japan fell from a high of 39% in 1993 to 15% in 2003. The loss in market share was captured by Mexico, 15% of the total market in 2003, and by Ireland and China, both with 8% of the market in 2003.

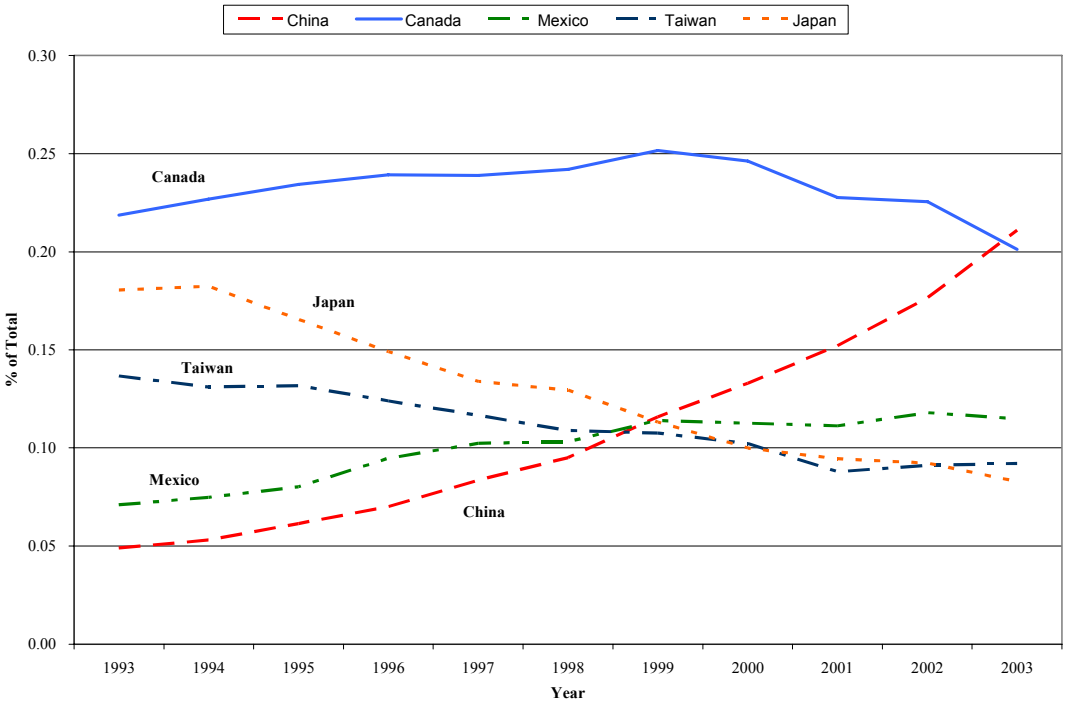
Figure A.7
Share of U.S. Imports
Electric Machinery, Sound Equip, TV Equip – HS 85



Source: USA Trade Online

In the electric machinery, sound equipment and TV equipment sector, Japan was once again the major loser dropping from a market share of 30% to 12% between 1993 and 2003. During this period, Mexico became the market leader with a high of 21% in 2003. China was also able to capture considerable market share, which stood at 18% in 2003. China's incredible growth over the past decade has positioned the country to become the largest exporter of electric machinery, sound equipment, and TV equipment to the United States. In fact, numbers released for 2004 indicate that China now imports 22% of the segment's goods compared to 20% for Mexico.

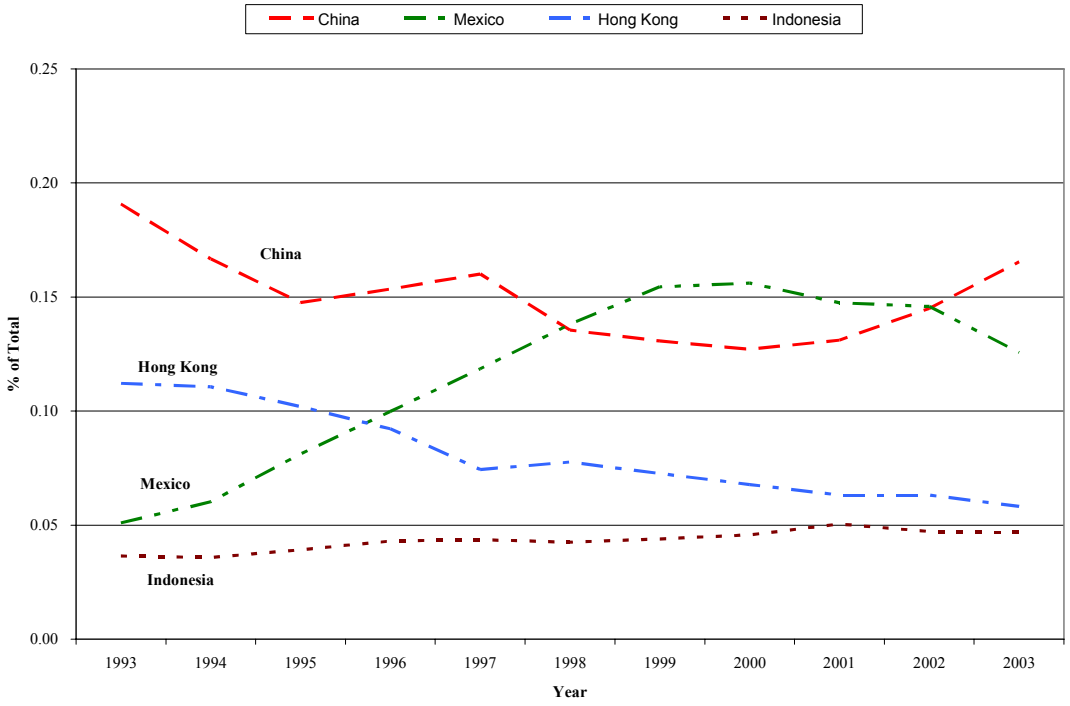
Figure A.8
Share of U.S. Imports
Articles of Iron or Steel – HS 73



Source: USA Trade Online

Japan, Taiwan and recently Canada have all lost ground in the steel import market. Since 1993, China has become the market leader with 21%, while Mexico has moved from 7% to 11% in the past decade.

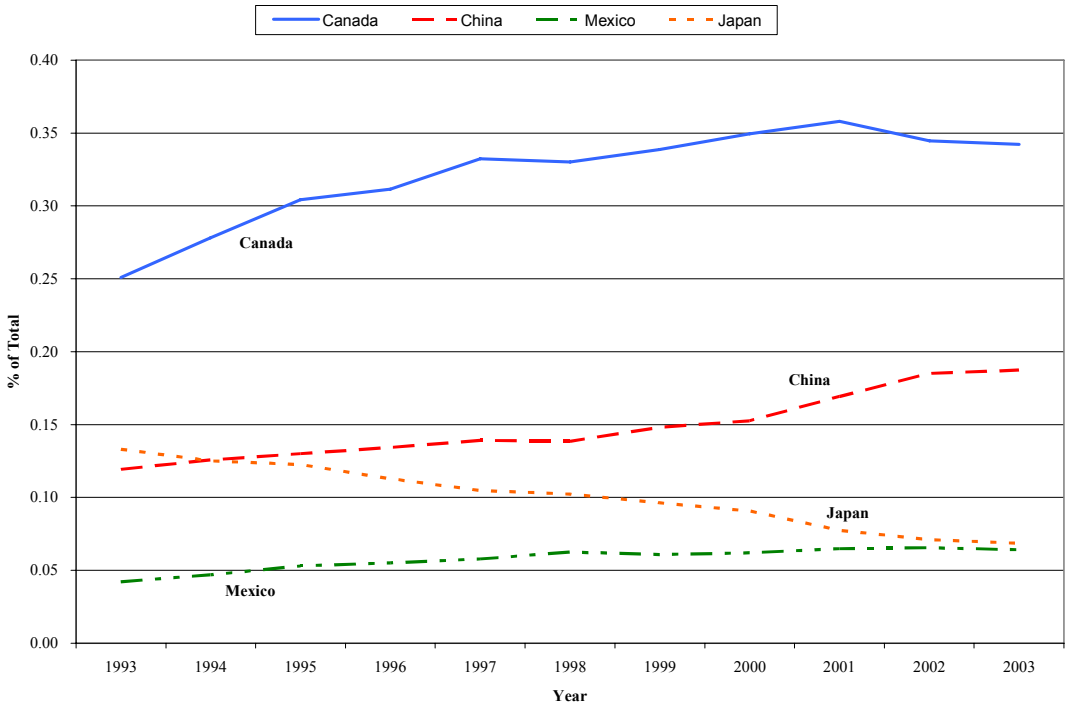
Figure A.9
Share of U.S. Imports
Apparel Articles and Accessories, Not Knit Etc. – HS 62



Source: USA Trade Online

In the apparel articles and accessories segment, China lost market share and its leadership position to Mexico after NAFTA went into effect. In 2001, after China's accession to the WTO, the trend reversed and China once again became the Unites States' largest importer of apparel and accessories. Mexico's market share continues to decline.

Figure A.10
Share of U.S. Imports
Plastics and Articles Thereof – HS 39



Source: USA Trade Online

In the plastics segment, Canada remains the market leader, but Japan fell from the number two spot to make way for China, which now controls approximately 20% of the market.

Over the past decade, while China's market share of its top-10 imports has increased, Mexico has been able to preserve its share of the market. For example, in the commodity segment 'Electric Machinery,' China has increased its share from 6% in 1993 to 18% in 2003. In the same segment, Mexico grew from 14% in 1993 to 20% in 1998, a level it has maintained through 2003.

A closer look at the 'Electric Machinery' segment reveals that both Mexico and China have a large market share in specific segments of the Electric Machinery market. Mexico exports 64% of all insulated wire and cable into the United States and 44% of all TV recorders and video monitors and projectors. China exports 61% of all video recording and reproduction equipment and 49% of all electric water space and soil heaters into the United States. This seems to indicate that both countries have specialized in the production of various sub-sectors within the industry. These specializations could be aided by the unique characteristics of the products and the production processes that lend themselves to being manufactured in either China or Mexico.

Table A.7
Mexico's Top Exports to the United States
4-Digit Harmonized System

Mexico's Top Exports by Dollar Amount (> $1 Billion)		
74% of All Electric Machinery Exported to the U.S.	**Percent of Total U.S. Trade**	
HS Code / Commodity Description	**China**	**Mexico**
8544 Insulated Wire, Cable Etc; Opt Sheath Fib Cables	64%	11%
8528 Tv Recvrs, Incl Video Monitors & Projectors	44%	12%
8525 Trans Appar For Radiotele Etc; Tv Camera & Rec	12%	18%
8517 Electric Apparatus For Line Telephony Etc, Parts	22%	21%
8501 Electric Motors And Generators (no Sets)	40%	12%
8527 Reception Apparatus For Radiotelephony Etc	27%	37%
8536 Electrical Apparatus For Switching Etc, Nov 1000 V	31%	13%
8504 Elec Trans, Static Conv & Induct, Adp Pwr Supp, Pt	24%	27%
8537 Boards, Panels Etc Elec Switch And N/c Appar Etc.	49%	6%

Source: USA Trade Online

Table A.8
China's Top Exports to the United States
4-Digit Harmonized System

China's Top Exports by Dollar Amount (> $1 Billion)		
69% of All Electric Machinery Exported to the U.S.	**Percent of Total U.S. Trade**	
HS Code / Commodity Description	**China**	**Mexico**
8525 Trans Appar For Radiotele Etc; Tv Camera & Rec	18%	12%
8517 Electric Apparatus For Line Telephony Etc, Parts	21%	22%
8521 Video Recrdng/reproduc Appar, Video Tuner	61%	2%
8527 Reception Apparatus For Radiotelephony Etc	37%	27%
8516 Elec Water, Space & Soil Heaters; Hair Etc Dry, Pt	49%	14%
8504 Elec Trans, Static Conv & Induct, Adp Pwr Supp, Pt	27%	24%
8528 Tv Recvrs, Incl Video Monitors & Projectors	12%	44%
8509 Electromech Domestic Appliances; Parts	53%	22%
8518 Microphones; Loudspeakers; Sound Amplifier Etc, Pt	43%	19%

Source: USA Trade Online

Since 1998, Mexico has been able to grow its market share in all of its top electric machinery segments except for TV recorders, communication equipment ('Trans Appar for Radiotele Etc; TV Camera & Rec') and electric transmission parts (Elec Trans; 'Static Cov & Induct, Adp Pwr Supp, Pt'). In each of these segments, China has seen considerable growth since 1998. In particular, the dollar value of TV Recorders imported from China grew approximately 325%, and the value of 'Trans Appar for Radiotel' grew almost 190%.

The pattern illustrates some of Mexico's vulnerabilities due to increased trade from China, but it also highlights Mexico's ability to retain market share and hold off competitive pressures from China. As discussed earlier, this ability may be due in large part to the proximity of Mexico to the U.S. market. Despite the move towards a global economy, distance still factors into a company's manufacturing decisions. Mexico is an attractive option for organizations that require a high degree of flexibility and responsiveness to incorporate rapidly changing

technology or consumer preferences. Mexico is also an attractive location for companies manufacturing heavy equipment sensitive to transportation costs. Yet, even these advantages can slowly be eroded over time. China's investment in logistics and the learning that is currently underway by a number of corporations will help to reduce transportation costs and increase operational efficiencies. Furthermore, China is developing a higher-skilled workforce and, at the same time, still has a large rural population serving as a wellspring of cheap labor. The development of these two sources of labor will help China contribute to the knowledge economy *and* serve as the low-cost global producer. In order for Mexico to preserve and grow its share of U.S. imports, in light of China's future prospects, it will need to invest in its labor force and shift its low-cost manufacturing industries towards higher-skilled labor and technology-intensive industries.

Conclusions about Trends in Global and U.S. Trade

Global trade has doubled during the period of 1993 to 2003. The share of the top-10 exporters in the world has decreased from 61% to 56% as the benefits of trade liberalization begin to spread over a larger number of countries. The main highlight has been the emergence of China at the cost of the tiger economies of Southeast Asia and Japan. In 2003, China surpassed Mexico as the second-largest exporter to the United States. Mexico has been able to muster only modest growth in exports to the United States. In 1998, Mexico's exports represented 10.4% of total U.S. imports, while China represented 7.8%. By 2003, Mexico exported 10.9% of total U.S. imports and China grew to 12.1%. Labor-intensive industries have shifted production to China to take advantage of the abundance of low-cost labor in the country. This has resulted in a loss of exports from Mexico in industries such as apparel and toys. Yet, while growth in Chinese exports seems daunting, a closer look reveals that Mexico has been able to retain an advantage in industries that rely on proximity to the U.S. economy, have high transportation costs or require high technology production. This is evident in the importance of transportation equipment and electronics trade between Mexico and the United States. While labor-intensive production of such basic products as TVs have shifted to China, the development of high-tech products such as LCD screens or medical equipment has remained in Mexico. The high transportation costs associated with certain products and the just-in-time production processes utilized in these industries has also contributed to Mexico maintaining its share of the U.S. export market and not succumbing to the same fate as the East Asian economies.

Appendix B: TRANS-PACIFIC TRADE ROUTES

Note: All the information about capacity deployments on individual routes have been sourced from the Containerisation International website (www.ci-online.co.uk).

Maersk Sealand

Trans-Pacific (TP) Service

Maersk Sealand operates seven weekly services on the trans-Pacific route and three all-water services to the East Coast.[189] One of the all-water services transits through the Suez Canal to connect East Asia with the East Coast of United States. This service begins from Hong Kong and provides a non-stop connection to Tacoma from Kaoshiung, Taiwan. This direct connection takes 11 days. It also calls on Oakland before beginning its westbound journey. This is a weekly service, but Maersk Sealand operates this as a slot charter.

TP-1 Eastbound

Port	Arrives		Departs		Transit
Hong Kong, PRC	Sun	1000	Sun	2100	–
Kaohsiung, Taiwan	Mon	1800	Tue	0700	1
Tacoma, WA	Sat	1200	Sun	1800	13
Oakland, CA	Tue	1800	Wed	1600	16
Honolulu, HI	Sun	2300	Tue	0700	21
Guam	Tue	1900	Wed	1800	30

Source: Maersk Sealand, Online. Available: http://www.maersksealand.com/HomePage/appmanager/?_nfpb=true&_windowLabel=routemaps&_pageLabel=page_schedules_routemaps&page=%2Froutemaps%2Ftrans_pacific_tp. Accessed: May 18, 2005

[189] Unless otherwise noted, all figures showing Maersk Sealand routes come from the same source identified under the first route map.

TP-2

The Transpacific-2 (TP-2) is a weekly service with five vessels deployed having an average weekly capacity of 2,700 TEUs. On its eastbound journey, it calls on ports of Xingang (China), Qingdao (China), Gwangyang (South Korea) and Busan (South Korea), before calling on the West Coast ports of Los Angeles and Oakland. The transit time to Los Angeles is 16 days and requires an additional two days for calling on port of Oakland. On the westbound route, the TP-2 service calls on the ports of Nagoya, Yokohama before terminating at Busan and Xingang. The entire roundtrip requires 35 days. The weekly service requires at least five vessels for this route.

TP2 Eastbound

Port	Arrives		Departs		Transit
Yokohama, JAPAN	Tue	1800	Wed	0400	--
Xingang, PRC	Sat	1130	Sat	2230	--
Qingdao, PRC	Mon	0200	Mon	1200	2
Kwangyang, KOREA	Tue	1800	Wed	0200	3
Busan, KOREA	Wed	1100	Wed	2000	4
Los Angeles, CA	Mon	0800	Tue	0300	16
Tacoma, WA	Thu	0900	Fri	1900	19

Notes: Weekly Service

TP2 Westbound

Port	Arrives		Departs		Transit
Los Angeles, CA	Mon	0800	Tue	0300	--
Tacoma, WA	Thu	0900	Fri	1900	3
Yokohama, JAPAN	Tue	1800	Wed	0400	15
Xingang, PRC	Sat	1130	Sat	2230	16
Qingdao, PRC	Mon	0200	Mon	1200	17
Kwangyang, KOREA	Tue	1800	Wed	0200	19
Busan, KOREA	Wed	1100	Wed	2000	21

Notes: Weekly Service

TP-3

TP-3 is an all-water service to the East Coast via the Panama Canal. This service calls on the ports of Miami, Charleston, Norfolk, and New Jersey. The total transit time on its eastbound journey from the Japanese port of Kobe to New Jersey is 37 days. The westbound journey requires an additional 26 days. Weekly service implies that there are seven vessels deployed on the TP-3 route. The average weekly capacity is 5,700 TEUs.

TP-3 Eastbound

Port	Arrives		Departs		Transit
Kobe, JAPAN	Mon	1900	Mon	2100	--
Shanghai, PRC	Wed	1800	Thu	1600	2
Ningbo, PRC	Fri	0800	Fri	1700	4
Yantian, PRC	Sun	0500	Sun	2200	6
Hong Kong, PRC	Mon	0400	Mon	2300	7
Kaohsiung, TAIWAN	Tue	2100	Wed	1100	8
Yokohama, JAPAN	Sat	0800	Sat	1600	12
Balboa, PANAMA	Mon	1600	Mon	2300	28
Manzanillo, PANAMA	Tue	1800	Tue	0200	29
Miami, FL	Fri	1300	Fri	2100	32
Charleston, SC	Sat	2300	Sat	0900	33
Norfolk, VA	Mon	1300	Mon	0800	35
Port Elizabeth, NJ	Wed	0800	Wed	0500	37

Note: Weekly Service

TP-3 Westbound

Port	Arrives		Departs		Transit
Charleston, SC	Sat	2300	Sun	0900	--
Norfolk, VA	Mon	1300	Tue	0800	1
Port Elizabeth, NJ	Wed	0800	Thu	0600	3
Miami, FL	Sat	1300	Sat	2000	6
Manzanillo, PANAMA	Tue	0800	Tue	1700	9
Balboa, PANAMA	Wed	1900	Thu	0600	10
Lazaro Cardenas, MEXICO	Sun	1600	Sun	2300	14
Yokohama, JAPAN	Sun	0800	Sun	1600	28
Kobe, JAPAN	Mon	1500	Mon	2100	29
Shanghai, PRC	Wed	1800	Thu	1600	31
Ningbo, PRC	Fri	0800	Fri	1700	33
Yantian, PRC	Sun	0500	Sun	2200	35
Hong Kong, PRC	Mon	0400	Mon	2300	37
Kaohsiung, TAIWAN	Tue	2100	Wed	1100	38

Note: Weekly Service

AE-5/TP-6

This is a round-the-world weekly service. It begins its 77-day round trip journey at the Spanish port of Valencia. This service calls on Middle-Eastern, Southeast Asian, and East Asian ports and terminates at the port of Long Beach. This onward journey takes 40 days and its return journey to its origin requires another 37 days. The voyage from Hong Kong to Los Angeles is completed in 12 days. For this AE5/TP6 service, eleven vessels are in operation with each vessel having a capacity of 6,600 TEUs each. In the map shown below, only the trans-Pacific leg of the route is displayed. The trans-Pacific route is operated by a Maersk group company called Safmarine Container Lines NV.

TP-6 Eastbound

Port	Arrives		Departs		Transit
Port Klang, MALAYSIA	Sun	2000	Mon	0600	--
Tanjung Pelepas, MALAYSIA	Mon	1930	Tue	1930	1
Singapore, SINGAPORE	Tue	2300	Wed	1000	2
Yantian, PRC	Sat	0700	Sun	0300	6
Hong Kong, PRC	Sun	0600	Mon	1000	7
Los Angeles, CA	Fri	1800	Mon	0300	19

Notes: 1) Weekly Service

TP-7

This is a weekly all-water service originating from Hong Kong to the U.S. East Coast. This service calls on the U.S. ports of Miami, Savannah and Charleston via the Panama Canal. It takes 28 days to complete its eastbound journey and 33 days for its westbound journey. The average weekly capacity deployed on this route is 4,500 TEUs.

TP-7 Eastbound

Port	Arrives		Departs		Transit
Hong Kong, PRC	Sat	1700	Sun	0900	--
Yantian, PRC	Sun	1400	Mon	0400	1
Kwangyang, S. Korea	Wed	1700	Thu	0700	4
Balboa, Panama	Sat	1100	Sat	1800	21
Manzanillo, Panama	Sun	1700	Mon	0300	22
Miami, FL	Wed	1300	Wed	2000	25
Savannah, GA	Thu	1900	Fri	1500	26
Charleston, SC	Sat	0800	Sat	2300	28

TP-7 Westbound

Port	Arrives		Departs		Transit
Savannah, GA	Thu	1900	Fri	1500	-
Charleston, SC	Sat	0800	Sat	2300	1
Miami, FL	Mon	0800	Mon	1600	3
Manzanillo, Panama	Thu	1300	Fri	0100	6
Balboa, Panama	Fri	1900	Sat	0600	7
Lazaro Cardenas, Mexico	Tue	1100	Tue	1700	11
Yokohama, Japan	Tue	0800	Tue	1700	25
Kobe, Japan	Wed	1400	Wed	1900	26
Hong Kong, P.R.C	Sat	1700	Sun	0900	29
Yantian, P.R.C	Sun	1400	Mon	0400	30
Kwangyang, S.Korea	Wed	1700	Thu	0700	33

TP-5

This weekly service originates from Jebel Ali port (Dubai) and calls on ports in the Indian sub-continent. It then proceeds to call on the Southeast Asian ports and East Asian ports before embarking on the eastbound leg of the service. It calls on the ports of Oakland and Los Angeles on the West Coast of the United States before resuming its westbound journey. The Yokohoma-Oakland non-stop voyage is completed in nine days and it requires 13 days to complete the Los Angeles-Busan voyage. There are nine vessels deployed for this service with a total round-trip transit time of 63 days. The average weekly capacity on this service is 4,500 TEUs.

TP5 Eastbound

Port	Arrives		Departs		Transit
Jebel Ali, U.A.E.	Fri	1300	Sun	0200	--
Nhava Sheva, INDIA	Tue	1300	Wed	1100	2
Colombo, SRI LANKA	Fri	0800	Fri	1700	5
Tanjung Pelepas, MALAYSIA	Mon	2330	Tue	1330	8
Laem Chabang, THAILAND	Thu	0400	Fri	0100	10
Hong Kong, PRC	Sun	2200	Mon	0800	14
Nagoya, JAPAN	Thu	0800	Thu	1600	18
Yokohama, PRC	Fri	0800	Fri	1600	19
Oakland, CA	Sun	0800	Sun	1700	28
Los Angeles, CA	Mon	1800	Wed	0500	29

Note: Weekly Service

TP5 Westbound

Port	Arrives		Departs		Transit
Oakland, CA	Sun	0300	Sun	1900	--
Los Angeles, CA	Mon	1800	Wed	0500	1
Busan, S. KOREA	Sun	1200	Sun	2100	14
Kwangyang, KOREA	Mon	0600	Mon	2000	15
Shanghai, PRC	Tue	0400	Thu	0200	16
Ningbo, PRC	Thu	2000	Fri	0800	18
Hong Kong, PRC	Sun	0300	Sun	1400	21
Yantian, PRC	Sun	1900	Mon	1000	21
Tanjung Pelepas, MALAYSIA	Thu	1530	Fri	0930	25
Jebel Ali, U.A.E.	Fri	0500	Sat	1700	33
Nhava Sheva, INDIA	Tue	0800	Wed	0600	37

Note: Weekly Service

CTP (WAE)

This is a weekly service originating at the port of Tacoma. Maersk-Sealand utilizes just 350 TEUs of the trans-Pacific slot. The roundtrip requires 84 days on this route. In the process, it calls on the ports of Vancouver in North America before beginning its westward journey to East and Southeast Asia. It also goes further west, calling on ports in the Indian sub-continent and Europe before terminating its journey at the Mediterranean port of Said in Egypt. The onward journey takes 53 days and return journey another 31 days. The transit time from Tacoma to its first port of call in East Asia, Tokyo, is 12 days.

CTP Eastbound

Port	Arrives	Departs	Transit
Kaohsiung, TAIWAN	Wed 1200	Thu 1230	--
Yantian, PRC	Fri 0800	Fri 2300	1
Hong Kong, PRC	Sat 0100	Sun 0400	2
Osaka, JAPAN	Tue 1800	Wed 1230	5
Tokyo, JAPAN	Thu 0400	Thu 2100	6
Tacoma, WA	Fri 0100	Sat 1900	14
Vancouver, BRITISH COLUMBIA	Sun 0300	Mon 0900	15

Note: Weekly Service

CTP Westbound

Port	Arrives	Departs	transit
Tacoma, WA	Fri 0100	Sat 1900	--
Vancouver, BRITISH COLUMBIA	Sun 0300	Mon 0900	1
Tokyo, JAPAN	Wed 0400	Wed 1900	10
Osaka, JAPAN	Thu 0900	Thu 2300	11
Kaohsiung, TAIWAN	Sun 0430	Mon 1000	14
Hong Kong, PRC	Tue 0300	Wed 0200	15
Yantian, PRC	Wed 0400	Wed 2300	16

TP-8

This is a westbound weekly service to ports in Japan, South Korea and China. On its eastbound return journey, it provides non-stop service from Kaoshiung, Taiwan to Los Angeles in 13 days. This service takes 35 days to complete the roundtrip with the final eastbound string to Los Angeles taking just 11 days. This service is served by five vessels having an average weekly capacity of 4,300 TEUs.

TP-8 Eastbound

Port	Arrives		Departs		Transit
Yantian, PRC	Tue	0600	Wed	0200	--
Xiamen, PRC	Wed	2000	Thu	0600	1
Kaohsiung, TAIWAN	Thu	1700	Fri	0500	2
Los Angeles, CA	Tue	1800	Thu	1800	15
Oakland, CA	Fri	1800	Sat	0800	17

Notes: Weekly Service

TP-8 Westbound

Port	Arrives		Departs		Transit
Los Angeles, CA	Tue	1800	Thu	1800	--
Oakland, CA	Fri	1800	Sat	0800	1
Yokohama, JAPAN	Tue	1800	Wed	0400	11
Kobe, JAPAN	Thu	0800	Thu	1800	12
Busan, S.KOREA	Sat	0800	Sat	1600	15
Yantian, PRC	Tue	0600	Wed	0200	18
Xiamen, PRC	Wed	2000	Thu	0600	19
Kaohsiung, TAIWAN	Thu	1700	Fri	0500	20

Notes: 1)Weekly Service

U.S. Flag Vessel Service Available

TP-9

This trans-Pacific string provides direct service from Ningbo and Shanghai, China and Kobe, Japan to the U.S. West Coast. On the West Coast, it calls on the ports of Dutch Harbor, Los Angeles and Oakland. A total of five vessels, having an average weekly capacity of 2,800 TEUs, are deployed on this route.

TP-9 Eastbound

Port	Arrives		Departs		Transit
Ningbo, PRC	Thu	2300	Fri	1000	--
Shanghai, PRC	Sat	0500	Sun	0300	1
Kobe, JAPAN	Tue	0800	Tue	1300	3
Shimizu, JAPAN	Wed	0900	Wed	1500	4
Los Angeles, CA	Sun	0800	Mon	0400	15
Oakland, CA	Tue	0800	Tue	1700	17

Notes: Weekly Service

TP-9 Westbound

Port	Arrives		Departs		Transit
Los Angeles, CA	Sun	0800	Mon	0400	--
Oakland, CA	Tue	0800	Tue	1700	1
Dutch Harbor, AK	Sun	1800	Mon	0900	7
Yokohama, JAPAN	Mon	1100	Mon	1700	14
Nagoya, JAPAN	Tue	0800	Tue	1400	16
Ningbo, PRC	Thu	2300	Fri	1000	19
Shanghai, PRC	Sat	0500	Sun	0300	21
Kobe, JAPAN	Tue	0800	Tue	1300	23
Shimizu, JAPAN	Wed	0900	Wed	1500	25

Notes: Weekly Service

Suez Express

Suez Express is a weekly service originating at Charleston, South Carolina on the U.S. East Coast. This service connects the U.S. with ports in Malaysia, China and Hong Kong via the Suez Canal. It takes 41 days to complete the eastbound voyage.

Suez Express Eastbound

Port	Arrives		Departs		Transit
MECL (----------)					
Charleston, SC	Wed	0800	Thu	0300	--
Norfolk, VA	Fri	0800	Fri	2200	1
Newark, NJ	Sat	1900	Sun	2200	2
Malaga, SPAIN	Mon	0800	Tue	0200	11
Jeddah, SAUDI ARABIA	Mon	0100	Mon	1000	18
Salalah, OMAN	Wed	2300	Thu	2300	20
AE7 Service (————)					
Salalah, OMAN	Mon	1900	Tue	1000	25
Tanjung Pelepas, MALAYSIA	Mon	1700	Tue	1400	32
Shanghai, PRC	Sat	2100	Sun	1900	35
Ningbo, PRC	Mon	1200	Tue	0200	37
Xiamen, PRC	Wed	0700	Wed	1700	39
Yantian, PRC	Thu	0900	Thu	1800	40
Hong Kong, PRC	Thu	2200	Fri	0800	41

Note: Weekly Service

Suez Express Westbound

Port	Arrives		Departs		Transit
AE7 Service (————)					
Tanjung Pelepas, MALAYSIA	Mon	0230	Mon	2130	--
Salalah	Sun	1900	Mon	1600	6
MECL Service (----------)					
Salalah	Mon	0600	Tue	0200	--
Charleston, SC	Wed	0800	Thu	0300	22
Norfolk, VA	Fri	1300	Sat	0300	24
Port Elizabeth, NJ	Sun	0800	Mon	1100	26

New World Alliance

The New World Alliance provides 10 weekly services to the Asia-North America route. Two of the services – CNY and NYX – are all-water services to the East Coast via the Panama Canal.[190]

PS-1

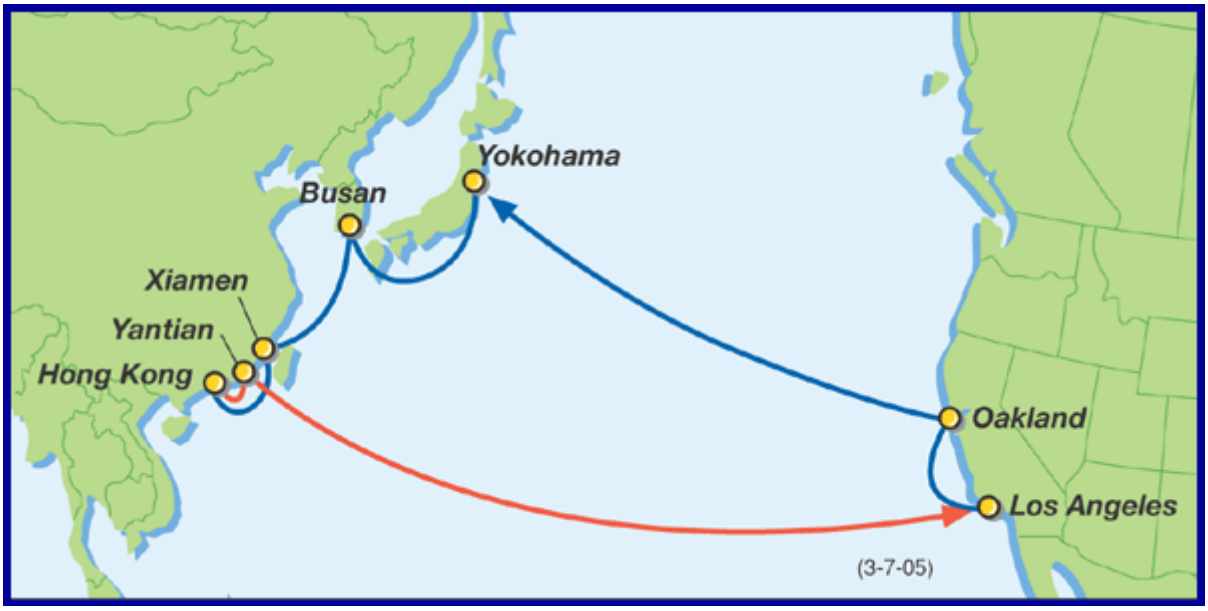
This is a weekly service operating from Seattle to Singapore and back in 42 days. On the West Coast, it calls on the ports of Seattle, Vancouver and Oakland. This service provides non-stop service from Oakland to Yokohama, Japan in 12 days. From Japan, it calls on the port of Chiwan, China and Kaoshiung, Taiwan before terminating its westbound journey in Singapore. The entire westbound transit time is 25 days. The eastbound leg of this service calls Yantian, China, and Hong Kong in Asia. The last string of this service from Hong Kong to Seattle is covered in 11 days. This service requires a deployment of six vessels. This route has an average weekly capacity of 4,500 TEUs.

Source: Mitsui OSK Lines. Online. Available: http://www.molpower.com/htm/default.htm Accessed: March 15, 2005

[190] Unless otherwise noted, all figures showing New World Alliance routes come from the same source identified under the first route map.

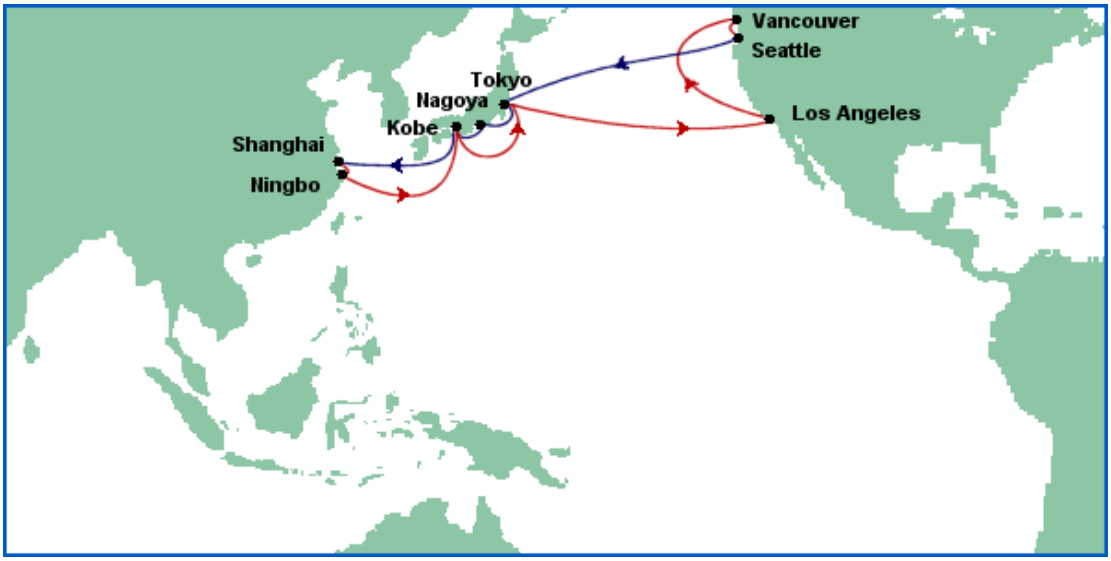
PS-2

This is a weekly service connecting the West Coasts ports of Los Angeles and Oakland with Yokohoma, Busan, Xiamen and Hong Kong. This service provides non-stop connection between Oakland and Yokohoma in 11 days. The average weekly capacity of this route is about 5,100 TEUs.



PS-3

This is a weekly service connecting East Asia with Los Angeles, Vancouver and Seattle. The ports called in East Asia are Shanghai, Ningbo, Kobe and Tokyo. The transit time from Shanghai to Los Angeles is 15 days and another 2 days for Seattle. There are five ships deployed on this route with an average weekly capacity of about 4,600 TEUs.

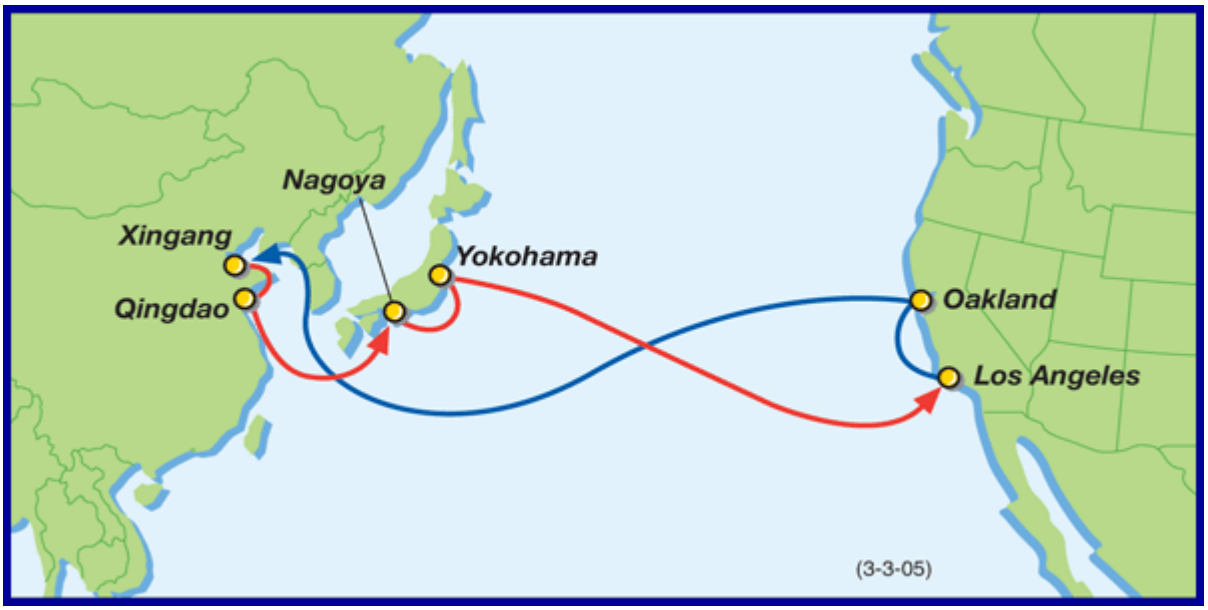


PSV

This is a weekly direct service from Los Angeles to Hong Kong in 13 days. The other ports of call are Chiwan, China and Kaohsiung, Taiwan. The total roundtrip voyage requires 28 days, requiring a deployment of four vessels for this weekly service.

GCX

This is a weekly service originating at the port of Los Angeles and terminating its eastbound journey at Yokohama. Five vessels deployed on this route add an average weekly capacity of 3,300 TEUs.



PSW

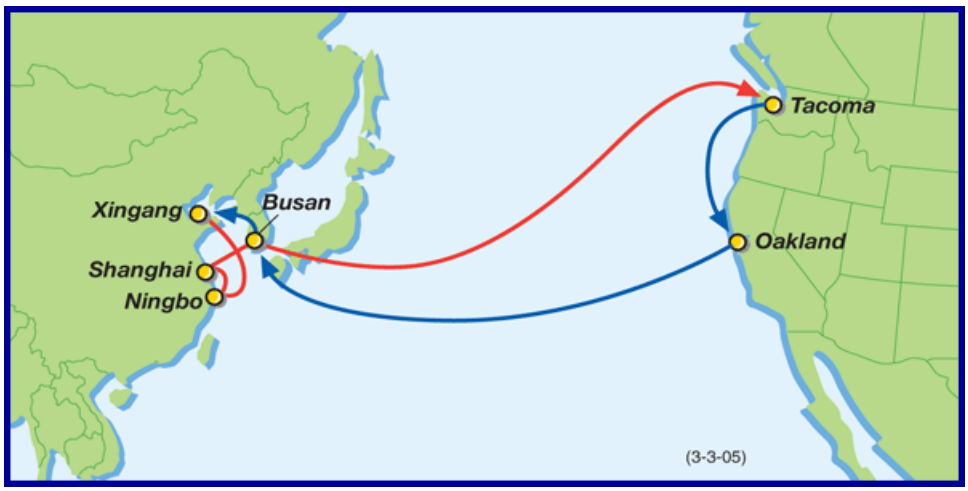
This service offers direct connection between Busan to Long Beach in 14 days. This weekly service begins its eastbound journey from Hong Kong and terminates at Oakland. On its westbound journey, Oakland is connected directly with Busan in 11 days. This route is served by five ships with an average weekly capacity of 6,500 TEUs.

PNW

This service calls on seven ports in East Asia before embarking towards the West Coast port of Tacoma. On this service, there are five ships deployed with an average weekly capacity of about 4,600 TEUs.

PCX

This is a weekly service connecting the West Coast ports of Tacoma and Oakland with ports in China and South Korea. The eastbound journey to Oakland takes 11 days.



CNY

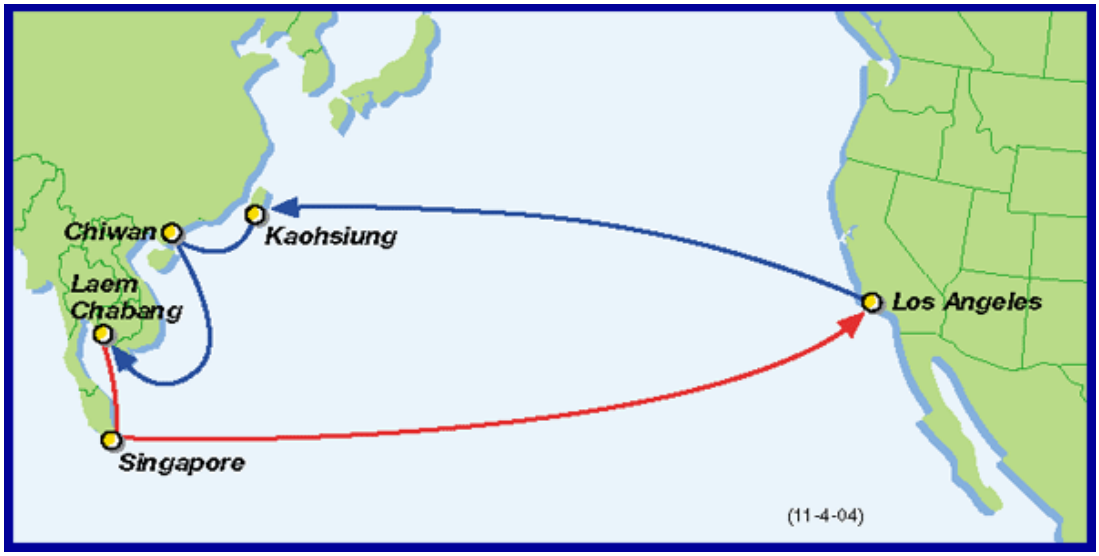
This is one of the two all-water services provided by this alliance to the East Coast. This service calls on six ports in East Asia on its eastbound journey. This service uses the Panama Canal to reach the U.S. East Coast.

NYX

This is an all-water service, traveling from Shanghai to New York in 27 days. The other ports of call on the East Coast are Norfolk, Savannah and Miami. This route is served by nine vessels with an average weekly capacity of about 4,800 TEUs.

SAX

This weekly service connects Southeast Asia (Thailand and Singapore). Singapore-Los Angeles route is covered in 17 days. This services calls only one port on the West Coast. There are six ships deployed on this route. This service adds an average weekly capacity of 5,600 TEUs.

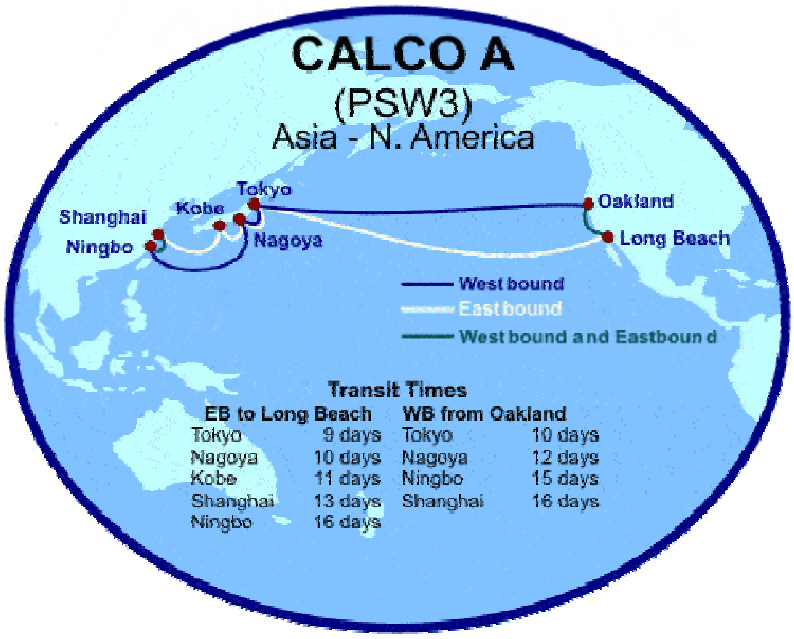


CKYH Alliance

There are seventeen services from East and Southeast Asia to the North American coasts.[191]

PSW3

The PSW3 service provides direct connection between Oakland and Tokyo in 10 days. This service provides the fastest eastbound connection to Long Beach from Tokyo in 9 days. The PSW3 service has an average weekly capacity of 3,600 TEUs.

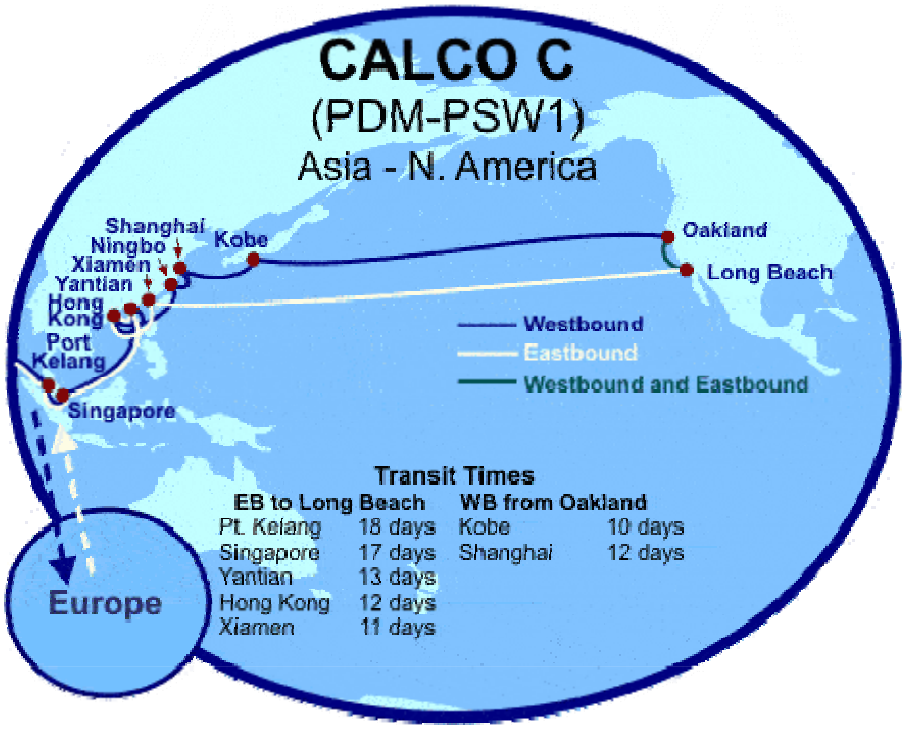


Source: K-Line. Online. Available: http://www.kline.com/Svc_Maps/Svc_maps_2004.asp. Accessed: April 2, 2005

[191] Unless otherwise noted, all figures showing CKYH Alliance routes come from the same source identified under the first route map.

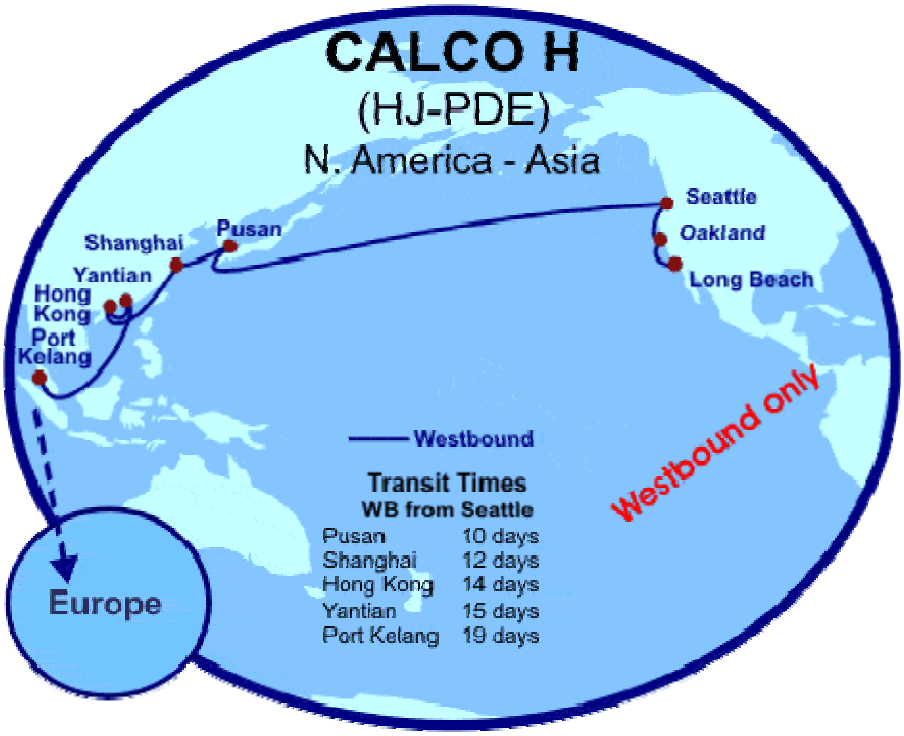
PDM-PSW1

This is a round-the-world service beginning from Long Beach. It takes 84 days to complete a roundtrip, and in the process, the service calls on ports in East Asia, Southeast Asia and Europe. This service provides non-stop service from Oakland to Kobe, Japan on its westbound journey and between Xiamen, China and Long Beach on its eastbound journey. For this weekly service, there are 12 vessels deployed with an average capacity of 5,600 TEUs.



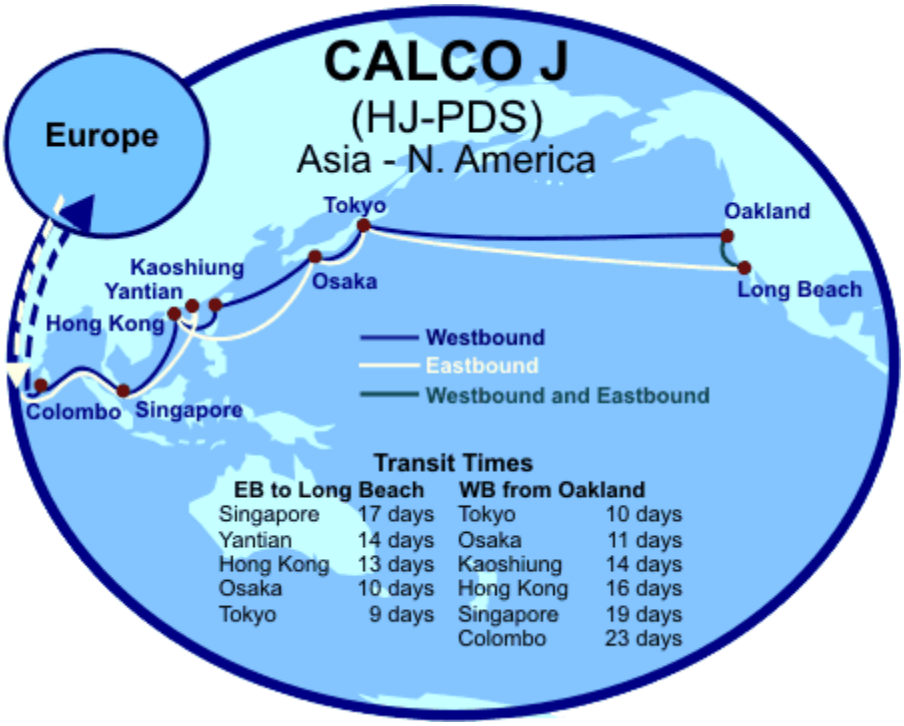
HJ-PDE

This service transits from ports in Europe to ports in East and Southeast Asia and then to ports in North America and finally back to Europe. This is a weekly service. It requires 84 days to complete a roundtrip. The West Coast ports of United States served by this service are Long Beach, Oakland, and Seattle. This service has an average weekly capacity of 5,600 TEUs.



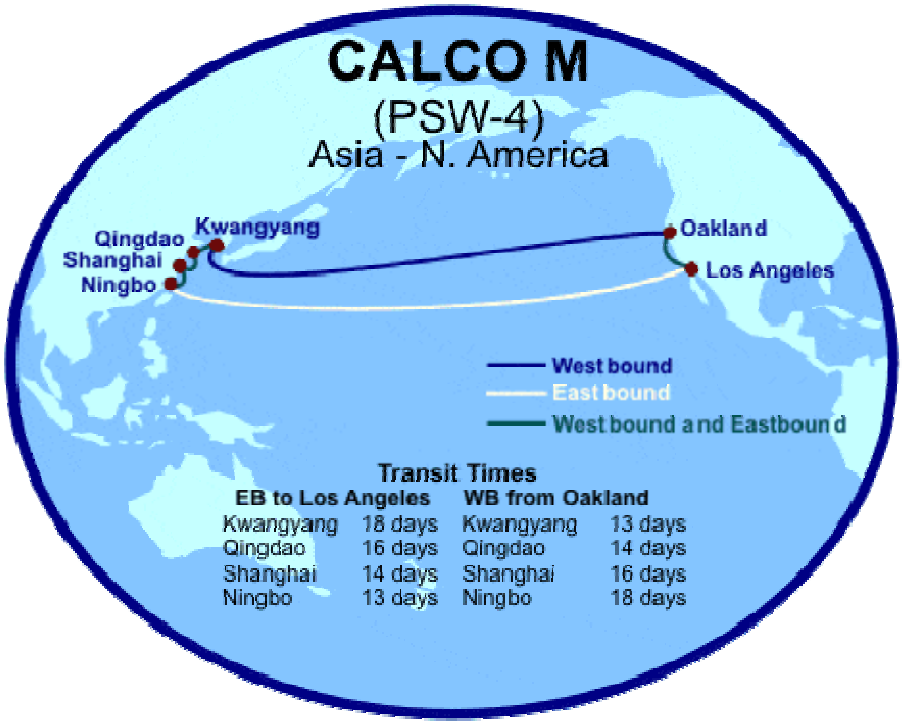
HJ-PDS

This service begins from the port of Le Havre in France. It connects Europe with East and Southeast Asia, and the West Coast of United States on its eastbound journey. The ports called on the West Coast of United States are Long Beach and Oakland. The non-stop journey from Tokyo to Long Beach is covered in 9 days. The complete roundtrip requires 84 days. The weekly average capacity added by this service is 4,700 TEUs.



PSW-4

This is a 35-day roundtrip service starting from Qingdao, China. The other ports of call in China are Shanghai and Ningbo. There are six vessels deployed on this route with an average capacity of about 3,400 TEUs. The vessels on this route travel non-stop between Ningbo and Los Angeles in 13 days.

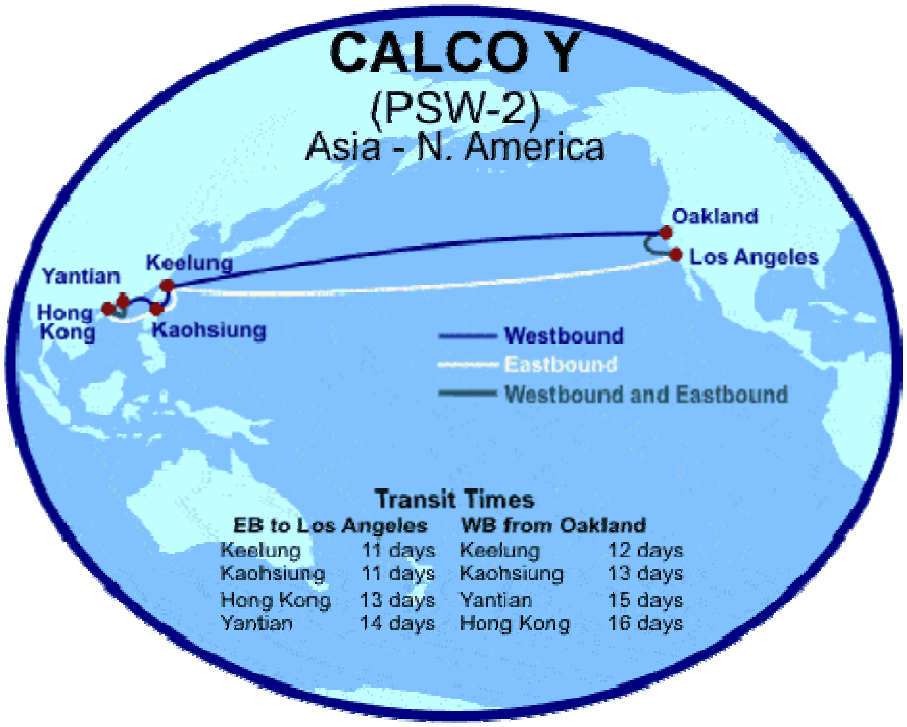


CEN

This is a weekly service between East Asia and the West Coast of United States. The ports of call on the West Coast are Long Beach and Oakland. It takes nine days to travel between Yokohama, Japan and Long Beach. This service adds a capacity of 3,400 TEUs on this trans-Pacific route.

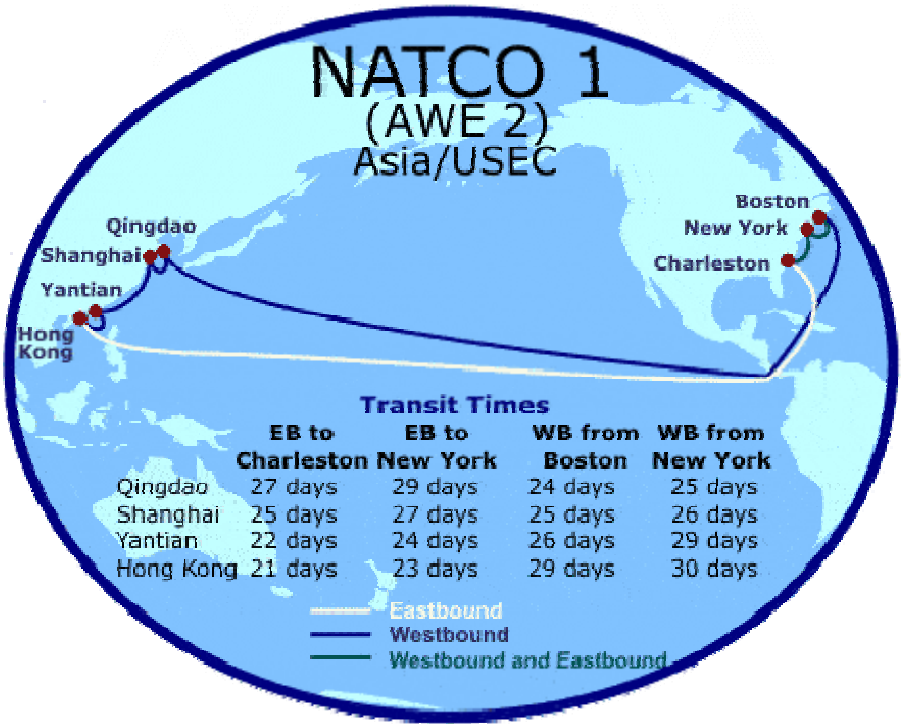
PSW-2

The PSW-2 service begins from Yantian, China. This trans-Pacific string terminates its eastbound journey in Oakland after calling on the port of Los Angeles. The roundtrip takes a total of 35 days. This weekly service requires 35 days for a roundtrip, with five vessels deployed on this route. The average weekly capacity of this service is approximately 4,000 TEUs.



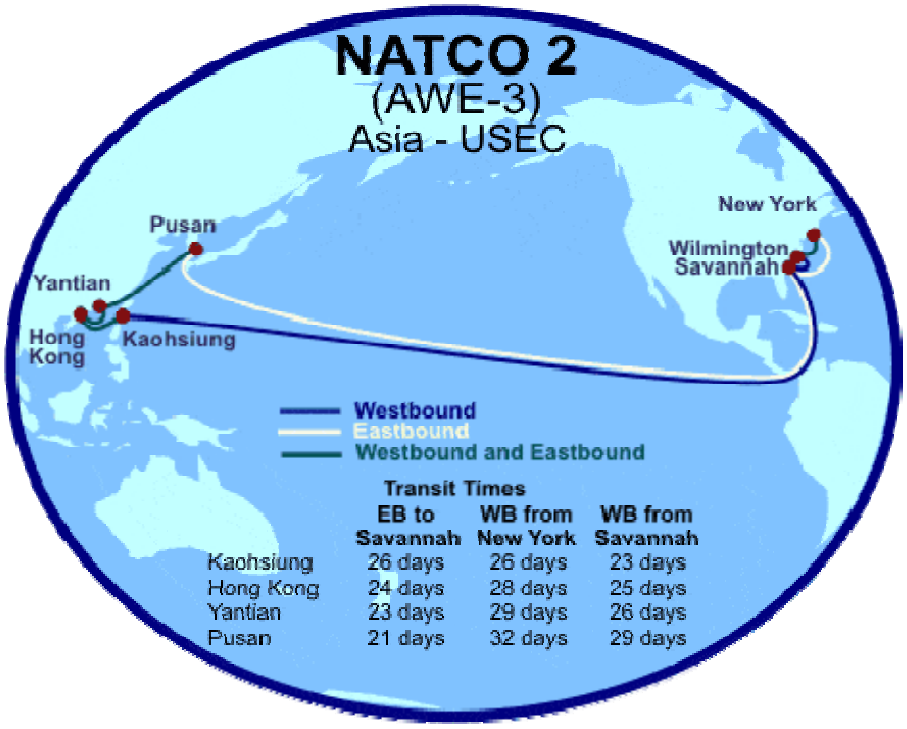
AWE-2

This is an all-water service to the East Coast of the United States. The East Coast ports that are included in this service are Charleston, New York and New Jersey, and Boston. The Hong Kong to Charleston voyage takes 21 days. The weekly capacity addition on the East Asia to North America route added by this service is 3,800 TEUs.



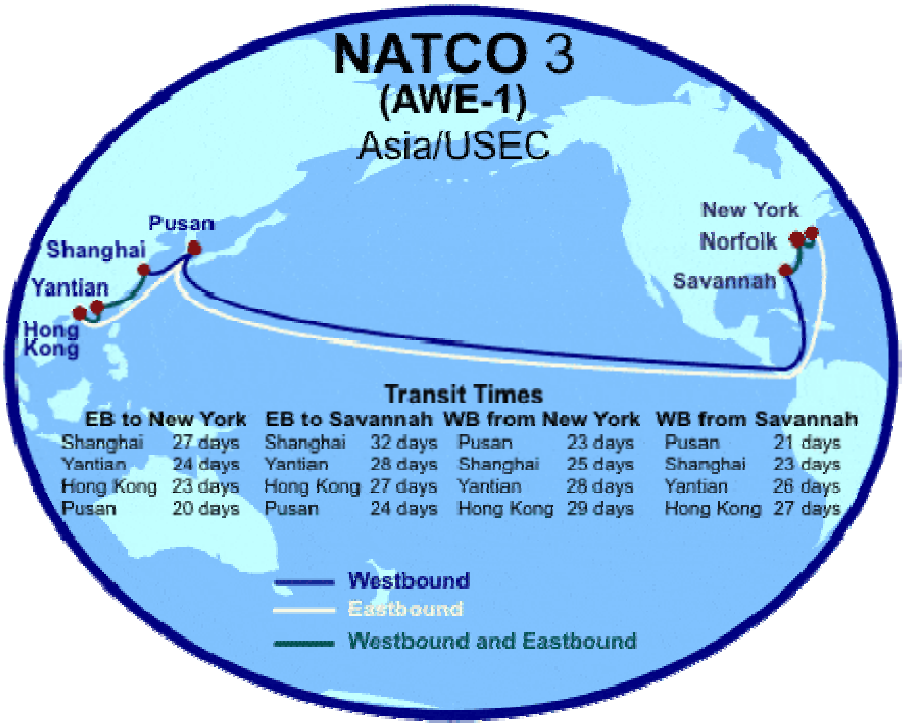
AWE-3

This is an all-water service to the East Coast of the United States. The East Coast ports of call on this service are Savannah, New York and Wilmington. It takes 21 days to reach Savannah from Busan, South Korea. This service has an average weekly capacity of about 3,600 TEUs.



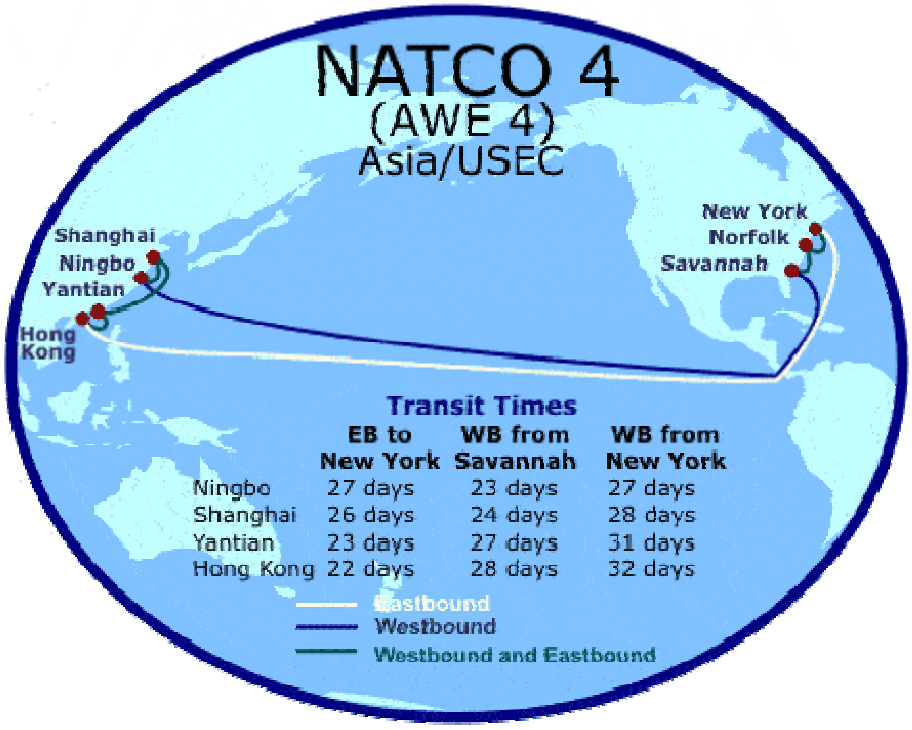
AWE-1

This service connects East Asian ports with the East Coast of United States, calling on the ports of New York and New Jersey, Norfolk, and Savannah. It takes 27 days to get to New York and New Jersey from Shanghai. This is a weekly service requiring the deployment of eight vessels. The average weekly capacity on this route is about 4,000 TEUs.



AWE-4

This service was introduced in late 2004 to circumvent the problem posed by the congestion at the West Coast ports. This is an all-water service to the East Coast ports of New York and New Jersey, Norfolk, and Savannah. It takes 22 days to reach New York and New Jersey non-stop from Hong Kong. This weekly service has an average capacity of 3,700 TEUs.

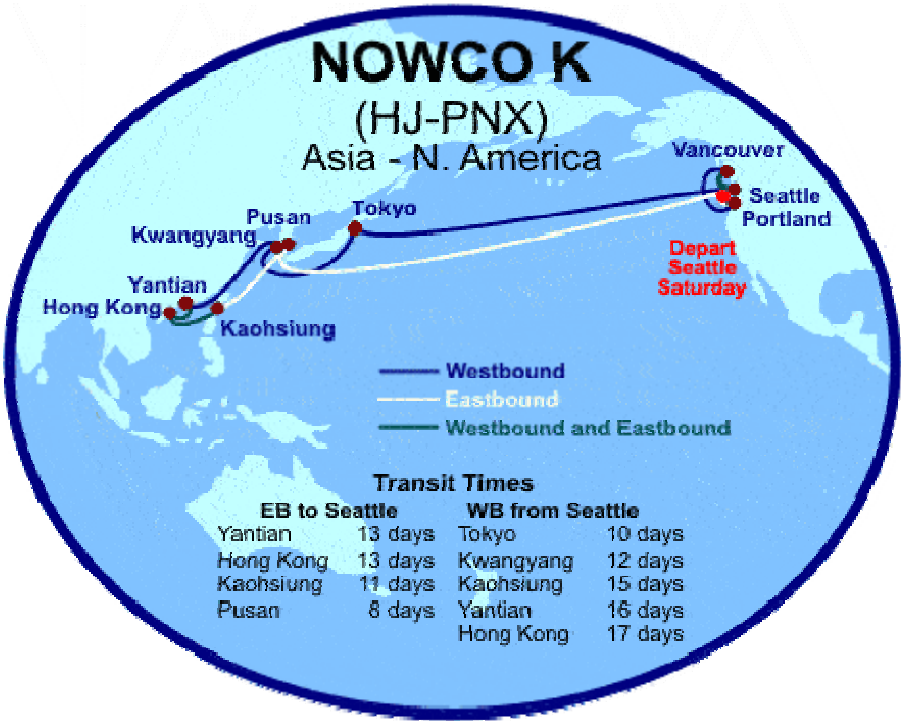


PNW

The PNW calls on ports of Tacoma, Vancouver, and Portland on the Pacific Northwest. On the eastbound route, this service calls on the ports of Yantian, Hong Kong Kobe and Nagoya and Tokyo. The average weekly capacity on this route is about 4,000 TEUs. The eastbound journey is completed in 14 days.

HJ-PNX

This is a weekly service connecting East Asian ports of Seattle, Portland and Vancouver. This adds a weekly capacity of about 4,000 TEUs on the trans-Pacific route and requires five vessels.

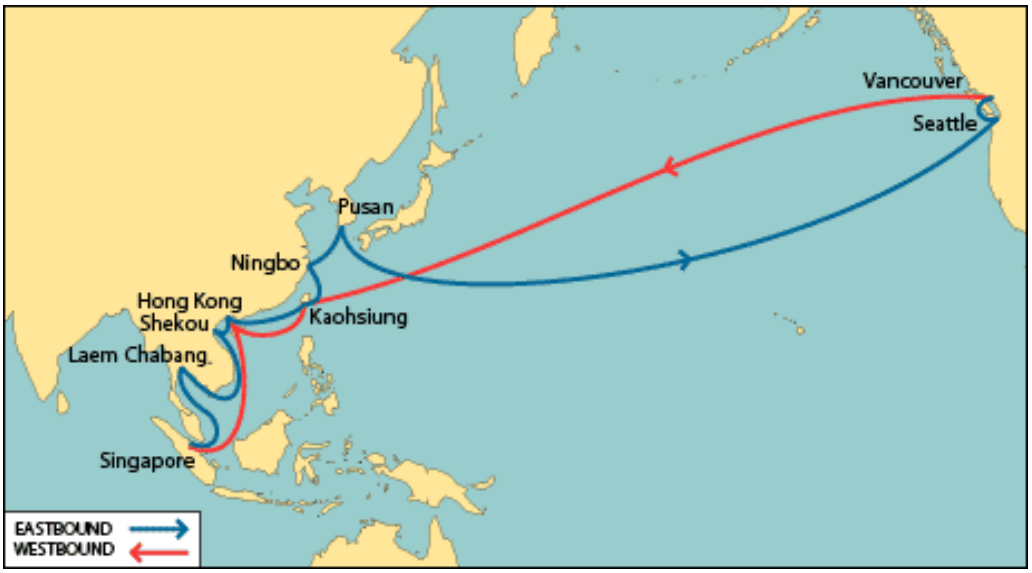


The Grand Alliance

The Grand Alliance operates seven services on the East and Southeast Asia to North America route, out of which, three are all-water services to the East Coast of United States.[192]

Pacific Northwest Express (PNX)

This Grand Alliance weekly service originates from Singapore and calls on other Asian ports of Laem Chabang (Thailand), Shekou (China), Hong Kong, Kaohsiung (Taiwan), Ningbo (China) and Busan (South Korea). It provides direct connection between Busan and Vancouver in 8 days. The westbound voyage from Seattle to Kaohsiung is completed in 11 days. This weekly service requires the deployment of six vessels having an average weekly capacity of about 5,600 TEUs.

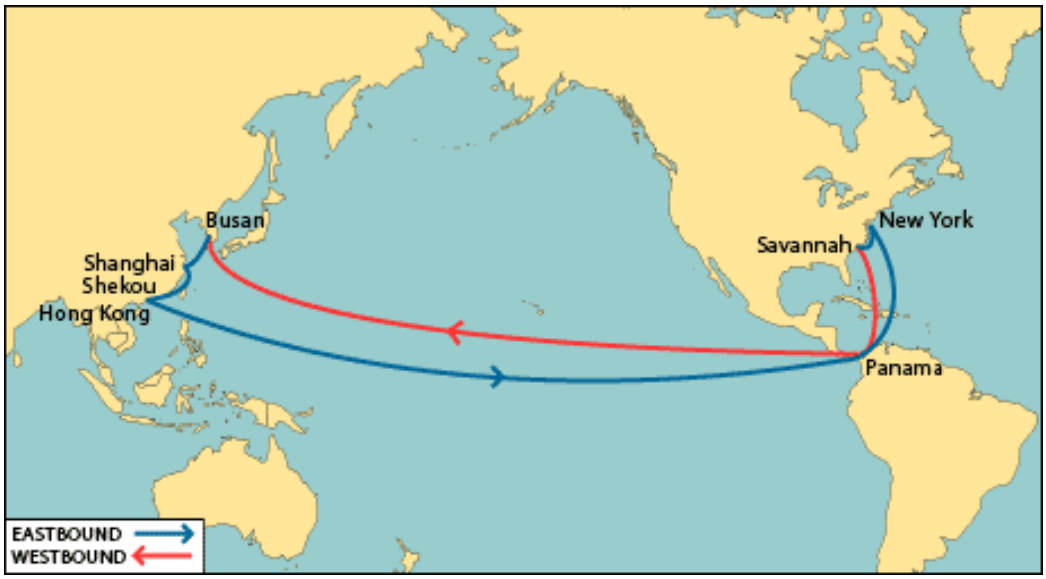


Source: NYK Line. Online. Available: http://www2.nykline.com/nykinfo/liner_services/con_serv/index.html. Accessed: May 18, 2005

[192] Unless otherwise noted, all figures showing Grand Alliance routes come from the same source identified under the first route map

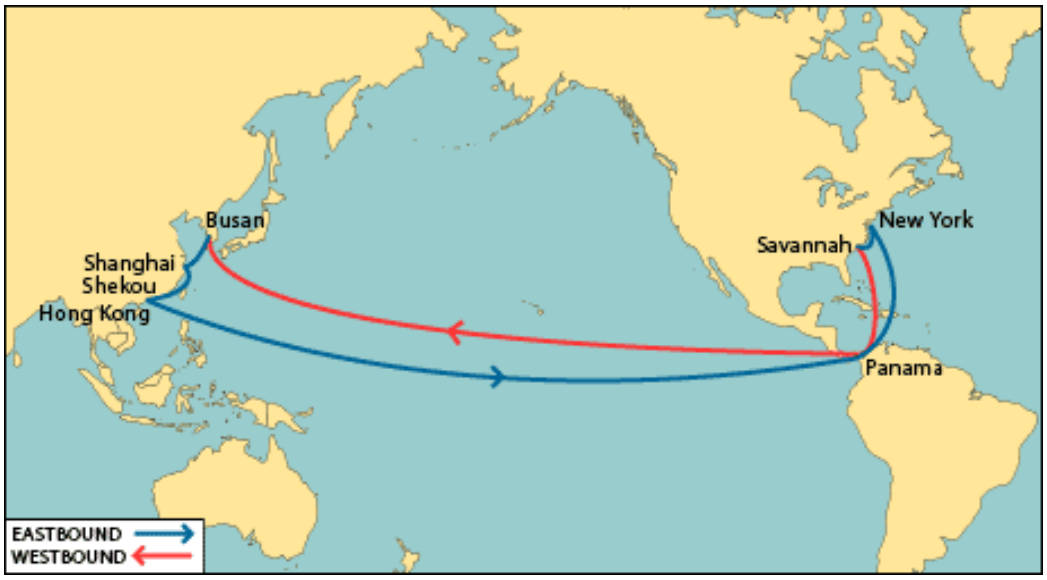
East Coast North Express (ECN)

This is an all-water service to the East Coast of the United States. This weekly service connects the East Asian ports of Busan, Shanghai, Shekou and Hong Kong with New York and Savannah. The voyage time to New York is 28 days and an additional three days for Savannah. This service provides an average weekly capacity of about 4,100 TEUs on this route and requires the deployment of 8 vessels.



East Coast South Express (ECS)

This is the second all-water service to the East Coast of the United States. The eastbound journey to the first port of call on the U.S. East Coast from Hong Kong takes 29 days. This service deploys ten vessels, which, on average, add 3,300 TEUs of weekly capacity.

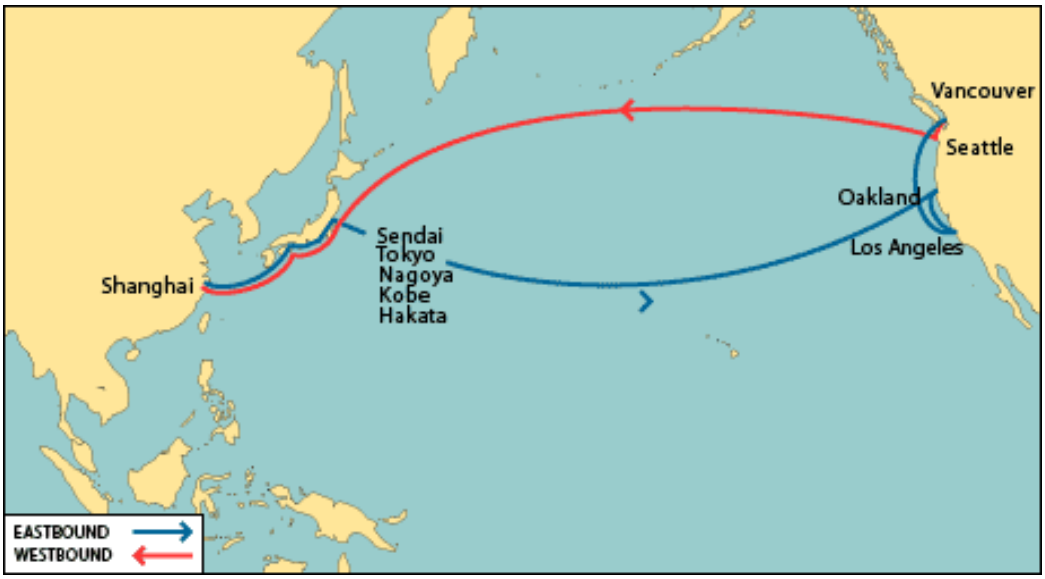


Pacific Atlantic Express (PAX)

The Pacific Atlantic Express is a 91-day roundtrip service linking East Asia, the West and East coasts of the United States via the Panama Canal, and western European ports. This service provides the shortest connection between Tokyo and Seattle in 8 days. This weekly service, starting from Kaoshiung, requires 10 ships to be deployed. The average weekly capacity of the service is about 6,700 TEUs.

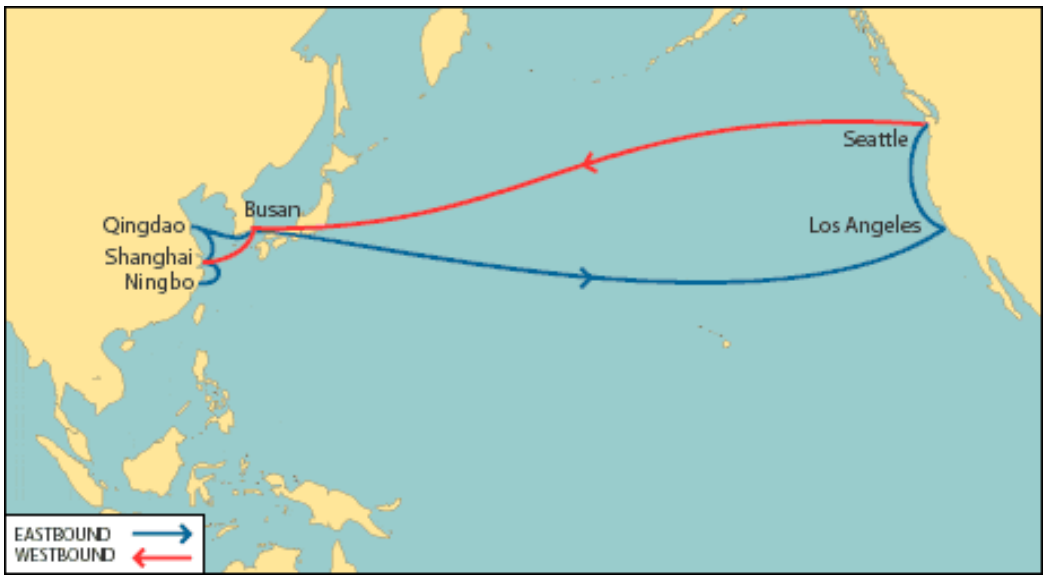
Japan China Express (JCX)

The JCX service calls on the West Coast ports of Oakland and Los Angeles in the United States. The Chinese and Japanese ports called on by this service are Shanghai, Kobe, Nagoya, Tokyo and Sendai. The westbound trans-Pacific route is covered in 8 days. This is a weekly service in which a roundtrip is completed in 42 days. This necessitates the deployment of 6 ships to provide weekly connectivity. The weekly capacity added on this trans-Pacific route is approximately 3,300 TEUs.



China Korea Express (CKX)

This service connects the West Coast ports of Seattle and Los Angeles with ports in South Korea and China. This service operates on a weekly basis and requires five ships to be deployed and has an average weekly capacity of approximately 5,500 TEUs.



Super Shuttle Express (SSX)

This service only calls on the West Coast port of Long Beach from Southeast and East Asia. This service originates in Malaysia and also calls on ports of Singapore, Yantian and Hong Kong. The Hong Kong to Long Beach voyage is completed in 12 days. The SSX service adds a weekly capacity of 7,900 TEUs on the trans-Pacific route.