Market Segmentation and Competitiveness for the Ports of Los Angeles and Long Beach

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Contents

Table of Figures

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1. Executive Summary

The Ports of Los Angeles and Long Beach have dominated the TransPacific container trade from its inception. However, the two ports' share of containerized imports from Pacific Rim countries has been in steady decline since 2003. Overall, the LA/Long Beach market share of Pacific Rim containerized imports declined from 55.7% in 2003 to 47.9% in 2012. The loss of market share has taken place in the context of rising costs for shipments through the Ports of LA and Long Beach relative to their East Coast competitors. This paper uses U.S. trade data to analyze market share performance of the Los Angeles/Long Beach gateway and competing ports, including detailed analysis of specific product groups and origins, and shifts in traffic over the last decade.

This analysis reviews two previous studies dealing with the TransPacific container trade which used a market segmentation approach based on shipment origins and destinations, transportation costs, commodity type, and commodity value.

The findings of this study include the following:

- Previous studies suggested that a shift in traffic origins from Northeast Asia to Southeast Asia would reduce the market share of West Coast ports. Shipment origins have changed little over the last decade, with Northeast Asia still accounting for almost 90% of U.S. Pacific Rim imports.
- Lack of data limits the ability to develop reliable estimates of shifts in demand among U.S. regions.
- The loss of market share by LA/Long Beach applies to all major product groups with the exception of vehicle parts and footwear.
- While the analysis supports the general conclusion that the average value of imports is higher at LA/Long Beach than East and Gulf Coast ports, product value is not a reliable predictor of shifts in market share at a product group level.

Examination of patterns of vehicle parts (HS 87) imports suggests that the success of LA/Long Beach in increasing its share of this traffic is attributable to the southward shift of vehicle manufacturing activity, and to service characteristics critical to reliable delivery of parts in the JIT environment of vehicle manufacturing.

Lessons from this analysis include:

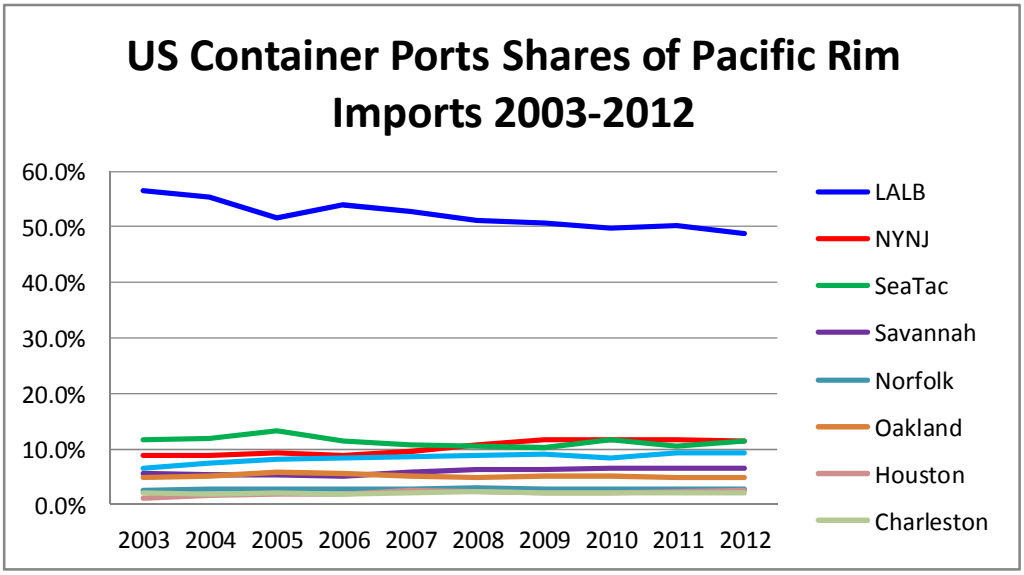
- The broad-based nature of the decline in LA/Long Beach market share suggests that cost increases over the last decade have affected traffic in almost all product groups, regardless of product value or service advantages offered by the Southern California ports.

- The example of vehicle parts imports shows that traffic routing for some products can be decisively influenced by service characteristics. An active market segmentation approach may provide opportunities to recapture market share for specific product groups. This would require extensive market research to identify groups with similar service requirements, and smaller scale investments and special programs targeted to specific market segments. This could be undertaken in concert with large scale investments required to improve transit times and reduce costs for all traffic transiting the Ports.

2. Introduction

The Ports of Los Angeles and Long Beach have dominated the TransPacific container trade from its inception. However, the two ports' share of containerized imports from Pacific Rim countries has been in steady decline since 2003. Overall, the LA/Long Beach market share of Pacific Rim containerized imports declined from 55.7% in 2003 to 47.9% in 2012. Container traffic at the two ports totalled 14.1 million TEU's in 2012. Had the ports managed to maintain their 2003 market share, traffic would have been 16.4 million TEU's, higher than the peak level reached in 2007.

Figure 2-1 US Container Ports Shares of Pacific Rim Imports 2003 – 2012



The loss of market share has taken place in the context of rising costs for shipments through the Ports of LA and Long Beach relative to their East Coast competitors. These fall into two major categories:

- Container fees passed on to Beneficial Cargo Owners (BCO's) to fund infrastructure investments and environmental mitigation programs, including the Alameda Corridor, PierPass, and the Clean Trucks Program.
- Rapidly rising rail costs for shipments to major markets in the eastern U.S.[1]

This paper uses U.S. trade data to analyze market share performance of the Los Angeles/Long Beach gateway and competing ports, including detailed analysis of specific product groups and origins, and shifts in traffic over the last decade.

3. Previous Research

Previous studies dealing with the TransPacific container trade have used a market segmentation approach to analyze the impact of port charges and/or tolls on traffic routings. Two prominent examples are profiled below.

In November 2004 Mercer Management Consulting (Mercer, 2004) completed a study analyzing potential demand for container traffic for the Panama Canal Authority. For U.S. imports from Asia, Mercer analyzed three competitive routings: West Coast ports and intermodal rail, and all-water services through the Panama and Suez Canals.

In September 2005 Leachman and Associates (Leachman et al, 2005) completed a study analyzing the impact of container fees on Southern California container traffic for the Southern California Association of Governments. A second phase of this study was completed in September 2010 (Leachman et al, 2010).

Both examples used a market segmentation approach to analyzing potential container traffic under alternative cost scenarios. A summary of the variables used for segmenting TransPacific container flows is shown below.

Figure 3-1 Market Segmentation Categories Previous Studies

Market Segmentation Categories Asian Imports - Panama Canal vs Southern California Studies		
	Panama Canal (Mercer 2004)	**Southern California (Leachman 2005)**
Origin	NE/SE Asia	Asia
Destination	5 US Regions (population)	21 US Regions (population and income)
Product Type	29 product groups	100 commodity codes (PIERS)
Product Value	$ per kg (11 groups)	$ per cubic ft (18 groups)
Importer Type	n/a	Top 83 + 19 "proxy miscellaneous"

Both examples focused on transportation costs and transit times as the key variables affecting route choice for container shipments. Both found that the savings in inventory costs ("opportunity costs" for Mercer) achieved as a result of faster transit times through West Coast routings are a major factor in overcoming potentially lower transportation costs via East Coast ports. In the Leachman model, the potential for diversion of traffic from LA/Long Beach to other ports is dependent on the value of the commodities imported: low value commodities are more likely to be diverted. This implies that as the relative costs of shipping through LA/Long Beach increase, any declines in market share should be greater for low value commodities.

While both examples used similar methodologies for analyzing routing options, they came to different conclusions. The Mercer report found that traffic via the Panama Canal is inelastic to toll increases in the short term. The Leachman studies found that traffic through the Ports of Los Angeles and Long Beach is highly sensitive to changes in costs and transit times in both the short and long terms.

Both examples were hindered by a lack of data in attempting to focus on specific market segments. In particular:

- Both were forced to estimate traffic flows to destination regions within the US due to the absence of reliable data. Both used population as the primary proxy for estimating regional demand shares.

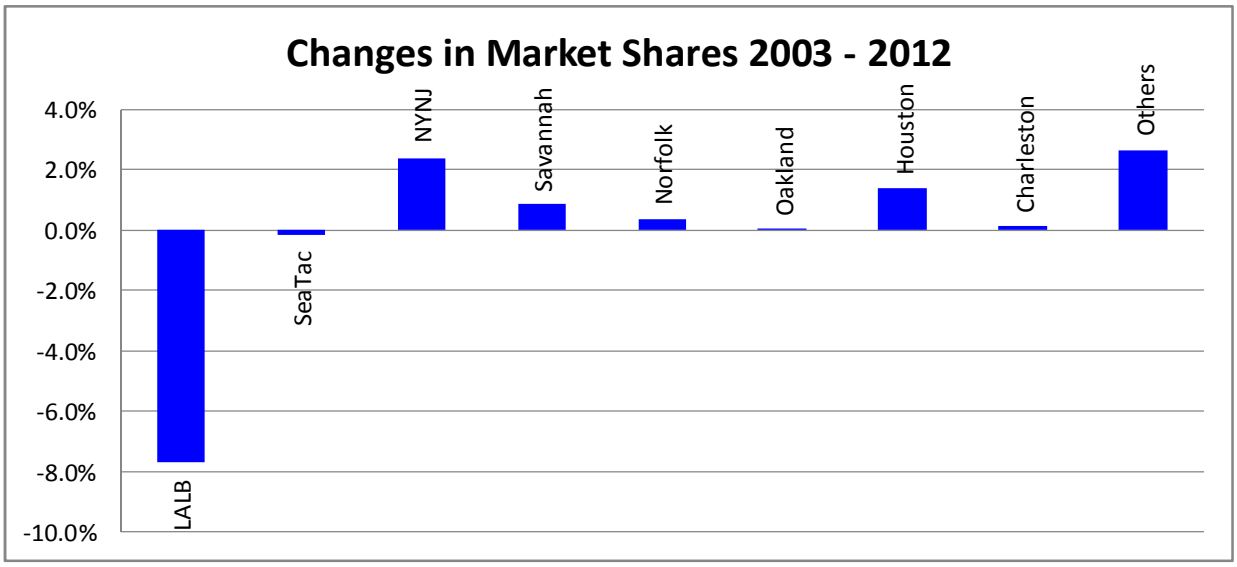
- Both assumed identical commodity demand distributions (type and value) among destination regions.
- While the Mercer study did not attempt to segment demand by importer type, the Leachman studies attempted to segment traffic by type of importer by assigning product value distributions to each.

While both examples "calibrated" their results to available data on aggregate traffic flows, data limitations make it impossible to verify the accuracy of the market segment estimates.

4. Evolution of Port Market Shares

The changes in the shares of US containerized imports from Pacific Rim countries among US ports are shown below.

Figure 4-1 Changes in US Ports' Shares of Containerized Pacific Rim Imports 2003 - 2012

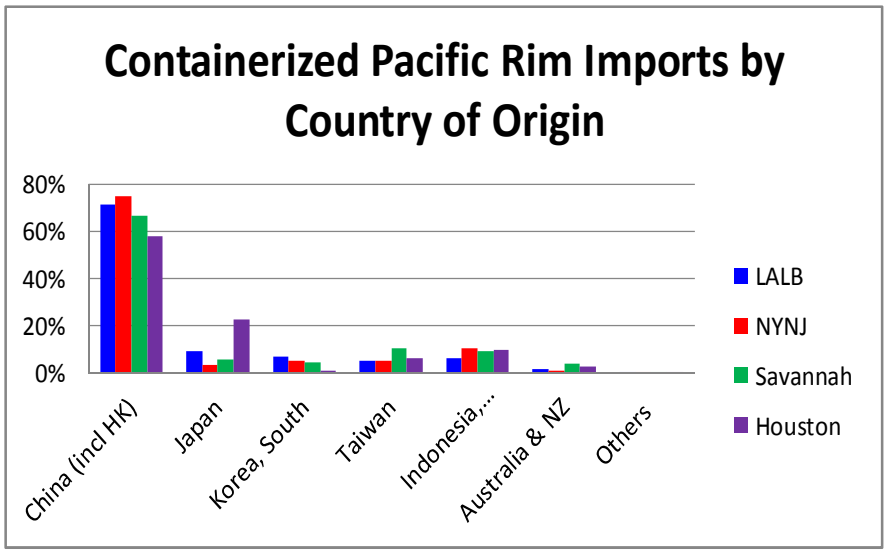


The largest increase was recorded by the Port of New York/New Jersey, which saw its share increase from 9.0% in 2003 to 11.3% in 2012. Houston's market share increased from 1.3% to 2.3%. Savannah's share increased from 5.7% to 6.5%. Increases for these three ports amounted to approximately 54% of the share lost by the Ports of LA and Long Beach over this period. The remainder was widely distributed among the remaining ports.

5. Market Share by Country of Origin

The pattern of Pacific Rim imports by country of origin among the four ports with largest changes in market share (LA/LB, NY/NJ, Savannah and Houston) is shown below. With the exception of Houston, the pattern is similar. Houston differs in that the share of imports from China is smaller and the share from Japan significantly larger. Correlation analysis reinforces the conclusion that traffic patterns by country of origin do not differ significantly among these ports.

Figure 5-1 Containerized Pacific Rim Imports by Country of Origin – LA/LB, NY/NJ, Savannah and Houston



6. Market Share by Product groups

To examine the distribution of imports by product groups, shares of total traffic by HS2 product groups were calculated for each port. Correlation coefficients among these distributions were then calculated to determine the extent to which commodity distributions vary among ports. The results are shown below.

Figure 6-1 Correlation Coefficients – Pacific Rim Imports Commodity Composition 2012

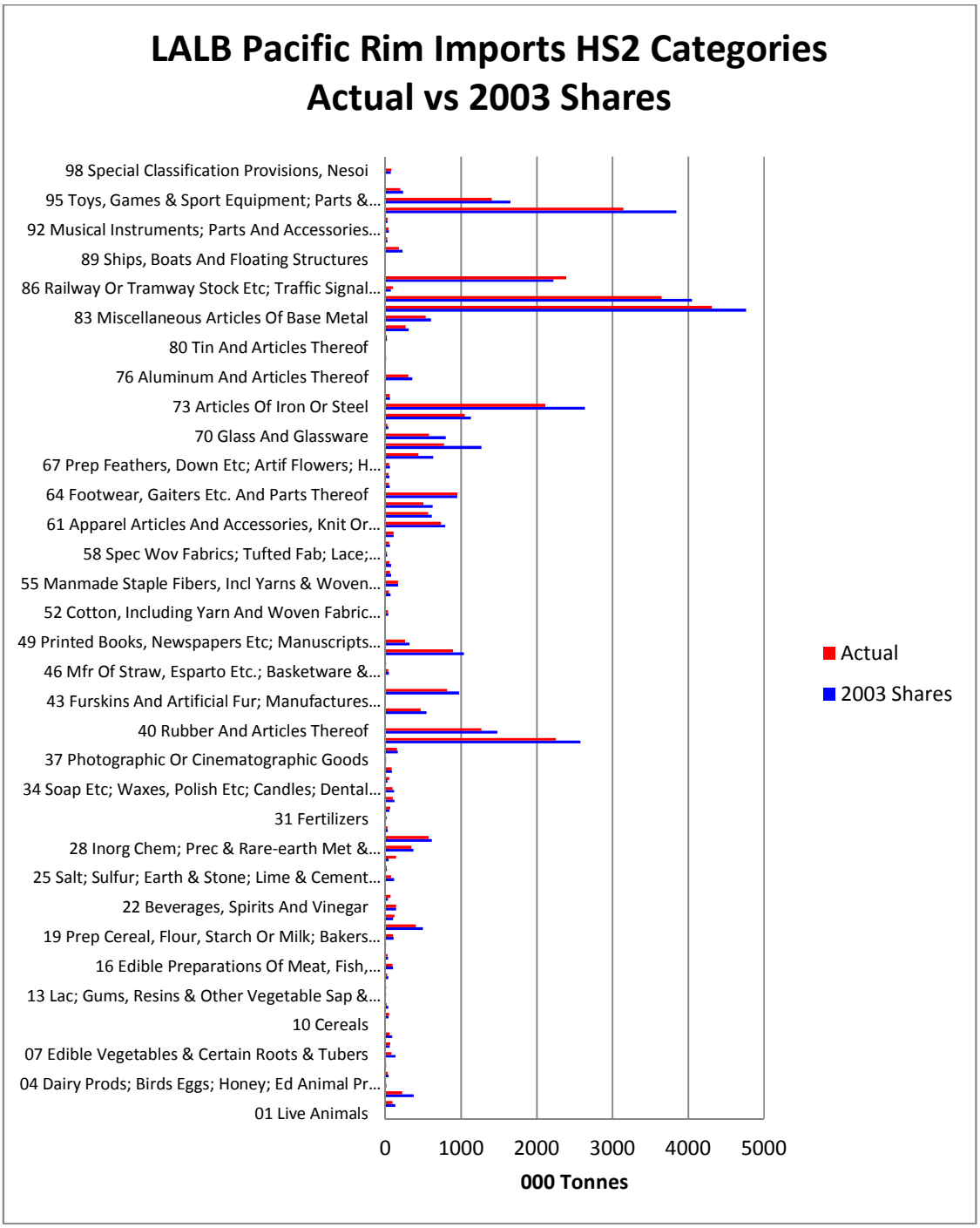
Correlation Coefficients - Commodity Composition 2012				
	LALB	NYNJ	Savannah	Houston
LALB	1			
NYNJ	0.85	1		
Savannah	0.93	0.88	1	
Houston	0.44	0.46	0.50	1

Among the three ports with substantial market share increases, the port with a commodity composition most similar to LA/Long Beach is Savannah followed by New York/New Jersey. The composition of traffic at Houston is substantially different from that at other ports.

5.1 Market Share by Product Groups– LA/Long Beach

The distribution of Pacific Rim containerized imports by product group through the Ports of Los Angeles and Long Beach for 2012 is shown below. The graph shows the actual level of imports compared to the level which would have been achieved if the ports had maintained their 2003 market share for each product group.

Figure 6-2 LA/LB Imports by Product Group Actual vs 2003 Share

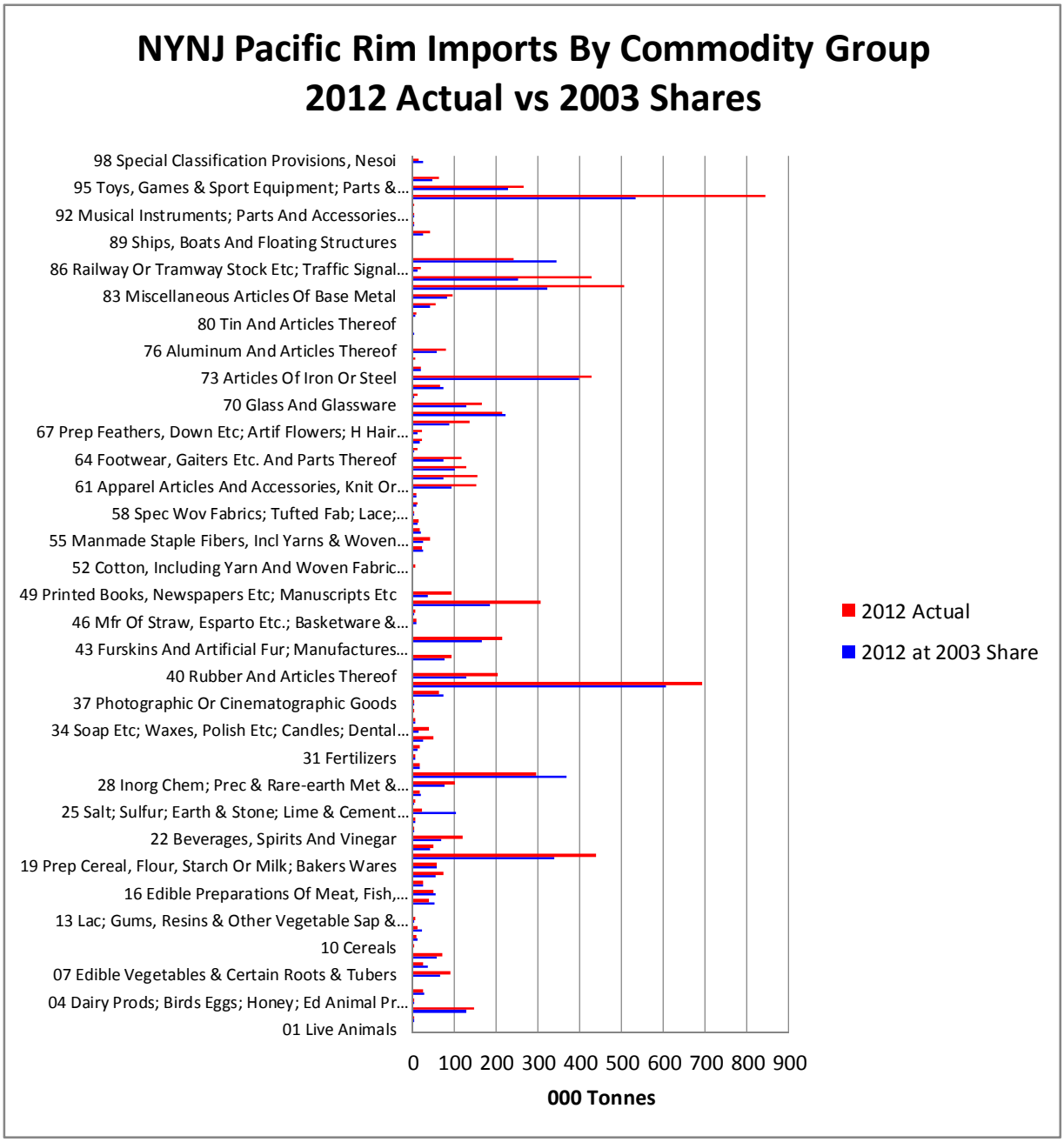


The data indicates that the LA/Long Beach market share declined across virtually all product groups. The only major product group where the ports saw a significant increase in market share was HS 87 (Vehicles and parts). The ports managed to maintain their market share in HS 64 (Footwear). All other product groups of significant volume showed a decline in market share.

5.2 Market Share by Product Groups – New York/New Jersey

The distribution of Pacific Rim containerized imports by product group through NY/NJ for 2012 is shown below.

Figure 6-3 NY/NJ Imports by Product Group Actual vs 2003 Share



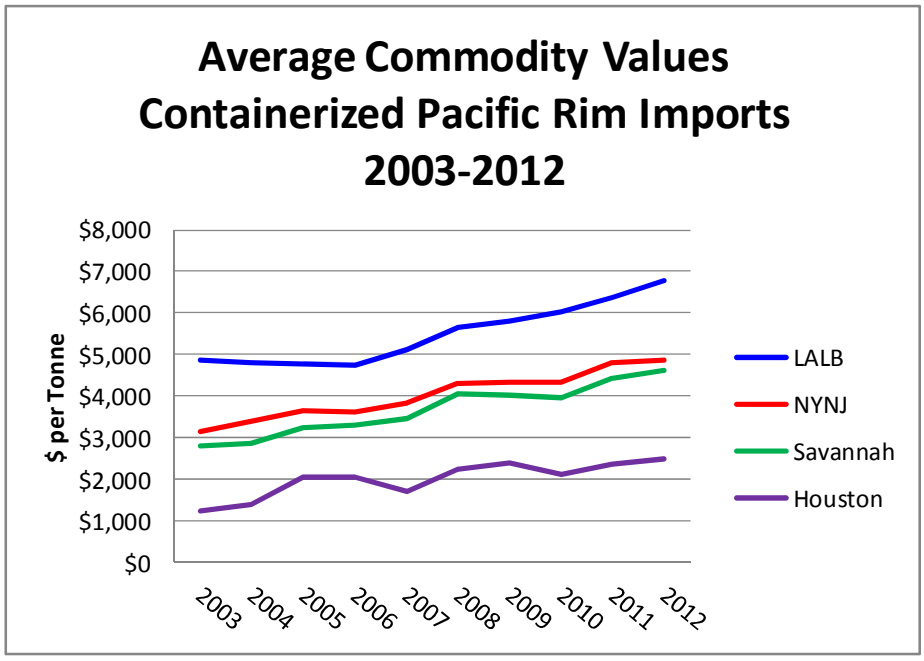
The data shows that NY/NJ gained market share in almost every product group. Among the major product groups, NY/NJ's share increased substantially in furniture (HS 94), machinery (HS 84), apparel (HS 62 and 63), plastics (HS 39), rubber (HS 40) and prepared plant products (HS 20). Market share in organic chemicals (HS 29) and vehicle parts (HS 87) declined.

Analysis of Pacific Rim import statistics for the Port of Houston shows that traffic is highly concentrated in mineral fuel oil etc. (HS 27), articles of iron and steel (HS 73) and organic chemicals (HS 29). It seems likely that demand for these commodities is related primarily to the local petroleum and petrochemical industries; for example, the commodities accounting for the largest share in the HS 27 category include pipes and pipe fittings.

7. Market Share by Commodity Value

Average commodity values by port for major container ports are shown below. The higher value for LA/Long Beach imports relative to NY/NJ is consistent with predictions from previous studies. The low average value for Houston is due to the high share of low value commodities (mineral oils and iron and steel products) in the commodity mix.

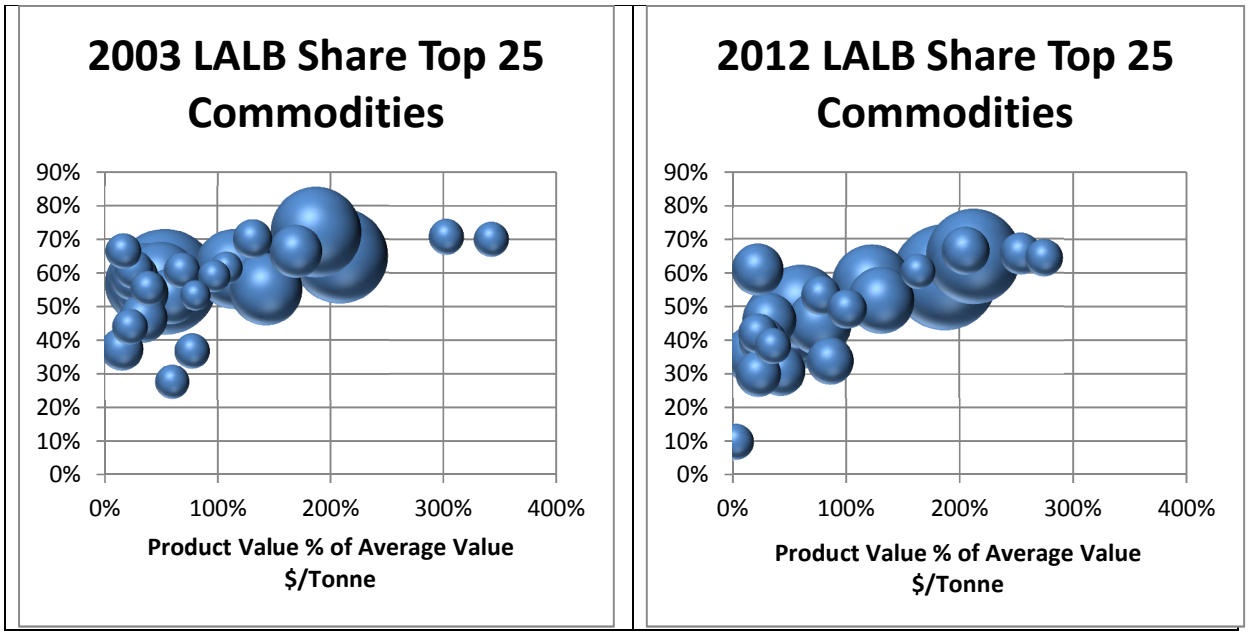
Figure 7-1 Average Commodity Values Pacific Rim Imports



6.1 Market Share by Commodity Value – LA/Long Beach

The previous studies cited above both suggested that higher value commodities are more likely to be shipped through West Coast than through East Coast ports. The graphs below depict the LA/Long Beach market shares for the top 25 Pacific Rim import commodities in 2003 and 2012. Costs for each product group are normalized by calculating as a percentage of the mean value per tonne for all commodities. The size of the spheres indicates the relative shares for each product group.

Figure 7-2 LA/Long Beach Market Shares Top 25 Product Groups 2003 and 2012



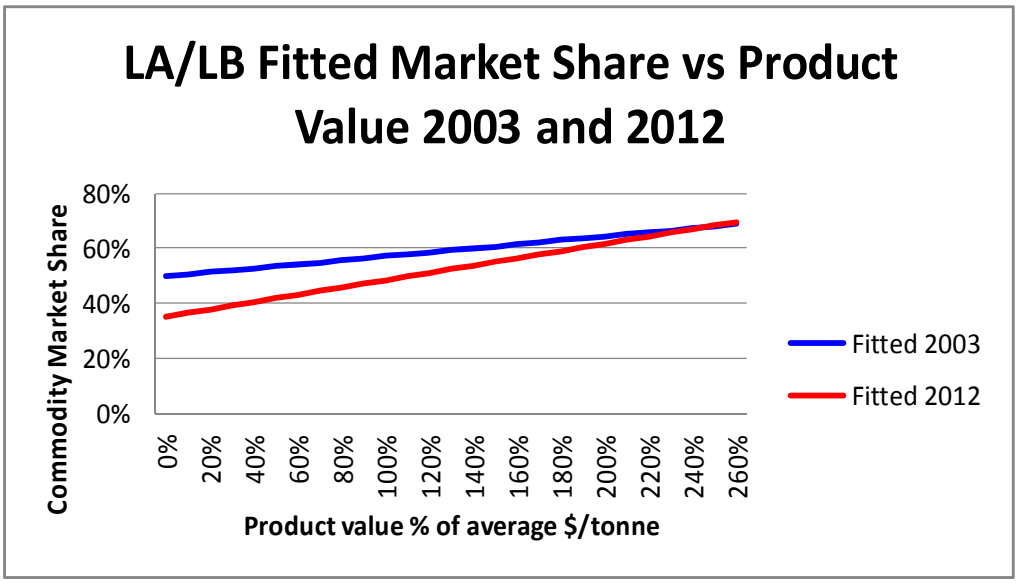
Analysis by product groups shows that LA/Long Beach market shares are positively related to product value. Results of regressions of LA/Long Beach market share on product group values for 2003 and 2012 are summarized below. Based on regression t statistics, all variables are significant at the .01 level.

Figure 7-3 Regression Results LA/Long Beach Market Share on Product Value

Regression Results LA/LB Market Share on Product Value - Top 25 Commodity Groups				
	Intercept	Product Value Coefficient	Adjusted R Square	Significance F
2003	0.498	0.073	0.290	0.003
2012	0.350	0.132	0.578	0.000

The results suggest that the loss of market share for LA/Long Beach is greater for low value commodities. This is consistent with the predictions of the Mercer and Leachman models which concluded that low value commodities are more likely to be diverted from West Coast ports.

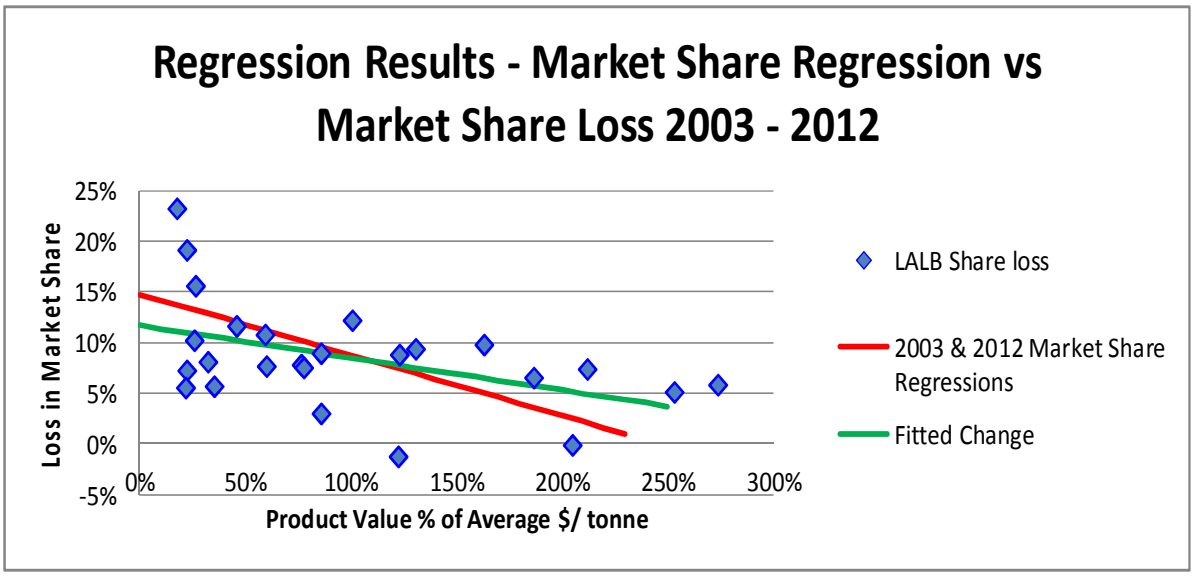
Figure 7-4 LA/LB Fitted Market Share vs Product Value 2003 and 2012 Top 25 Product Groups



To test the relationship between the loss of market share and commodity values, another regression analysis was conducted using loss of market share as the dependent variable and normalized product value for 2012 as the independent variable. The regression yielded a relatively poor fit (adjusted R^2 of .19) with a t statistic for the dependent variable significant at the .02 level.

A comparison of the results of regression analysis to actual losses in market share among major product groups is shown below.

Figure 7-5 Regression Results vs Actual Market Share Loss – Major Product Groups

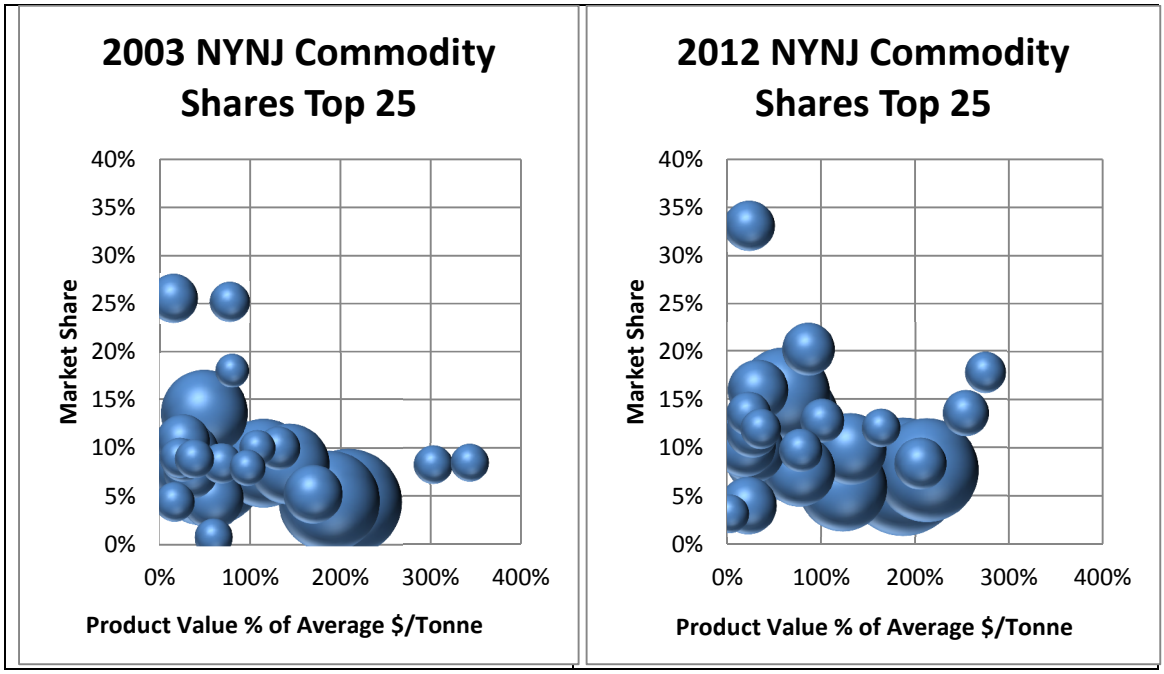


The results of the regression analysis supports conclusion that the market shares for major product groups are higher for higher value commodities, and that in general their market shares have declined by a greater amount for lower value commodities. However, commodity value alone is not a very reliable predictor for changes in market share for specific product groups from 2003 to 2012.

6.2 Market Share by Commodity Value – New York/New Jersey

Market shares for the top 25 Pacific Rim import product groups at NY/NJ in 2003 and 2012 are depicted below.

Figure 7-6 NY/NJ Beach Market Shares Top 25 Product Groups 2003 and 2012

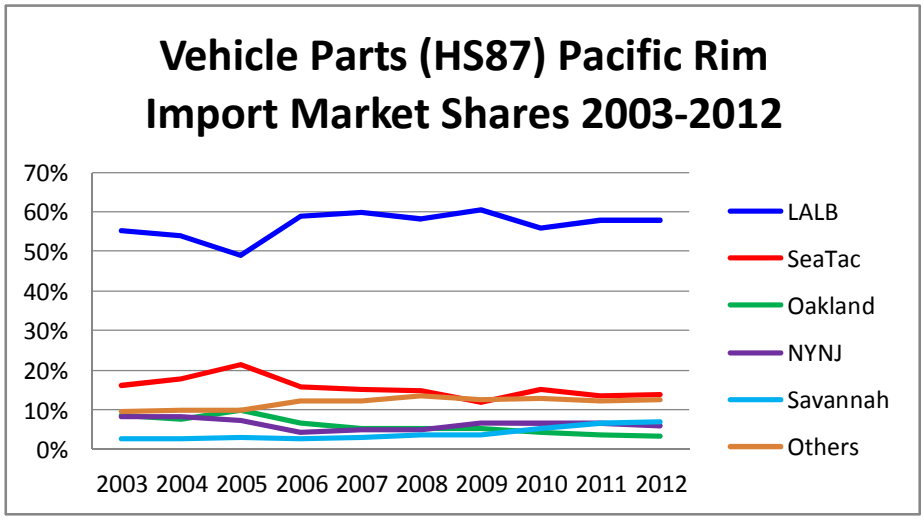


Based on previous studies, we would expect a significant negative relationship between product value and market share. However, the relationship between market share and product value at NY/NJ is very weak (correlation coefficient of -.042).

8. Case Study: HS 87 Vehicles and Parts

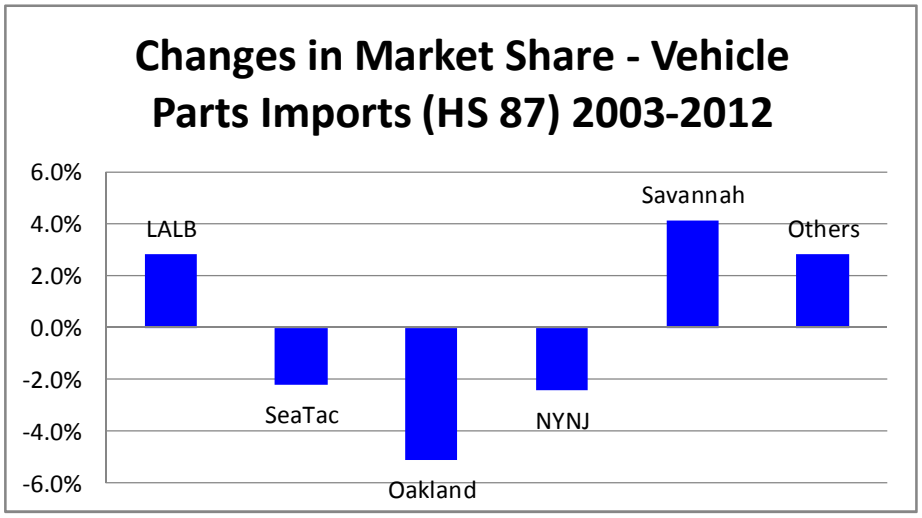
The HS 87 product group is distinctive in being the only major Pacific Rim import category in which the ports of LA and Long Beach actually increased market share between 2003 and 2012. Market shares for major container ports over this period are depicted below.

Figure 8-1 Vehicle Parts (HS 87) Pacific Rim Import Market Shares 2003-2012



The LA/Long Beach gain appears to have come at the expense of NY/NJ, the SeaTac ports and Oakland.

Figure 8-2 Changes in Port Market Shares for Pacific Rim Vehicle Parts Imports 2003 – 2012

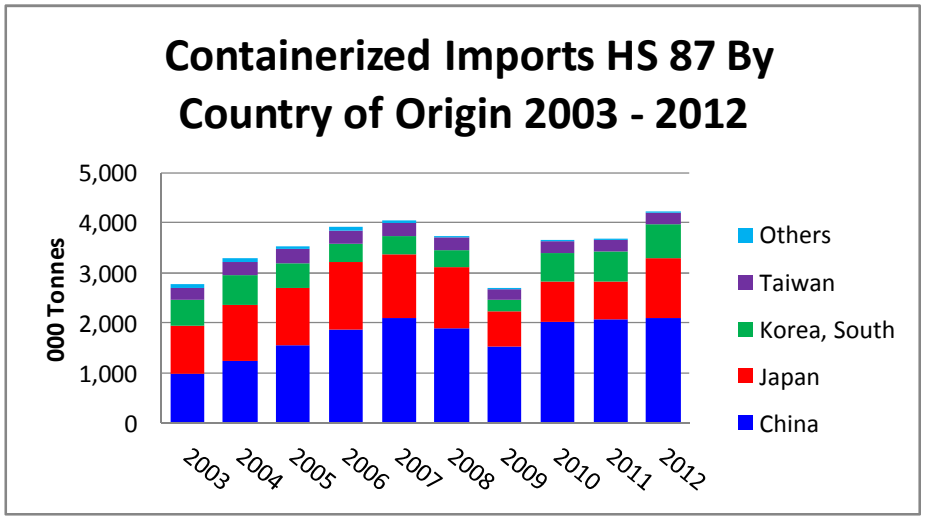


The following sections analyze potential explanations for these shifts using the market segmentation categories from the Mercer and Leachman studies.

7.1 Country of Origin

Statistics on containerized imports of vehicle parts (HS 87) by country of origin are shown below. Since 2003 the shares originating in China and South Korea have increased while those of Japan and Taiwan have decreased. However, insofar as these represent changes in distribution among Northeast Asian origins (using the Mercer category) there is little reason to believe that these shifts have altered the competitive balance among U.S. ports.

Figure 8-3 Pacific Rim Vehicle Parts Imports (HS 87) by Country of Origin 2003-2012



7.2 Destination Region

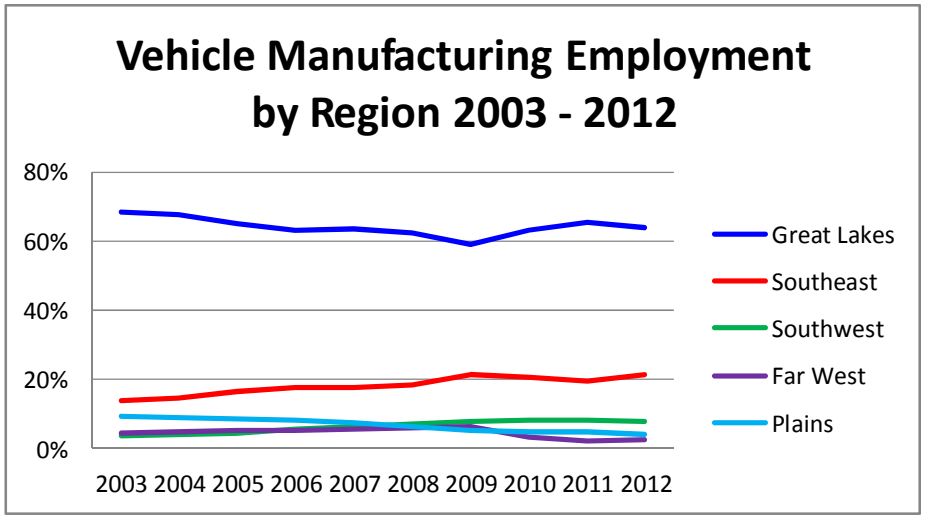
Both the Mercer and Leachman studies were forced to estimate market shares for destination regions within the US based on population shares due to a lack of data. In the case of vehicle parts, more accurate estimates can be developed by examining the distribution of vehicle manufacturing activity.

Historically auto manufacturing activity in the U.S. was concentrated in the Great Lakes states of Michigan, Indiana and Ohio. However, production has been shifting southward:

> *… automotive manufacturing has also increasingly shifted to the South, creating an "auto alley, along the I-65/I-75 interstate highways. This development has come about because of heavy investments by foreign-owned OEMs in states such as Alabama, Indiana, Kentucky, Ohio, and Tennessee.* (Platzer and Harrison, 2009).

Vehicle manufacturing employment by state from 2003 to 2012 is depicted below. From 2003 to 2012, the share of employment in the Southeast and Southwest regions grew from 18% to 30%, while the Great Lakes states shares fell from 68% to 64%. The largest portion of the growth in vehicle manufacturing in the southern states is a result of investment in new plants by Asian manufacturers, including Nissan, Toyota, Honda, Hyundai and Kia. These manufacturers are more likely to import parts from Asia for their U.S. plants.

Figure 8-4 Vehicle Manufacturing Employment by Region 2003 – 2012



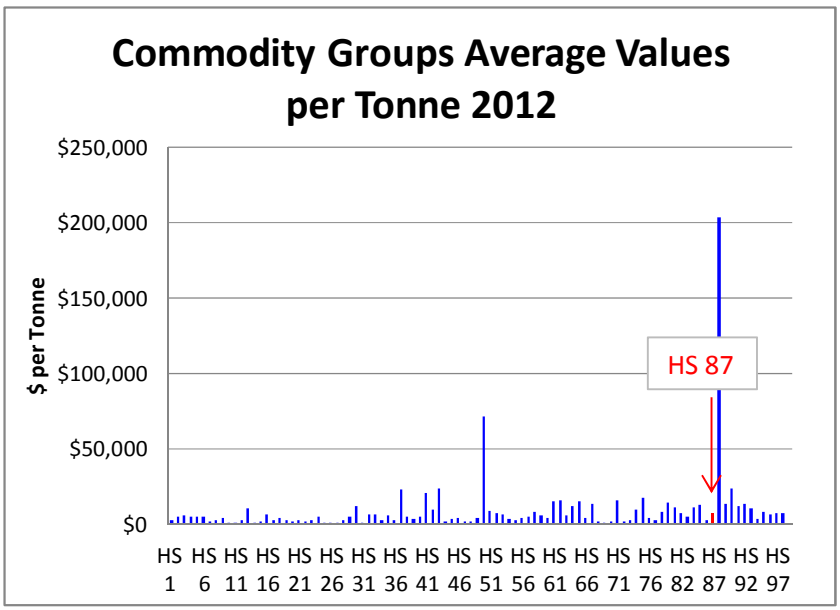
The shift in containerized vehicle parts imports from Pacific Rim countries followed a similar pattern, declining at the northern SeaTac ports and NY/NJ and increasing at the southern ports of LA/Long Beach and Savannah.

The decline in vehicle parts imports at the Port of Oakland is probably due to the closure of the GM/Toyota NUMMI plant at Fremont, California in 2010. This was the only vehicle assembly plant in California, located approximately 40 miles south of the port. Prior to the plant's closure, it produced Toyota Corolla and Tacoma models, and the Pontiac Vibe. The plant is now used for production of Tesla vehicles on a much smaller scale.

7.3 Product Value

The vehicle parts (HS 87) product group is not among the highest value imports; the average value per tonne in 2012 was $7175, 143% of the average value among all product groups.

Figure 8-5 Product Groups Average Values 2012



The West Coast ports have lost market share in vehicle parts imports since 2003, but they still retain 75% of the traffic, and this is the only major product group for which the Ports of LA and Long Beach have increased market share. This may be attributed to the specific supply chain requirements for this traffic. Vehicle parts are primarily imported as intermediate goods for use in the assembly of new vehicles. Vehicle manufacturing operates on strict Just In Time (JIT) inventory model where reliability of delivery is critical to maintaining the efficiency of manufacturing operations. Under these circumstances, service quality may be the overriding consideration in routing choice. Potential advantages from use of West Coast ports for vehicle parts imports include:

- Faster transit times.
- Frequent sailings from multiple origins.
- More frequent intermodal rail service.

These advantages are attributable to economies of scale and scope from the high volume of traffic transiting the Ports of LA and Long Beach.

7.4 Vehicle Parts (HS 87) Conclusions

Vehicle parts (HS 87) imports represent the single major product group for which the Ports of LA and Long Beach have increased their market share over the last decade. Using the market segmentation categories from the Mercer and Leachman studies, this success is attributable to:

- A shift in the location of vehicle manufacturing activity southward, with a consequent shift in import traffic from northern to southern ports; and
- Service advantages of the LA/Long Beach routing.

8 Conclusions

The LA/Long Beach market share of containerized imports from Pacific Rim countries has been in steady decline since 2003. The loss of market share has taken place in the context of rising costs for shipments through the Ports of LA and Long Beach relative to their East Coast competitors. These fall into two major categories: container fees passed on to Beneficial Cargo Owners (BCO's) to fund infrastructure investments and environmental mitigation programs, including the Alameda Corridor, PierPass, and the Clean Trucks Program; and rapidly rising rail costs for shipments to major markets in the eastern U.S.

Previous studies have used a market segmentation approach to analyze the competitiveness of West Coast vs East Coast options for Pacific Rim imports, focusing on transportation costs and transit times. Market segmentation categories included shipment origins, destinations within the U.S., and product type and value. In this paper shifts in the patterns of Pacific Rim imports among major container ports over the last decade have been analyzed using U.S. trade data. Findings include:

- Shipment origins have changed little over the last decade, with Northeast Asia still accounting for almost 90% of U.S. Pacific Rim imports.
- Lack of data limits the ability to develop reliable estimates of shifts in demand among U.S. regions.
- The loss of market share by LA/Long Beach applies to all major product groups with the exception of vehicle parts and footwear. While the analysis supports the general conclusion that the average value of imports is higher at LA/Long Beach than East and Gulf Coast ports, product value is not a reliable predictor of shifts in market share at a product group level.

Examination of patterns of vehicle parts (HS 87) imports suggests that the success of LA/Long Beach in increasing its share of this traffic is attributable to the southward shift of vehicle manufacturing activity, and to service characteristics critical to reliable delivery of parts in the JIT environment of vehicle manufacturing.

Lessons from this analysis include:

- The broad-based nature of the decline in LA/Long Beach market share suggests that cost increases over the last decade have affected traffic in almost all product groups, regardless of product value or service advantages offered by the Southern California ports.

- The example of vehicle parts imports shows that traffic routing for some products can be decisively influenced by service characteristics. An active market segmentation approach may provide opportunities to recapture market share for specific product groups. This would require extensive market research to identify groups with similar service requirements, and smaller scale investments and special

programs targeted to specific market segments. This could be undertaken in concert with large scale investments required to improve transit times and reduce costs for all traffic transiting the Ports.

[1] Estimates of relative cost increases for containerized shipments to Midwest destinations from 1987 to 2011 were developed in a previous paper Thinking Outside the Box: Macroeconomic and Inland Network Impacts on Port Competitiveness (Davies, 2013).

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