Port and Modal Elasticity Study

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Aim of the study

- Container fees on imports are an increasingly prominent topic in legislatures
- This study, sponsored by the Southern California Association of Governments, aimed to determine the elasticity of imports through the San Pedro Bay Ports (Los Angeles and Long Beach) to potential container fees and to potential reductions in lead times for container movement

Structure of Study

- Industry assessment
  - Methodology
    - Stakeholder interviews by project team
  - Components
    - Operational framework
    - Vessel deployment
    - Port competition
    - Economics of transloading
    - Traffic composition
- Elasticity model
  - Methodology
    - Analytical model done by Dr. Leachman
  - Components
    - Transportation costs
    - Lead time distributions
    - Inventory costs
    - Importer segmentation
    - Limitations and interpretation

Data sources

- Quantitative data came from several sources
  - PIERS and WTA data received from POLB and MARAD
    - 2001-2003 PIERS data for West Coast ports
    - 2001-2003 WTA data for entire USA
    - 2003 Asia trade totals for all US ports
  - Obtaining accurate and granular data for this study was a great challenge

Alternative landside channels

- Local: steamship -> dray
  - "Store-door" delivery service from steamship line
- Direct truck: steamship -> truck
  - Port gate pick-up by trucker
- Direct rail: steamship (-> dray) -> rail -> dray
  - "Inland point intermodal" service from steamship line
- Trans-load rail: steamship -> dray -> trans-load warehouse -> dray -> rail -> dray
  - IMC sells the transportation from trans-load whse to destn
- Trans-load truck: steamship -> dray -> trans-load warehouse -> truck

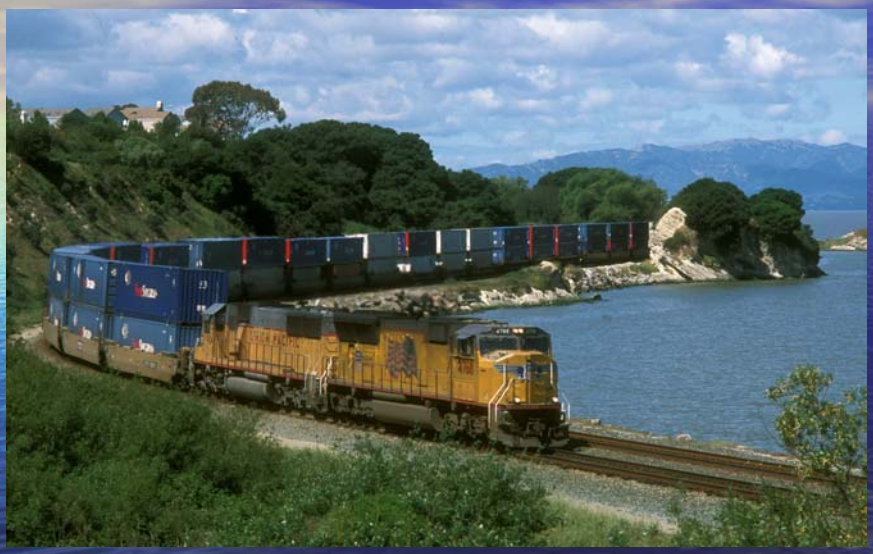
Transportation costs

- Cost per cubic foot of imports is what matters to an importer
- A 53-foot domestic container has 60% more useable space than a standard 40-foot marine container
- A 53-foot truck has 70% more useable space
- Rail and truck rates are sub-linear in box size

Domestic vs. marine containers

Marine stack train

Domestic stack train



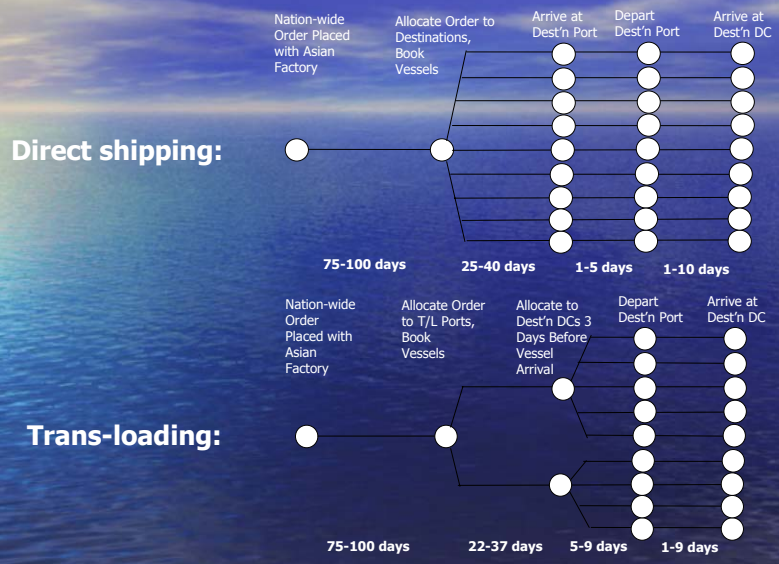
Transportation costs

- A database of total transportation costs from 10 ports of entry to 21 US destination regions was developed considering alternative landside modes:
  - Direct truck movement of marine box
  - Direct rail movement of marine box
  - Trans-load to domestic 53-foot container, then rail
  - Trans-load to trailer, then truck
- Trans-load rail is $0.02 less - $0.05 more per cubic foot than direct rail from WC ports, and $0.07 - $0.15 more from EC ports
- Trans-load truck is $0.40 - $0.60 more from WC ports, $0.05 - $0.15 more from EC ports

Inventory costs

- Two types of inventory costs are influenced by choice of supply channel:
  - Pipeline stocks
    - Proportional to transit time and value of goods
  - Safety stocks at destinations
    - Proportional to value of goods
    - Square root function of lead time, variability in lead time and sales forecast error over lead time
    - Square root function of volume to other destinations that is consolidated

Impact of trans-loading strategy



Impact of trans-loading (cont.)

- For the case of weekly shipping from Asia and 6% average error in nationwide one-week-ahead sales forecasts, consolidation, de-consolidation and trans-loading affords large, nation-wide retailers an 18-20% reduction in their total pipeline plus safety stock inventory (compared to direct shipping from Asia)
  - Even considering the extra transportation expense, total cost savings to the US economy is about $1.1 billion per year
- No inventory reduction afforded for small or regional retailers

Trans-loading vs. direct shipping

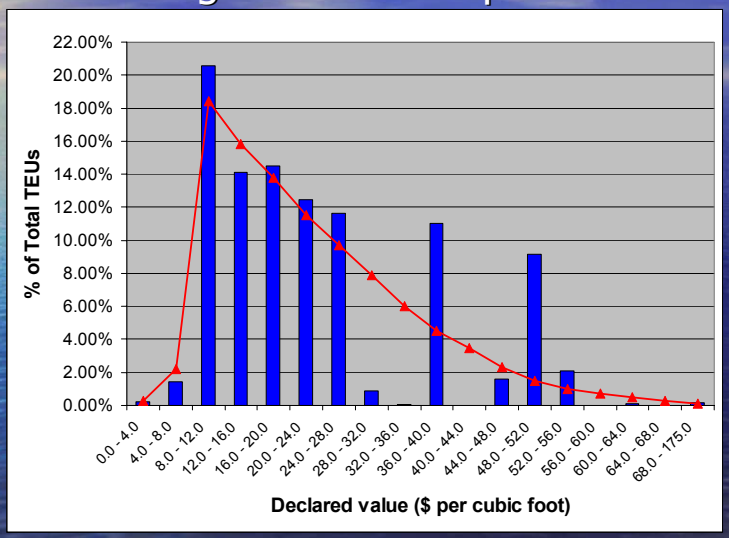
- Trade-off between inventory costs and transportation costs for large, nation-wide retailers (N/A for small or regional importers)
- For importers of low-value goods (< $13 per cu. ft.), direct shipping is cheapest
- For importers of moderate-value goods, trans-loading using multiple ports is cheapest
- For importers of high-value goods (> $28 per cu. ft.), trans-loading using a single port is cheapest

2003 Distribution of imports by commodity through U.S. West Coast Ports

Commodity	TEUs (1000s)	$ per Cu Ft
Furniture & Bedding	1,014	8.27
Electronics & Elect Eqpt	749	37.46
Toys, Games & Sports Eqpt	663	16.56
Machinery	661	50.23
Vehicles & Parts	480	20.19
Plastic goods	353	13.18
Apparel - not knitted	329	27.93
Footwear	318	24.37
Misc manufactured goods	274	23.42
Steel goods	265	14.13
Leather goods	199	18.05
Rubber goods	198	14.63
Apparel – knitted	149	53.81
Ceramic goods	109	8.38
All other	1,460	

Source: PIERS, WTA and PMA data

Distribution of declared values of Asian imports through West Coast ports



Largest importers of containerized Asian goods

Importer	Assumed avg. value per cu ft	PIERS 2004 Volume (TEUs)
Wal-Mart	$15	576,000
Home Depot	$ 9	301.200
Target	$20	202,700
Sears/K-Mart	$20	186,000
Ikea	$ 9	100,000
Lowe's	$ 9	100,000
Costco	$20	73,040
Ashley Furniture	$ 9	70,180

Source: PIERS Data published in Journal of Commerce

The long-run elasticity model

- Model scope and structure
  - Importers
    - Considers top 83 actual Asian importers
      - These are the only ones eligible for trans-loading
    - Adds 19 "proxy miscellaneous" importer categories
      - To include all potential declared values from $2 to $70
  - USA divided into 21 destination regions
    - Served by 10 potential ports of entry

The long-run elasticity model (cont.)

- Model development
  - Volume for each importer distributed among all regions proportional to purchasing power
  - Imports are assigned to channels so as to minimize total transportation and inventory costs for each importer
  - One homogeneous strategy assigned for all goods of each importer
    - No product differentiation

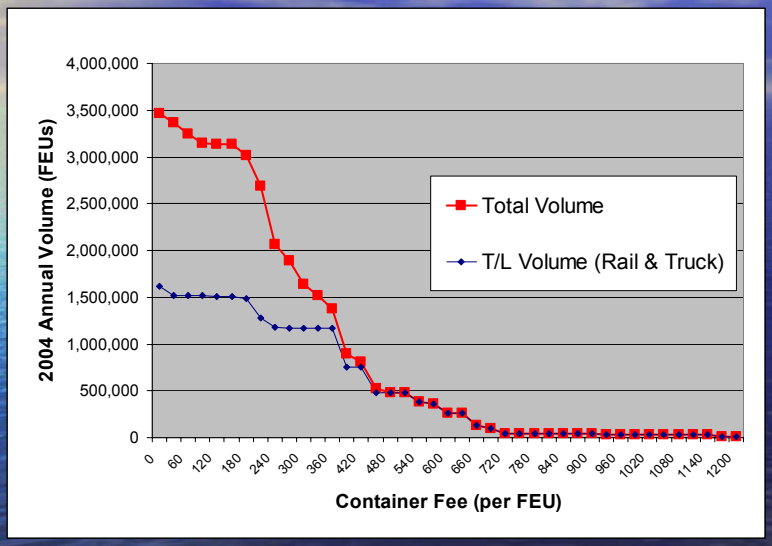
The long-run model (cont.)

- Total import volume and total trans-load import volume through the SPB ports are tabulated by model
- Model may be used for "what-if" analysis of new user fees, lead time reductions from new infrastructure investments, changes in rates, etc.

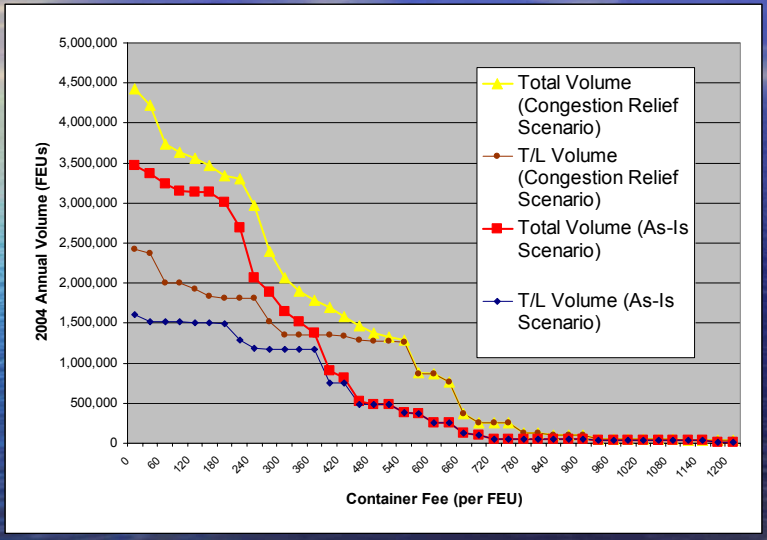
Scenarios analyzed

- As-is scenario
  - Container fee on the dock ranging from $0 up
- Congestion relief scenario
  - Reduction in lead time from SPB ports to T/L warehouses (mean down by 1 day, s.d. down by 0.4 days)
  - Reduction in variability of rail transit times from LA Basin to all inland points (s.d. down by 0.1 days)
  - Container fee on the dock ranging from $0 up

Results – as-is scenario



Results – congestion relief scenario



Interpretation of the model

- The elasticity curves reveal the points at which importers would have an economic incentive to reduce their routing of imports via the SPB ports
- In the short-run, SPB port volumes may be more inelastic than predictions of the model because of resulting congestion at other ports, capacities, contract commitments, etc.
- But large investments in access infrastructure should be confirmed to be sound investments by long-run elasticity calculations

Discussion of results

- If no congestion relief, even a small container fee would, in the long run, drive some traffic away from the SPB ports
  - The model predicts a $60 per FEU fee (such as proposed recently) would cut total SPB import volume by 6.3% and cut trans-loaded import volume by 5.9%, if no reduction is provided in lead times

Discussion of results (cont.)

- The congestion relief scenario would significantly alter the mix of traffic through the SPB Ports
  - A fee in the range of $190-$200 per FEU results in 12.5% more trans-loading volume, 4% less total volume
- There would be a significant increase in economic activity in Southern California

Conclusions

- SPB port volumes are much more elastic with respect to congestion than with respect to modest container fees
  - But they are nonetheless elastic w.r.t. fees
- Fees assessed before there is congestion relief cause loss of volume. A fee of $60 per FEU would result in about a 6% drop in both total and trans-loaded imports if shipment lead times are not reduced.

Conclusions (cont.)

- If there is substantial congestion relief, SPB imports are relatively inelastic for fees up to about $200 per FEU. SPB volume might decrease marginally, but trans-loaded volume would increase significantly.
- Fees above $200 per FEU result in major traffic diversion, even when coupled with substantial congestion relief.

For more information

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Thank you for your attention