Cascadia Border Operations, Issues, and Consequences for the Agrifood Market

Anne Goodchild
Assistant Professor
Civil and Environmental Engineering
University of Washington

May 23, 2008
• Pacific Highway Crossing
  – $43 Million in trade each day
  – 500,000 trucks in 2005
  – 4th busiest N. border commercial crossing
  – Busiest crossing W. of Detroit
  – Transit times can be long & unpredictable
  – Congested during peak periods
  – Connects the mega regions of Vancouver and Seattle.

Courtesy of WCOG
Only top 5 crossing West of Mississippi

Top 5 US/Canada Border Crossing (2006)

US Census Bureau, 2008
Top 5 US/Mexico Crossings

Top 5 US/Mexico Border Crossings (2006)

US Census Bureau, 2008
Champlain-Rouses Point, NY Southbound vehicle commodity data

- **Articles Of Iron Or Steel**, 43,876, 34%
- **Plastics And Articles Thereof**, 242, 0%
- **Rubber And Articles Thereof**, 22,397, 17%
- **Spec Wov Fabrics; Tufted Fab; Lace; Tapestries Etc**, 1,281, 1%
- **Electric Machinery Etc; Sound Equip; Tv Equip; Pts**, 1,207, 1%
- **Furniture; Bedding Etc; Lamps Nesoi Etc; Prefab Bd**, 15,071, 12%
- **Tanning & Dye Ext Etc; Dye, Paint, Putty Etc; Inks**, 44,377, 35%
- **Special Classification Provisions, Nesoi**, 107, 0%

US Census Bureau, 2008
Pacific Highway Cross-Border Truck Commodities & Origin-Destination Patterns

- Agricultural products: 4%
- Wood products: 7%
- Allied paper products: 4%
- Misc. manufactured products: 2%
- Prepared foodstuffs: 3%
- Non-metallic products: 3%
- Base metals: 2%
- Plastics and rubber: 2%
- Meat, fish, and seafood: 2%
- Articles in base metal: 2%
- Waste and scrap: 2%
- Empty/Empty containers: 47%
- Other: 18%

Dominated by food and agricultural products (9%)

Courtesy of WCOG
Motivation

• Much of the existing literature has overlooked the impact of border operations on agribusiness, and classifies it as non time sensitive

• For Cascadia, however, these are our most time critical goods, and are very important to the regional economy.
Border Crossing Process

Wait in line

Radiation Portal Monitor (RPM)
Average: 20 seconds
Variable range: 10 – 30 seconds

Transition Time
Average: 17 seconds

Primary Inspection
CBP: Process procedures of FDA, Agriculture Specialist, Immigration

FAST
(Hours: 8am-8pm):
Average: 86 seconds
Variable Range: 69 – 114 seconds

nonFAST:
(Hours: 24 hrs):
Average: 120 seconds
Variable range: 114 – 129 seconds

Vehicle and Cargo Inspection Systems (VACIS)

Secondary Inspection
CBP: Process procedures of FDA, Agriculture Specialist, Immigration in depth. Agriculture K-9 team searches cargo

Maybe

Released

Maybe

Released

Maybe

Released
Programs to reduce delay and increase trust

• **Advance Electronic Presentation of Cargo Information (ACE)**
  – Electronic manifest filing
  – More information submitted
  – Reduces errors
  – Process improvements: 2006 study shows secondary inspections reduced by 50%
  – Now required for all crossers
Programs to reduce delay and increase trust

• **Customs Trade Partnership Against Terrorism (C-TPAT)**
  – Voluntary security practices that increase trust
  – Companies comply to reduce wait time
  – CBP introduced the program to increase security
Programs to reduce delay and increase trust

• Free and Secure Trade (FAST)
  – Driver must be US citizen or permanent resident
  – Passengers, driver, vehicle, goods, carrier, and importer must all be FAST certified
  – Must be C-TPAT approved
  – Difficult for LTL and package carriers
  – Separate border infrastructure (8am-8pm)
  – Inspection and wait times significantly reduced
## Delay Summary

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>90&lt;sup&gt;th&lt;/sup&gt; Percentile</th>
<th>Arrival Rate</th>
<th>Average Service Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCOG FAST</td>
<td>579</td>
<td>22 minutes</td>
<td>21 minutes</td>
<td></td>
<td>21.5 Vehicles per hour</td>
<td>86 Seconds</td>
</tr>
<tr>
<td>Halcrow, 2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WCOG non-FAST</td>
<td>1480</td>
<td>1 hour 23 minutes</td>
<td>26 minutes</td>
<td></td>
<td>21.5 Vehicles per hour</td>
<td>119 seconds and 121 seconds</td>
</tr>
<tr>
<td>(Halcrow, 2007)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe, southbound (FAST)</td>
<td>5658</td>
<td>23 minutes</td>
<td>24 minutes</td>
<td>50 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Goodchild, et al)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe, northbound (non-FAST)</td>
<td>5805</td>
<td>23 minutes</td>
<td>20 minutes</td>
<td>45 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Goodchild et al)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe (overall)</td>
<td>11,463</td>
<td>23 minutes</td>
<td>22 minutes</td>
<td>47 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Goodchild et al)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FAST Border Crossing Times

20 minutes

4 hours
Disruptions off-hours
The chart shows the time spent on different days of the week, with Monday to Friday showing a consistent pattern, and Saturday and Sunday varying more, as indicated by the SB more variable note in the legend. The chart includes bars for NB Average, NB Standard Deviation, SB Average, and SB Standard Deviation, with Saturday having the highest SB deviation.
Delay summary

• Variability more difficult for supply chain management than average.
• Average lower in low flow times, but variability increased.
• NB and SB have different operating characteristics that affect delay.
Days with >2 hour observations
Previous Research

• Impact of border crossing time variability on regional supply chains

• Examination of the cause of very long delays (>2 hours)

• Description of Cascadia regional freight transportation

• Examination of long-term delay patterns
  – Seasonal patterns
  – Daily patterns

Data from Pacific Highway Crossing, GPS data, manifest data, truck counts, operations survey, interviews with carriers
Previous Research Findings

• Variability in delay increases cost beyond average delay

• Delays are dramatically reduced for FAST approved trucks

• Very long delays (> 2 hours) are very problematic

• Regional industry is not tightly scheduled due to typical distances and ability to predict travel times

• Cascadia has a unique profile with different issues than Michigan/Ontario crossings
# Supply Chain Responses to Delay

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Motivation</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routing Changes</td>
<td>Address average crossing time</td>
<td>• Reduces the impact of variability on operations</td>
</tr>
<tr>
<td>Schedule changes</td>
<td>Address average crossing time</td>
<td>• Reduces the impact of variability on operations</td>
</tr>
</tbody>
</table>
| Reduce level of activity in cross-border trade | Address average crossing time and increased documentation requirements | • Reduce impact of variability on operations  
• Stop providing courier or same day service  
• Reduce revenue to carrier and level of cross border economic activity |
| Change transportation mode       | Address average crossing time                      | • Change border procedures which, depending on local circumstances, may improve travel time reliability |
Supply Chain Responses to Variability and Documentation

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Motivation</th>
<th>Consequence</th>
</tr>
</thead>
</table>
| Increase buffer times           | Address crossing time variability                | • Reduces capacity of existing infrastructure or requires additional hires and equipment  
|                                 |                                                 | • Increases transportation and inventory cost                              |
|                                 |                                                 | • Reduces late arrivals and stock-outs                                     |
| Increase dwell times at intermediate handling facilities | Address crossing time variability | • Reduces impact of delay on outbound vehicles, particularly relevant for LTL (less than truckload) operations  
|                                 |                                                 | • Increases total transit time and therefore inventory cost                |
| Hire full time border logistics staff | Increased documentation requirements | • Primarily Canadian firms  
|                                 |                                                 | • Necessary to meet regulatory requirements                               |
Recommendations

• Take advantage of existing programs where possible
  – FAST, C-TPAT, ACE
  – Ensure paperwork in place at all exchange points
  – Our current research shows this is responsible for about 25% of border delay

• Learn about the performance of borders used
  – Cross outside of high flow hours but within program hours
  – Use lower volume crossings
  – Locate terminals before border crossing
  – Consider other modes

• Dedicate resources to managing these issues
Approximate location of BC Piezo WIM

Signal-controlled stop-bar for non-FAST trucks

RPM

Primary

Primary

FAST lane SB
Non FAST SB
Non FAST route for parking and rejoining queue - SB
All trucks NB
NB holding for outbound paperwork
NB Route for parking if still need to file entry, secondary inspection, etc.
Future (2yrs) NB truck alignment
Delay is consistent

![Graph showing consistent delay over time]

- **Average 5 minute delay**
- **Arrival Time**
## Southbound Routes

<table>
<thead>
<tr>
<th>DESTINATIONS</th>
<th>West Lower Mainland</th>
<th>Rest BC</th>
<th>Alberta</th>
<th>East Lower Mainland</th>
<th>Whatcom</th>
<th>West Canada</th>
<th>East Canada</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska</td>
<td>0.1%</td>
<td>0.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.2%</td>
</tr>
<tr>
<td>East Canada</td>
<td>0.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.1%</td>
</tr>
<tr>
<td>Whatcom</td>
<td>10.5%</td>
<td>0.6%</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.1%</td>
<td></td>
<td></td>
<td>11.6%</td>
</tr>
<tr>
<td>Puget Sound</td>
<td>34.9%</td>
<td>0.7%</td>
<td>0.8%</td>
<td>0.2%</td>
<td></td>
<td></td>
<td>0.4%</td>
<td>37.1%</td>
</tr>
<tr>
<td>West WA</td>
<td>4.4%</td>
<td>0.2%</td>
<td>0.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.8%</td>
</tr>
<tr>
<td>East WA</td>
<td>3.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.2%</td>
</tr>
<tr>
<td>West USA</td>
<td>28.4%</td>
<td>1.7%</td>
<td>0.7%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>31.0%</td>
</tr>
<tr>
<td>Rest USA</td>
<td>11.6%</td>
<td>0.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12.1%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>93.2%</td>
<td>3.7%</td>
<td>1.9%</td>
<td>0.4%</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.5%</td>
<td></td>
</tr>
</tbody>
</table>

Puget Sound to Vancouver: 150 miles