THE EFFECTS OF TRANSPORTATION ON COMPETITIVENESS OF U.S. AGRICULTURE

IMPORTANCE OF INTERMODAL CONNECTIVITY AND BOTTLENECK ELIMINATION

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Importance of Intermodal Connectivity and Bottleneck Elimination

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Intermodal Supply Chain Networks

Intermodal transport refers to the shipment of goods that involves two, or more, modes of transport in a single journey.

Ideally, each mode of transport is used for the length of haul that minimizes the line haul cost for the maximum distance moved.

The best attributes of each model of transport are combined in a system that yields the lowest cost of transportation for the supply chain.
Rationale for Intermodal Transport

• Trade-off between time and cost: a rail-barge intermodal system should be lower cost than all rail, but will be slower

• Accessibility: trucks are usually needed for pick-up and delivery, but don’t do well on ocean crossings
Intermodal Freight Bottlenecks

• Definition
  – Any impediment that slows or halts the flow of traffic.

• Symptoms
  – Congestion slowdowns, queue formation, shipping delays

• Causes
  – physical, economic, political and environmental
Bottleneck Elimination

• Cascading Bottlenecks
  – The impact of any bottleneck can accentuate other bottlenecks, and create new ones

• “Bottleneck Removal Futility”
  – Clearing up a single bottleneck only causes another bottleneck to appear – Manheim, 1979
Importance of Eliminating Bottlenecks from Intermodal Transport

- The effectiveness of a supply chain network is a like the strength of materials. The fewer the cracks, the stronger the material.

- As bottlenecks are reduced or removed, the average velocity of the traffic increases. As a result, costs fall and the supply chain network becomes more competitive.
Typical bulk supply chain for single point product supply
Economic Model of Supply Chain Network Costs

Costs $/tonne vs. Output TKm/time

- Total Logistics Costs
- Bottleneck Costs
- Logistics & Transport Costs
Competing Supply Chain Intermodal Networks

Costs
$/tonne

Output
TKm/time

Total Logistics Costs
Supply Chain A

Total Logistics Costs
Supply Chain B
Taxonomy of Bottleneck Causes

Infrastructure Bottlenecks
- Chronic
- Temporary

Regulatory Bottlenecks
- Direct
- Indirect

Supply Chain Dysfunctions
- Labour
- Corporate
- Information
Any infrastructure bottleneck can be relieved, at least temporarily, if enough money and time is invested
Infrastructure Bottlenecks

Chronic Constraints
- Climate Barriers
- Physical Restrictions
- Under-Investment

Temporary Constraints
- Weather Disruptions
- Market Perturbations
- Construction, Accidents, etc
Regulatory Bottlenecks

- Direct Effects
  - Safety/Quality Inspections
  - Security Measures

- Indirect Effects
  - Cabotage Restrictions
  - Pricing Policies
  - Competition Policy
Dysfunctional Supply Chain Bottlenecks

- Labour
- Work Rules
- Competing Corporate Agendas
- Information Incompatibility
The Basic Canadian Bulk Grain Handling and Transportation System

1. **Farm Storage**
2. **Farm to Primary Elevators**
3. **Primary Elevators**
4. **Unit Train**
5. **Terminal Elevators**
6. **Terminal to Vessel**
The Proposed Canadian Containerized Grain Handling and Transportation System

1. Container Loading
2. Truck to Inland Terminal
3. Ag. Container Yard
4. Scheduled Intermodal Train
5. Rail to Vessel
6. Scheduled Sailing
Competing Intermodal Systems for Grain Transportation

• Bulk Handling
  – Economies of size
  – Zero Tare Weight
  – Specialized material handling systems
  – Large pipeline inventories
  – Bottlenecks?

• ISO Container Handling
  – Economies of scope
  – Identity preservation
  – Minimal product handling
  – Just-in-time delivery capability
  – Bottlenecks?
## Sources of Intermodal Grain Transportation Bottlenecks

<table>
<thead>
<tr>
<th></th>
<th>Advantage Containers</th>
<th>Advantage Bulk</th>
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</thead>
<tbody>
<tr>
<td><strong>Infrastructure:</strong></td>
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<td></td>
</tr>
<tr>
<td>Chronic</td>
<td>Climate Barriers</td>
<td>★</td>
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<td>Accidents, Construction, etc.</td>
<td>★</td>
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<td><strong>Regulations:</strong></td>
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<tr>
<td><strong>Supply Chain Dysfunction:</strong></td>
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<td></td>
<td>Labour Work Rules</td>
<td>★</td>
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<td></td>
<td>Corporate Agendas</td>
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</table>
## Bottleneck Scorecard

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<tr>
<th>Bulk Handling</th>
<th>Chronic and Temporary Infrastructure Bottlenecks</th>
<th>Direct and Indirect Regulatory Bottlenecks</th>
<th>Dysfunctional Supply Chain’s Bottlenecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO Containers</td>
<td>Advantage Temporary</td>
<td>Advantage Direct Effects</td>
<td>Advantage Corporate Policy &amp; Information</td>
</tr>
<tr>
<td></td>
<td>Advantage Chronic</td>
<td>Advantage Indirect Effects</td>
<td></td>
</tr>
</tbody>
</table>
Who’s afraid of genetically modified foods?

Courtesy of Frankenfoods Inc.
Grain Supply Chains Containers versus Bulk

Costs $/tonne

Output TKm/time

Total Logistics Costs Bulk with IP Grain

Total Logistics Costs Bulk

Total Logistics Costs Containers
Pending Bottleneck: Harvest Transportation

• Consolidation Trends:
  – Fewer, larger farms
  – Fewer, larger grain elevators
  – Fewer, larger combines

• Longer hauling distances from fields to storage could increase harvest equipment idle-time
  – More trucks
  – More portable temporary storage
Conclusions

• Removal of any bottleneck is likely to improve the efficiency of an intermodal supply chain.

• Just because a bottleneck exists, its removal may not be justified economically.

• Some parties may benefit from bottlenecks.

• Bottlenecks are a symptom of a problem, and should not be treated as the problem.