Integrating Supply Chain Benefits Into the Economic Impact Analysis of Freight Investments

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Note: Presented jointly with Cambridge Systematics
Agenda

- The Importance of Supply Chain Benefits
- Benefits from Lower Transport Cost
- Benefits from Fewer Bottlenecks
- Service Level and Pricing Benefits
- Conclusions
Importance of Supply Chain Benefits
Evolution of the supply chain concept

- Physical distribution (NCPDM): 1963
- Logistics (CLM)
- Supply Chain Management (CSCMP)

Boston Strategies International’s Supply Chain Types™

<table>
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<tr>
<th>FLOW/CONTINUOUS</th>
<th>BATCH/CELLULAR</th>
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<tr>
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<tr>
<td>Make to Plan</td>
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<td>Assemble to Order</td>
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Major supply chain movements

- **Strategic sourcing**
  - Purchasing
  - Procurement
  - Strategic sourcing

- **Lean**
  - Minimization of the amount of all the resources (including time) used in the various activities of the extended enterprise

- **Visibility**
  - Ability to manage material at any point in the process from the beginning to the end of the supply chain
Supply chain benefits of transport projects

Representative Infrastructure Project

Transport Projects

Direct Benefit

Shipper Actions

Centralize Plants

Rationalize Fleets

Source from Lower-Cost Suppliers

Reduce Cycle Stock

Reduce Warehousing Cost

Cross-dock

Optimize Network and Cross-Dock

In-transit stock

Tighten delivery windows

Reduce Safety Stock

Reduce Logistics Overhead

Serve Farther Customers

Supply Chain Benefits

More Revenue

Lower Cost

Fewer Assets

More Revenue

Lower Cost

Fewer Assets

Centralize Plants

Rationalize Fleets

Source from Lower-Cost Suppliers

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Serve Farther Customers

More Revenue

Lower Cost

Fewer Assets


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Benefits from Lower Transport Cost
Operating fewer plants, increasing ROA

**EFFECT**

**Site Location Cost Drivers**

- Total Cost
- O/B Transport 1
- O/B Transport 2
- Fixed Asset Carrying Cost
- Inventory Carrying
- I/B Transport 1
- I/B Transport 2

**BENEFIT**

- 10% decrease in transport costs

Supply Chain Benefits

- 0.2% of operating cost
- 4.1% of transport costs

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<tr>
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Lower transport costs increase accessibility

**EFFECT**

Strategic Sourcing Savings vs. Transportation Costs

- Sourcing Benefit
- Transportation Costs
- Foregone savings due to transportation costs
- Eroded savings due to transportation costs

**BENEFIT**

10% decrease in transport costs

Supply Chain Benefits
- 0.1% of operating cost
- 1.5% of transport costs

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Reducing inventory due to more frequent deliveries

**EFFECT**

Inventory Requirements by Inbound Mode and Order Quantity

**BENEFIT**

10% decrease in transport costs

Supply Chain Benefits
0.1% of operating cost
1.2% of transport costs

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Benefits from Fewer Bottlenecks
Increasing Inbound Reliability, Reducing Inventory

**EFFECT**

Transit Time Variability
Compression, Same Mode

**BENEFIT**

10% more transport reliability (capacity increase)

Supply Chain Benefits
0.1% of operating cost
1.1% of transport costs

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</table>
Rationalized Fleet and Warehouse Assets

- Reduced congestion
- Fewer spare vehicles
- Less warehouse space
- More miles/day

**BENEFIT**

10% more transport reliability (capacity increase)

- Supply Chain Benefits
  - 0.01% of operating cost
  - 0.3% of transport costs

Truck Delivery Zones by Number of Days, from Chicago

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Higher ROA
Service Level and Pricing Benefits
Secondary benefits

Creation of Secondary Benefits

Transportation Improvements

- Initial Supply Chain Effects
  - Sourcing from less expensive suppliers
  - Operating fewer plants
  - Reducing shipment size
  - Increasing inbound reliability
  - Rationalizing fleet and warehouse assets
  - Postponing physical commitment
  - Monitoring conditions

Secondary Effects

- New Business Models
- Service Enhancements
- Price Reductions
Increased service/cost ratio, enhancing revenue

- Same service level (shorter order-to-delivery leadtimes) for a lower price
- Higher service levels for the same price (higher revenue)
- Higher service levels for a higher price (higher margin)
Creating on-demand supply chains

- **Postponing physical commitment**
  - Postponing order fulfillment
  - Dynamic pricing
    - In-transit visibility

- **Monitoring conditions**
  - Damage
  - Loss
  - Theft

- **More sales revenue**
  - Flexibility can command a premium price

- **Higher margins**
  - Dynamic pricing can clear slow-moving inventory before it becomes obsolete

- **Less in-transit loss**
  - Loss & damage (L&D) claims

Illustrative Profitability by Type of Manufacturing Operation
Conclusions
Conclusions

- Transportation infrastructure investments generate significant supply chain benefits.
- Direct transportation cost benefits could be off by order of magnitude without considering supply chain benefits.
- Additional price reduction and service enhancement benefits could be substantial.
Recommendations

- Further research is recommended to improve completeness and accuracy of the methodology.

- Increase completeness
  - Develop a method to determine the revenue impact of the demand
  - Develop a method to determine the profit impact of increases in service level made possible through transportation improvements.

- Improve accuracy
  - Extend and refine mapping of Supply Chain Types™ to NAICS industry definitions
  - Consider how this varies by region