Mode choice in Freight Transport in New Zealand
Findings of a Revealed Preference (RP) Survey of Shippers
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Introduction

- **Demand for Freight transport in NZ** (tonne-kilometres)

  - 92% of total volume of freight movements are made by **road**

Sources: TERNZ, NFDS and Ministry of Transport
NZ Freight patterns

- Changes in the **shape of products** being transported and **logistics patterns** of firm

- **67%** of NZ manufactures outsourced logistics services*

  - The **common outsourced** services: Outbound transportation(79%), Warehousing(53%), and Shipment consolidation(48%)

Sources: *Zhang (2009)
Background: Mode Choice literatures

- The perceptual approach
- Discrete Choice Model:
  - Binomial choice models
  - Multinomial choice models

\[ P_{ni} \equiv \text{Probability Person } n \text{ Choose Alternative } i = Gx_{ni}, x_{nj} \forall j \neq i, s_n, \beta \text{ based on } U_{ni} = \beta z_{ni} + \sigma_{ni} \]

- Utility theory
- Gilmour (1976), McGinnis (1990), Murphy et al. (1994, 1995), Evers et al. (1996), and Bolis and Maggi (2003)

Mode Choice Perceptions 1970s~1990s (Murphy et al. 1995)
Background: NZ Studies

- Freight Mode Choice Studies in NZ
  - the National Freight Demand Study (NFDS: Richard Paling Consulting, 2008)
  - Coastal Shipping and Modal Freight Choice (Rockpoint, 2009)
  - the Gisborne to Napier Coastal Shipping Study (Warwick Walbran Consulting, 2010)
Study Questions

- What is the use of road transport fleet and the nature of the relationships with carriers?
- What service attributes do shippers use to select transport mode(s) and which attributes are most and least important?
- What are the shipper’s perceptions of rail and sea shipping?
- What are the differences in the total logistics cost between business types?
Research Method

- RP(Revealed Preference) Survey
- Web-based questionnaires
- Survey sample sources: New Zealand Stock Exchange (NZX), Industry association/groups, and councils
- Invitation sent to 1900 NZ based companies from June ~ September 2011
Questionnaires

Physical factors

- Company Information
- Product Information
- Inbound & Outbound O/D
- Supply Chain & Logistics facilities

Behavior factors

- Transport mode use
- Mode choice service factors
- Mode preference
- Intermodal preference

PART 1

PART 2

PART 3
Sampling & Data Collection

- Total 176 firms completed
  - 4 business types
- 9 Industry(product) groups
Survey Sample: Number of employees

<table>
<thead>
<tr>
<th>Category</th>
<th>NZ Enterprises</th>
<th>Survey Sample</th>
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<tbody>
<tr>
<td>Over 500</td>
<td>0.2</td>
<td>3.4</td>
</tr>
<tr>
<td>100~499</td>
<td>1.2</td>
<td>13.7</td>
</tr>
<tr>
<td>50~99</td>
<td>1.7</td>
<td>9.1</td>
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<tr>
<td>20~49</td>
<td>5.8</td>
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<td>10~19</td>
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<td>17.7</td>
</tr>
<tr>
<td>1~9</td>
<td>80.2</td>
<td></td>
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</tbody>
</table>

SMEs (small and medium-sized enterprises)
Mode Share: by Business Types

- Wholesale/Retails
- Manufactures
- Primary

Mode Share:

- Road
- Sea
- Rail
- Air

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Mode Share: by Product Groups

- Animal
- Non-animal
- FMCG
- Chemical
- Plastics
- Textiles
- Machinery
- Wood
- Metal

Mode Share:
- Air
- Rail
- Sea
- Road
What is the use of *road transportation fleet*?

What is the nature of the *relationships with carriers*?
Road Transport

Structure of trucking industry

- Perishable food product
- Non-perishable durable product

- Animal
- Food-stuffs & FMCG
- Leather, footwear & Textiles
- Machinery & mechanical equipments
- Chemical
- Plastic
- Wood
- Glass & base-metal

- Owned fleet 45%
- Contracted Carrier 55%

- Canada

- United States

- Perishable food product: 13%
- Non-perishable durable product: 87%

- Truck Loading

- Owned fleet: 52%
- Contracted Carrier: 48%

- United States

- Owned fleet: 55%
- Contracted Carrier: 45%

- by the American Trucking Association, (2006)


- IPENZ Transportation Group Conference 2012, March 20, Rotorua
What *transport mode(s)* characteristics do you consider most important?
Mode Choice: Service Factors & Preference

- **Timeliness** (e.g., transit time, reliability of service),
- **Transport cost**,
- **Suitability** (e.g., suitability for shipment size, suitability for commodity to be carried),
- **Customer service** (e.g., firm contact, after sale service),
- **Mode availability/accessibility** (e.g., availability of equipment/mode at origin or destination point(s)), and
- **Restitution** (e.g., processing of loss and damage, amount of loss and damage)

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![Bar chart showing the percentage of primary manufactures, manufactures, and wholesale/retails for different service factors and preferences.](chart.png)
What are the most important constraints that discourage you from using RAIL/SEA to carry your products?
Mode shift: Constraints to Rail & Sea

- Door-to-door service
- Road transfer
- Transport time
- Transport cost
- Minimum loading size
- Service frequency
- Accessibility

<table>
<thead>
<tr>
<th></th>
<th>Sea</th>
<th>Rail</th>
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</thead>
<tbody>
<tr>
<td>Door-to-door service</td>
<td>8.3</td>
<td>17.5</td>
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<tr>
<td>Road transfer</td>
<td>3.8</td>
<td>9.2</td>
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<tr>
<td>Transport time</td>
<td>9.2</td>
<td>25</td>
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<tr>
<td>Transport cost</td>
<td>6.7</td>
<td>25</td>
</tr>
<tr>
<td>Minimum loading size</td>
<td>6.7</td>
<td>25</td>
</tr>
<tr>
<td>Service frequency</td>
<td>8.3</td>
<td>17.3</td>
</tr>
<tr>
<td>Accessibility</td>
<td>17.3</td>
<td>24.2</td>
</tr>
</tbody>
</table>

Percentage (%)

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What are the differences in the logistics costs between business types?
Logistics Cost

- Transportation & cargo handling
  - Wholesale/Retailer: 44.0%
  - Manufacturer: 49.1%
- Warehousing
  - Wholesale/Retailer: 20.5%
  - Manufacturer: 17.1%
- Inventory carrying cost
  - Wholesale/Retailer: 21.2%
  - Manufacturer: 21.1%
- Logistics administration
  - Wholesale/Retailer: 8.7%
  - Manufacturer: 7.0%
- All other logistics costs
  - Wholesale/Retailer: 5.8%
  - Manufacturer: 5.6%
Conclusions

- NZ shippers strongly prefer road transport.
- NZ shippers rely heavily on contracted carriers.
- There is increased emphasis on timeliness and cost as mode choice factors.
- NZ shippers have negative perceptions about transporting goods by both rail and sea in terms of poor accessibility and transport time.
- Wholesalers/retailers spent more on warehousing costs, while manufacturers spent more on transportation costs.
Q & A

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