Multi-Stop Truckload: Cost and Carrier Behavior

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2. Problem & Methodology
3. Results
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Introduction
80.9% of Nation’s Freight Bill

2011 American Trucking Association Report
How Truckload

Step 1. Bidding & Contracts

Step 2. Routing Guide

<table>
<thead>
<tr>
<th>Priority</th>
<th>Carrier Name</th>
<th>Price ($/mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carrier A</td>
<td>$ 1.80</td>
</tr>
<tr>
<td>2</td>
<td>Carrier B</td>
<td>$ 1.85</td>
</tr>
<tr>
<td>3</td>
<td>Carrier C</td>
<td>$ 1.90</td>
</tr>
<tr>
<td>4</td>
<td>Carrier D</td>
<td>$ 2.00</td>
</tr>
<tr>
<td>5</td>
<td>Carrier E</td>
<td>$ 2.20</td>
</tr>
</tbody>
</table>
Full Truckloads & Contracts

Step 3. Tendering Loads

Known as the Routing Guide Depth
Problem & Methodology
Multi-Stop

Example Multi-Stop Route (5 Stops)

How does having additional stops affect acceptance and price?
## Past Research

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</table>

- Distance traveled
- Lead Time
- Seasonality
- Volume
Methodology

Collaborated with a 4PL company

Database with 5M tender records over 2.5 years

Over 4K carriers, large and small
Methodology

Pricing

Price = \beta_0 + \beta_1 \cdot x_1 + \beta_2 \cdot x_2 + \cdots + \beta_k \cdot x_k + e

Looking at final prices

Carrier Behavior

Acceptance = \beta_0 + \beta_1 \cdot x_1 + \beta_2 \cdot x_2 + \cdots + \beta_k \cdot x_k + e

Using tender information
Results
Impact of Additional Stops

Additional stops increase rejections and lead to higher prices. The magnitude depends on whether it’s a pick or a drop.

<table>
<thead>
<tr>
<th></th>
<th>Additional Stops</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picks</td>
<td>+1</td>
<td>$172</td>
</tr>
<tr>
<td></td>
<td>+2</td>
<td>$174</td>
</tr>
<tr>
<td>Drops</td>
<td>+1</td>
<td>$304</td>
</tr>
<tr>
<td></td>
<td>+2</td>
<td>$334</td>
</tr>
</tbody>
</table>

Illustrative example
Impact of Additional Stops

Multi-stop loads with higher stop-off charges have higher acceptance rates and might be potentially cheaper.

<table>
<thead>
<tr>
<th>Stop-Off</th>
<th>Extra Stop</th>
<th>Discount</th>
<th>Strategy 1</th>
<th>Strategy 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>+100$ x 2</td>
<td>+172$ x 2</td>
<td>-280$</td>
<td>-80$</td>
<td>+172$ x 2</td>
</tr>
</tbody>
</table>

Illustrative example
Clustering stops together improves price

Illustrative example

- $80$

Clustering Drops

- $113$

Clustering Picks
Continuous Moves

Continuous moves are cheaper \(-270\$\)
Geographic Effects

There is significant regional sensitivity to multiple stops in both price and acceptance
Performance Effects

Delivery performance deteriorates

Performance by Stop

Avg. OTD %

90%
80%
70%
60%
50%

Stops

OTD %
OTD % if picked up late
Time to Accept

Tender acceptance time increases

# OF STOPS

ADDITIONAL TIME TO ACCEPT (HOURS)
Conclusion
Autonomous Vehicles, Electronic Logs, Environmental Regulation, Hours of Service, Onboard Computers, On-Demand Economy...
Summary Findings

1. Multi-stop Truckload shares some characteristics with Full Truckload, but with significant differences.

2. Beware of black box software promising risk-free cost savings.

3. Communication and information sharing is key: clustering, continuous moves, planned moves…

4. Data is power: analysis, prediction.
Questions, Comments, Suggestions?