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Analyzing Long-Distance Truck Travel for Statewide Freight Planning in Ohio

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Available at: https://works.bepress.com/gregory-erhardt/24/
ANALYZING LONG-DISTANCE TRUCK TRAVEL FOR STATEWIDE FREIGHT PLANNING IN OHIO

Presented by:
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2 percent of all trips, but 1/3 of all VMT
Most freight flows travel long-distance
Ohio deals with a lot of through trips (I-80/I-90)
Employment is only a poor substitute for truck trip generation
Goods shipments explain most truck traffic, but some trucks travel empty
Mode share is based on long-term contracts
Highly limited data availability
Part 1: Methods and Data
- Statewide model
- Freight Analysis Framework 3 (FAF3)
- Empty truck modeling
- Combining statewide model and FAF3

Part 2: Planning Questions
- How do we define a truck network?
- Which bottlenecks most affect freight movements in Ohio?
- What if we build new intermodal terminals?
- What if we increase truck weight limits?
METHODS

Let's model freight!
Maps show TAZs:
Green=Ohio; Blue=Halo
FREIGHT ANALYSIS FRAMEWORK 3 (FAF3)
FREIGHT FLOW DISAGGREGATION

Freight flows between 3,241 counties

US county Employment

Payload factors

Empty trucks

FAF data

Freight flows between 3,241 counties

O/D matrix of loaded truck trips

Truck trip O/D matrix including empty trucks
# Empty Truck Trips

## Zone A
- 10 trucks
- 8 trucks
+ 5 trucks
- 8 trucks

## Zone B
- 2 trucks
+ 0 trucks
- 5 trucks
+ 10 trucks
+ 3 trucks

## Zone C
- 5 trucks
- 0 trucks
+ 2 trucks
+ 5 trucks
NATIONWIDE ASSIGNMENT OF TRUCKS
1. FAF - Determine commodity flows by TAZ, in tons

2. ACOM - convert to truck trips
HOW DO WE DEFINE A TRUCK NETWORK?

Which trucks matter?
TRUCKS BY FLOW DIRECTION

External-to-External

Internal to Internal
TRUCKS BY FLOW DIRECTION

Internal-to-External
External-to-Internal

Internal-to-Internal
Internal-to-External
External-to-Internal
HOW DO WE DEFINE A TRUCK NETWORK?
Links with 2,000 Ohio-based trucks or more
Links with 4,000 Ohio-based trucks or more
Links with 6,000 Ohio-based trucks or more
Links with 10,000 Ohio-based trucks or more
WHICH BOTTLENECKS MATTER?

Where are the bottlenecks and what commodities move through them?
FOLLOWING SLIDES SHOW OHIO-BASED TRUCK FLOWS BY COMMODITY GROUP

- Only trips with at least one trip end within Ohio are included.
- The background color shows the number of trucks generated and attracted per acre by county, i.e., truck trips are counted twice (at their origin and destination).
- Bottlenecks are shown in yellow (identical for every slide, not commodity-specific).
- Scale on every slide changes. The relative distribution of truck flows can be compared across different commodities, but not the absolute bandwidth/color.
<table>
<thead>
<tr>
<th>Group</th>
<th>Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unprocessed agricultural products</td>
</tr>
<tr>
<td>2</td>
<td>Live animals and live fish</td>
</tr>
<tr>
<td>3</td>
<td>Food products</td>
</tr>
<tr>
<td>4</td>
<td>Petroleum</td>
</tr>
<tr>
<td>5</td>
<td>Automobiles</td>
</tr>
<tr>
<td>6</td>
<td>Coal</td>
</tr>
<tr>
<td>7</td>
<td>Gravel, Sand, Minerals and ores</td>
</tr>
<tr>
<td>8</td>
<td>Waste and scrap</td>
</tr>
<tr>
<td>9</td>
<td>Base metal products</td>
</tr>
<tr>
<td>10</td>
<td>Instruments and electronics</td>
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<tr>
<td>11</td>
<td>Logs</td>
</tr>
<tr>
<td>12</td>
<td>Wood products</td>
</tr>
<tr>
<td>13</td>
<td>Basic chemicals</td>
</tr>
<tr>
<td>14</td>
<td>Chemical products</td>
</tr>
<tr>
<td>15</td>
<td>Machinery and building stone</td>
</tr>
<tr>
<td>16</td>
<td>Nonmetallic mineral products</td>
</tr>
<tr>
<td>17</td>
<td>Miscellaneous freight</td>
</tr>
</tbody>
</table>
AGRICULTURE
WHAT IF WE BUILD NEW INTERMODAL TERMINALS?

How much traffic would divert from trucks to intermodal?
### INTERMODAL FACILITIES IN COLUMBUS AREA

#### Tons

<table>
<thead>
<tr>
<th>Year</th>
<th>MULTIMODAL</th>
<th>TRUCK</th>
<th>RAIL</th>
<th>OTHER</th>
<th>Total</th>
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<tbody>
<tr>
<td>2000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2005</td>
<td>38,462</td>
<td>(38,462)</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>41,398</td>
<td>(41,398)</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Mode Share%

<table>
<thead>
<tr>
<th>Year</th>
<th>MULTIMODAL</th>
<th>TRUCK</th>
<th>RAIL</th>
<th>OTHER</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2005</td>
<td>0.1%</td>
<td>-0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2010</td>
<td>0.1%</td>
<td>-0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
WHAT IF WE INCREASE TRUCK WEIGHT LIMITS?

How many fewer trucks would be on the road?
## INCREASE PAYLOAD FACTORS IN MI & OH

<table>
<thead>
<tr>
<th>Payload factor</th>
<th>I-I</th>
<th>I-E/E-I/E-E</th>
<th>Total in OH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>63,491,368</td>
<td>33,746,501</td>
<td>97,237,869</td>
</tr>
<tr>
<td>Increased</td>
<td>62,272,117</td>
<td>33,655,403</td>
<td>95,927,519</td>
</tr>
<tr>
<td>Difference</td>
<td>(1,219,251)</td>
<td>(91,099)</td>
<td>(1,310,349)</td>
</tr>
<tr>
<td>% Difference</td>
<td>-1.9%</td>
<td>-0.3%</td>
<td>-1.3%</td>
</tr>
</tbody>
</table>
CONCLUSIONS

What did we learn?
CONCLUSIONS

Part 1: Methods and Data
- Freight needs to be modeled on a large (national) scale
- Data matters
- Statewide model needed for auto flows
- Questions about how much sensitivity to allow

Part 2: Planning Questions
- Freight forecasting is not “plug-and-chug”
- Creativity needed in framing the questions and searching for insights
Many thanks to:

- Joe Bryan
- Carlee Clymer
- Mark Locker
- Rebekah Anderson