Study of Competition in the Railroad Industry and Analysis of Proposals that Might Enhance Competition

Final Report

November 2008
Outline

- Project background
- Railroad economics
- Trends in rates and market power
- Railroad productivity and costs
- Railroad revenue sufficiency
- Shipper captivity
- Capacity and service quality
- Economic analysis of policy proposals
- Future directions
Project Background

- The Christensen Associates team was selected by the STB to perform an independent study of competitive issues in the U.S. freight railroad industry, including:
  - Competition and captivity
  - Capacity and service quality issues
  - Economic analysis of policy proposals

- Two research phases
  - Gather stakeholder input to assist in formulating research plan
  - Quantitative research
Railroad Economics

- Economies of density and fixed costs require pricing above marginal cost to cover total costs
  - Economies of density – costs fall as traffic over network increases

- By definition, price above marginal cost is the exercise of market power, but exercise does not imply abuse

- Railroads use differential pricing to recover their total costs
  - Different commodity groups face different markups of rates over marginal costs
Trends in Railroad Rates and Market Power

- Recent years’ rate increases due to declining productivity growth and increasing costs, not increased exercise of market power

- Market power index relatively flat in recent years
  - \[ \text{LMI} = \frac{\text{RPTM} - \text{MC}}{\text{RPTM}} \]

- Market power increased most when both MC and RPTM falling
Railroad Market Power – Lerner Index
Railroad Productivity and Costs

- Recent declines in productivity growth and increases in input price growth
  - Less ability for railroads to absorb cost increases
  - Reflected in upturn in RCAF-A

- Increases in average and marginal costs in recent years
  - “Spike” in fixed costs
  - Increases in marginal and variable costs
  - Differences in marginal costs by commodity and over time
Productivity-Adjusted Input Prices – RCAF-A
Railroad Average Costs

[Graph showing trends in Railroad Average Costs from 1987 to 2006 for ATC, AVC, and AFC]
Recent Trends in Commodity Rates

- Rates and markups over marginal cost vary by commodity groups and within groups
  - Relatively larger markups for agricultural commodities

- Some ability by shippers to adjust to counteract increases
  - e.g., length of haul, car loadings
  - But what are adjustment costs?
  - However, not all shippers can adjust

- Data problems with intermodal
  - Most lumped into STCC 46, Misc. Mixed Shipments
### Estimated Marginal Costs and Markups by Commodity

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Farm Products (Aggregate)</td>
<td>0.61</td>
<td>0.61</td>
<td>0.9</td>
</tr>
<tr>
<td>Barley</td>
<td>0.68</td>
<td>0.75</td>
<td>0.7</td>
</tr>
<tr>
<td>Corn</td>
<td>0.71</td>
<td>0.73</td>
<td>0.7</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.67</td>
<td>0.71</td>
<td>0.8</td>
</tr>
<tr>
<td>Soybeans</td>
<td>0.63</td>
<td>0.58</td>
<td>0.9</td>
</tr>
<tr>
<td>Metallic Ores</td>
<td>0.46</td>
<td>0.51</td>
<td>2.1</td>
</tr>
<tr>
<td>Coal</td>
<td>0.46</td>
<td>0.51</td>
<td>2.3</td>
</tr>
<tr>
<td>Non-metallic Minerals</td>
<td>0.52</td>
<td>0.39</td>
<td>1.8</td>
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<tr>
<td>Food Products</td>
<td>0.59</td>
<td>0.60</td>
<td>1.2</td>
</tr>
<tr>
<td>Lumber &amp; Wood Products</td>
<td>0.64</td>
<td>0.63</td>
<td>1.4</td>
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<tr>
<td>Chemicals</td>
<td>0.63</td>
<td>0.59</td>
<td>1.6</td>
</tr>
<tr>
<td>Petroleum &amp; Coal Products</td>
<td>0.64</td>
<td>0.60</td>
<td>1.6</td>
</tr>
<tr>
<td>Clay, Concrete, Glass, &amp; Stone</td>
<td>0.60</td>
<td>0.60</td>
<td>1.7</td>
</tr>
<tr>
<td>Primary Metal Products</td>
<td>0.59</td>
<td>0.59</td>
<td>1.8</td>
</tr>
<tr>
<td>Transportation Equipment</td>
<td>0.55</td>
<td>0.51</td>
<td>5.1</td>
</tr>
<tr>
<td>Intermodal (COFC/TOFC)</td>
<td>-0.36</td>
<td>-0.35</td>
<td>4.3</td>
</tr>
<tr>
<td><strong>Adjusted MC (2000 Q1 cents)</strong></td>
<td></td>
<td></td>
<td>4.5</td>
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</tbody>
</table>
Railroad Revenue Sufficiency

- Revenue sufficiency measure = RPTM/ATC

- For most years of study (1987-2006) Class I’s do not appear to be earning above normal profit
  - Results vary by railroad
  - Does 2006 indicate start of new trend?

- Consistent with financial market assessment
  - e.g., P/E ratios, EPS
  - Financial performance similar to electric utilities
Railroad Revenue Sufficiency: RPTM/ATC
Railroad Revenue Sufficiency and Market Power

- No increase in exercise of market power in recent years as revenue sufficiency improved

- Greatest increases in market power occurred in late 1980s and early 1990s when industry mostly below and trying to achieve revenue sufficiency levels
Railroad Revenue Sufficiency and Market Power

![Graph showing Railroad Revenue Sufficiency and Market Power from 1987 to 2006. The graph compares the RPTM/ATC and Lerner Index over the years, indicating trends in market power and revenue sufficiency.]
Shipper Captivity

- Within commodity groups, shippers with no or limited transportation options pay more than shippers with same shipment characteristics and better transportation alternatives.

- R/VC is weakly correlated with market structure factors that affect shipper captivity:
  - Not a reliable indicator of market dominance
  - Instances of “relative captivity” when R/VC < 180
  - Percent of R/VC below 100 often greater than percent above 300
## Percent Tons and Ton-Miles by R/VC Category

### Percent of Tons by R/VC Category

<table>
<thead>
<tr>
<th>Period</th>
<th>R/VC &lt; 100 %</th>
<th>R/VC between 100 and 180 %</th>
<th>R/VC between 180 and 300 %</th>
<th>R/VC &gt; 300 %</th>
<th>Subtotal R/VC &gt; 180 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2001</td>
<td>14%</td>
<td>44%</td>
<td>31%</td>
<td>12%</td>
<td>43%</td>
</tr>
<tr>
<td>2005-2006</td>
<td>14%</td>
<td>42%</td>
<td>27%</td>
<td>17%</td>
<td>44%</td>
</tr>
</tbody>
</table>

### Percent of Ton-Miles by R/VC Category

<table>
<thead>
<tr>
<th>Period</th>
<th>R/VC &lt; 100 %</th>
<th>R/VC between 100 and 180 %</th>
<th>R/VC between 180 and 300 %</th>
<th>R/VC &gt; 300 %</th>
<th>Subtotal R/VC &gt; 180 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2001</td>
<td>19%</td>
<td>51%</td>
<td>25%</td>
<td>5%</td>
<td>30%</td>
</tr>
<tr>
<td>2005-2006</td>
<td>20%</td>
<td>51%</td>
<td>21%</td>
<td>9%</td>
<td>29%</td>
</tr>
</tbody>
</table>
## Correlation of R/VC with Market Factors

<table>
<thead>
<tr>
<th>Commodity Group</th>
<th>Correlation Coefficient with R/VC Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RPTM</td>
</tr>
<tr>
<td>Chemicals</td>
<td>0.18</td>
</tr>
<tr>
<td>Coal</td>
<td>0.61</td>
</tr>
<tr>
<td>Corn</td>
<td>0.23</td>
</tr>
<tr>
<td>Intermodal</td>
<td>0.12</td>
</tr>
<tr>
<td>Transportation</td>
<td>0.16</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.44</td>
</tr>
</tbody>
</table>
R/VC Averages by County - Wheat

COUNTIES
R/VC Ratio
- 0.43 - 1.00
- 1.01 - 1.80
- 1.81 - 3.00
- 3.01 - 7.57

Miles
Market Structure and Rates - Wheat

COUNTIES
Market Structure Factor
- 1.33
- 1.33 - 1.49
- 1.49 - 1.64
- 1.64 - 1.87
- Rivers

Legend:
- 1 - 1.33
- 1.33 - 1.49
- 1.49 - 1.64
- 1.64 - 1.87
- Rivers

Miles
Capacity Constraints

- Capacity “tightness” due to localized congestion and constraints
  - Similar to performance of other network industries
  - Econometric and engineering studies say overall networks not constrained

- No evidence of connection between capacity and increased exercise of market power
  - No overall changes in railroad markups during periods of “tightness,” but some redistribution

- Capacity lumpiness – hard to achieve optimality

- Future projections must be viewed cautiously
Investment has increased in both nominal and real terms in recent years.

Investment is relatively constant percent of industry revenues.

- Still high relative to other industries, but down somewhat from 1990s – period of high “capex”
- Similar to electric utilities
Service Quality

- RPM Train speed data used as proxy
  - These data are a rough, aggregate proxy

- Service performance declines in 2003-2005 period linked to terminal congestion

- Speed and variability by commodity
  - Variability typically greatest for coal and grains, lowest for intermodal

- Better data needed
Economic Analysis of Policy Proposals

- Circumstances (as of 2006) imply providing relief to certain groups will likely result in increases for other shippers or threaten railroad viability
  - Caveat – does 2006 represent a new trend?

- Incremental policies have greater likelihood of resolving shipper issues with lower risk of adverse consequences. For example,
  - Reciprocal switching, terminal agreements
  - Improvements in STB procedures
  - Possibility of encouraging competitive response and expanding “size of pie”

- Some shippers will not benefit from greater competition – continued oversight necessary
## Economic Impact of Open Access Proposals

<table>
<thead>
<tr>
<th></th>
<th>Reciprocal Switching</th>
<th>Bottleneck Rates</th>
<th>Terminal Agreements</th>
<th>Trackage Rights</th>
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</thead>
<tbody>
<tr>
<td><strong>Economies of Density</strong></td>
<td>Potential gains</td>
<td>Gains unlikely</td>
<td>Potential gains</td>
<td>Potential gains</td>
</tr>
<tr>
<td><strong>Length-of-Haul Economies</strong></td>
<td>Small loss</td>
<td>Potentially large loss</td>
<td>No gain to small gain</td>
<td>No gain to small gain</td>
</tr>
<tr>
<td><strong>Vertical Economies</strong></td>
<td>Small loss</td>
<td>Potentially large loss</td>
<td>Small loss</td>
<td>Potentially large loss</td>
</tr>
<tr>
<td><strong>Investment Incentives</strong></td>
<td>Small effect</td>
<td>Potentially large effect</td>
<td>Small effect</td>
<td>Potentially large effect</td>
</tr>
<tr>
<td><strong>Railroad Profitability</strong></td>
<td>Small effect</td>
<td>Potentially large effect</td>
<td>Small effect</td>
<td>Potentially large effect</td>
</tr>
<tr>
<td><strong>Coordination Costs</strong></td>
<td>Small to moderate</td>
<td>Small to moderate</td>
<td>Small to moderate</td>
<td>Potentially large</td>
</tr>
<tr>
<td><strong>Competitive Response</strong></td>
<td>Most likely</td>
<td>Least likely</td>
<td>Most likely</td>
<td>Somewhat likely</td>
</tr>
<tr>
<td><strong>Shipper Gains</strong></td>
<td>Most likely</td>
<td>Least likely</td>
<td>Most likely</td>
<td>Somewhat likely</td>
</tr>
</tbody>
</table>
Future Directions

- Captivity and effective competition
- Disaggregate analysis of service quality
- Disaggregate analysis of capacity issues
- Cost shifting
- Fuel surcharges
- Class II and III issues
- Critical evaluation of demand growth projections
- Access to railroads