Determinants of Price in Sales of Railroad Rights-of-Way to Public Transportation Agencies

Second Conference on Railroad Industry Structure, Competition, and Investment

Introduction

Scope of Study
• 1980 to Present
• Privately held freight railroad rights-of-way sold to public agencies

Issue
• Why do prices paid for these rights-of-way range from $0.3 to $6.3 million per mile?
Literature Review

**Qualitative Evaluation of Utility and Transportation Corridors**


**Dolman (1978)** – Contrasts three corridor appraisal methodologies
1. At-the-fence (ATF) value
2. Non-corridor use value (lower bound)
3. Corridor use (upper bound)

**Zoll (1985–1995)** – Four different papers
1. Analyzes actual sales to highlight explanatory variables of price
2. Analyzes seller and buyer motives; compares corridor prices to the at-the-fence price
3. Details the step-by-step procedures of valuation of land for railway corridors
4. Uses a cost approach for valuing railway corridors based on sales comparisons

**Ackelson (1996)** – ATF value as upper bound; net liquidation value as lower bound for corridor valuations.

**Valentine (1998)** – Be aware of potential corridor uses and know highest and best use; corridor might be worth more or less by dividing it into several parcels.

**Seymour (2002)** – Asserts that cost and income approach of corridor appraisal does not work; prefers sales comparison approach.

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**Valuation of Abandoned Railroad Corridors**

**Blackard (1981)** – focuses on abandoned railroad rights-of-way
- Type of title owned by the railroad
- Highest and best use of the property
- Approaches to value


**Antonides (2001)** – describes “net salvage value” of abandoned rail corridors under the Canada Transportation Act process
- Direct comparison approach
- Discount factor to the ATF value
- Completion of a detailed “breakup analysis” of the corridor
Literature Review

**Valuation of Entire Railroad Companies**

Perlik (1983) – Outlines theories of the valuation of rights-of-way used by a special court to convey bankrupt railroad assets to Conrail

Shughart (2003) – Econometric valuation model of short line and regional railroad sales partly determined by selling company’s prior-year operating ratio

**Impact of Transit Development on Surrounding Real Estate Values**

Cervero (1995) – multiple regression analysis: effects of rail transit on property values

Functional Formulation

**Transaction price serves as the endogenous variable**

- Adjusted for inflation to 1984 dollars
- Explored price per corridor mile as a possible substitute for the dependent variable

**Explanatory variables**

- Corridor Physical Attributes
- Geographic Context and Surroundings
- Economic Context of Transaction
- Potential Explanatory Variables—limited or unavailable data
Determinants of Transaction Value
Corridor Physical Attributes

Corridor Length
- Purchased Route Miles
- Purchased Open Corridor Miles
- Purchased Trackage Route Miles

Corridor Width
Purchased Acres
- Corridor Acres
- Out-Parcel Acres

Number of Tracks
Continued Freight Rights
Traffic Density
Purchased Signals

Determinants of Transaction Value
Context

Corridor Context and Surroundings
- Relative Value of Real Estate
- Population Density

Economic Context
- Five-quarter Rolling GDP Growth
- Operating Ratio of Selling Railroad
Unexplored Explanatory Variables
Limited or Unavailable Data

Alternate routes for the selling railroad

Rail bridges

Highway/rail flyovers

Highway/rail grade crossings

Ongoing track maintenance agreement between the railroad and the public agency

Capital upgrade agreement

Length and type of the transaction agreement

Transactions

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<th>Obs</th>
<th>Year</th>
<th>State</th>
<th>Region</th>
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* Value in millions (1984 dollars)
Transaction Summaries

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Approach

Econometric Railroad Corridor Valuation Model

- Test a simple representation of value
  - as a function of quantities of land and track purchased

- Fully specify a model
  - including all of the explanatory variables

- Identify a smaller group of explanatory variables
  - logically and statistically accounting for transaction value
Simple First-Order Test

(1) \( \text{price} = \beta_1 \times \text{Total purchased acres} + \beta_2 \times \text{Purchased track miles} \)

Results:
- \( \beta_1 = 0.28 \) (t = 4.07) and \( \beta_2 = -2.03 \) (t = -2.11)
- \( R^2 = 0.62 \)
- Explanatory variables highly correlated
- Sign on \( \beta_2 \) negative instead of positive

Fully-specified Model

Functional Form

(2) \( \text{price} = \left[ \beta_1 \times \text{Purchased route miles} + \right. \)

\[ \left. \beta_2 \times \text{Purchased open corridor miles} + \beta_3 \times \text{Trackage route miles} + \right. \)

\[ \left. \beta_4 \times \text{Purchased out-parcel acres} \right] \times \]

\[ \left[ \beta_5 \times (\text{Rolling GDP} - \text{Rolling GDP}_{\text{mean}}) + \right. \]

\[ \left. \beta_6 \times (\text{Oper ratio} - \text{Oper ratio}_{\text{mean}}) \right] \]
Fully-specified Model
Component Equations

(2.1) Price of Purchased route miles ($\beta_1$)
\[ = a_0 + a_1 \times \text{Width} + a_2 \times \text{Number of purchased tracks} +
   a_3 \times \text{Cont'd freight rights} + a_4 \times \text{Traffic density} +
   a_5 \times \text{Signaled} + a_6 \times \text{Population} + a_7 \times \text{Home value} \]

(2.2) Price of Purchased Open Corridor Miles ($\beta_2$)
\[ = ?_0 + ?_1 \times \text{Width} + ?_2 \times \text{Population} + ?_3 \times \text{Home value} \]

(2.3) Price of Trackage Route Miles ($\beta_3$)
\[ = ?_0 + ?_1 \times \text{Number of tracks} + ?_2 \times \text{Traffic density} \]

(2.4) Price of Purchased Out-Parcel Acres ($\beta_4$)
\[ = ?_0 + ?_1 \times \text{Population} + ?_2 \times \text{Home value} \]

Fully-specified Model
With Substitution

(3) price = [ a_0 \times \text{Purchased route mi.} + a_1 \times \text{Purchased route acres} +
             a_2 \times \text{Purchased track mi.} + a_3 \times \text{Purchased route mi. w/ freight rights} +
             a_4 \times \text{Purchased route density mi.} + a_5 \times \text{Purchased signaled route mi.} +
             a_6 \times \text{Purchased route pop. mi.} + a_7 \times \text{Purchased route home value mi.} +
             ?_0 \times \text{Purchased open corr. mi.} + ?_1 \times \text{Purchased open corr. acres} +
             ?_2 \times \text{Purchased open corr. pop. mi.} +
             ?_3 \times \text{Purchased open corr. home value mi.} + ?_4 \times \text{Trackage route mi.} +
             ?_5 \times \text{Trackage track mi.} + ?_6 \times \text{Trackage route density mi.} +
             ?_7 \times \text{Purchased out-parcel acres} + ?_8 \times \text{Purchase out-parcel pop.} +
             ?_9 \times \text{Purchased out-parcel home value acres} ] 
      \times [ \beta_5 \times (\text{Rolling GDP} − \text{Rolling GDP}_\text{mean}) +
               \beta_6 \times (\text{Oper ratio} − \text{Oper ratio}_\text{mean}) ]
Best Overall Models

(4.1) \[ \text{price} = \beta_1 \times \text{Purchased route mi.} + \beta_2 \times \text{Purchase open corr. mi.} + \beta_3 \times \text{Trackage route mi.} \]

(5) \[ \text{price} = \beta_1 \times \text{Purchased route mi.} + \beta_2 \times \text{Purchased signaled route mi.} + \beta_3 \times \text{Purchase open corr. mi.} + \beta_4 \times \text{Trackage route mi.} \]

Results

<table>
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<tr>
<th>Variable</th>
<th>Equation (4.1)</th>
<th>Equation (5)</th>
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<tbody>
<tr>
<td>R²</td>
<td>0.75</td>
<td>0.80</td>
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<tr>
<td>Purchased route miles</td>
<td>( \beta_1 = 1.30 \ (t = 4.76) )</td>
<td>( \beta_1 = 0.82 \ (t = 2.50) )</td>
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<tr>
<td>Purchased signaled route miles</td>
<td>( \beta_2 = 0.86 \ (t = 2.65) )</td>
<td>( \beta_2 = 1.12 \ (t = 2.24) )</td>
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<tr>
<td>Purchased open corridor miles</td>
<td>( \beta_3 = 1.40 \ (t = 2.07) )</td>
<td>( \beta_3 = 0.87 \ (t = 2.96) )</td>
</tr>
<tr>
<td>Purchased trackage route miles</td>
<td>( \beta_4 = 1.40 \ (t = 2.07) )</td>
<td>( \beta_4 = 1.73 \ (t = 2.77) )</td>
</tr>
</tbody>
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Conclusions and Next Steps

Purchased route miles and trackage rights are more expensive per mile than corridor land without any infrastructure.

Adding explanatory variables, such as signal condition, increases the variation in price per mile.

The higher costs associated with purchasing trackage rights may reflect a premium paid to avoid risks and financial obligations inherent in owning track.

The width of a purchased corridor, and thus purchased acreage, does not appear to be a significant determinant of transaction price.

The real and overarching value of a right-of-way is directly and uniquely related to its length.

Enhancements to this study will require expansion of the data set:

- Number of observations
- Level of quantified detail about each transaction
- Diversity of transactions