SOME PRELIMINARY ESTIMATES OF THE BORDER PRICE EFFECT ON CIGARETTE SALES

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Issues To Be Addressed

• Standard Demand Analysis

• Measurement Questions

• Border Effect Results
Standard Cigarette Demand Analysis

• Price
• Income
• Demographics
• Internet Sales
• Trends and State Effects

Data and Sources

• The Tax Burden on Tobacco, 2002
• Bureau of Economic Analysis - PI, Price Index
• Census Bureau - Population
• Pooled Cross-sectional time series
• 48 years and 51 states
• Potential observations (2,448) and usable unbalanced observations (2,333)
Cigarette Demand Model

- $Q_{st} = b_0 + b_1 P_{st} + b_2 Y_{st} + b_3 Z_{st} + e_{st}$
- $Q_{st}$ is tax-paid sales of cigarette per capita
- $P_{st}$ is the average retail price per pack in constant dollars
- $Y_{st}$ is real per capita income
- $Z_{st}$ is vector of other demand factors

Model Results

Log Transformation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>price</td>
<td>-0.611007</td>
<td>0.014426</td>
<td>-42.35556</td>
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<tr>
<td>income</td>
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<td>teenage</td>
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<tr>
<td>trend</td>
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<td>-2.05761</td>
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</tbody>
</table>

Obs = 2384
Weighted $R^2 = 0.997$
D.W. = 0.351044
S.E. = 0.119903
Measuring the Border Effect

• Use state cigarette tax rate as metric
• Assume that tax rate differences capture most of the price differences
• Example:
  - $\text{BORDER}_{\text{WI}} = \frac{\text{RTXCIG}_{\text{WI}}}{(\text{RTXCIG}_{\text{IL}} + \text{RTXCIG}_{\text{IA}} + \text{RTXCIG}_{\text{MN}} + \text{RTXCIG}_{\text{MI}}) / 4}$
Ratio of Wisconsin Cigarette Tax Rate to Average of Bordering States’ Tax Rates

Ratio of Kentucky Cigarette Tax Rate to Average of Bordering States’ Tax Rates

Simple Average  Population Weighted Average
Model Results with Border Effect

<table>
<thead>
<tr>
<th>Variable</th>
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<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
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<td>trend</td>
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<td>border</td>
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</tbody>
</table>

Obs=2380
Weighted $R^2=0.998$
D.W.=0.519497
S.E.=0.066324

Modifications

• Residuals of cross-section units revealed strong time trends in the error terms
• Re-estimation with GLS, each state has two fixed effects, a constant and a time trend.
• Forty-one states had statistically significant negative time trends
• Six states had statistically significant positive time trends
• Four states had statistically insignificant time trends
Compare to Standard Model

- Price elasticity is lower, dropping from -0.611 to -0.407
- Income elasticity rises from 0.162 to 0.302
- Coefficient on teenage share increases from 0.207 to 0.246
- Trend coefficient (proxy for Internet) stronger, going from -0.003 to -0.013

Interpretation of Border Effect

- Log ratio
- For every 10 percentage points that a state is above the average of its bordering states, there will be an additional 0.8% reduction in taxable sales of cigarettes
- In Wisconsin, for example, the border effect evaluated at 1.1 (10% higher than surrounding states) translates into $23 million of lost revenue, compared to $293.7 million total in FY2002.
Future Research

• Add Municipalities that tax cigarettes
• Analyze effect of sales tax on cigarette retail price
• Refine geography on border effect to isolate large metro areas that border on two or more states
• Include the border effect, if any, of Canada and Mexico
• Consider how the model can be modified to include smuggling