Definition of relevant market in beer industry: Application of LA-AIDS model

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Outline

1 Motivation

2 Model
   - Data
   - Model specification

3 Estimation/Results
   - Estimation
   - Critical loss analysis
   - Results
Market definition - first step in market power assessment or in investigating the intensity of market competition.

Why beer industry?

- permanent growth in market concentration during last decades, primarily due to mergers
- the relevant market considered beer in nearly all market decision in beer brewing industry
Procedure

- 2-stage demand estimation
- Critical Loss Analysis
- SSNIP test and on its basis definition of relevant markets
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Data

- Panel scanner data from Dominick’s Finer Food company (36 stores in Chicago metropolitan area)
- Weekly data from June 91 to November 95 (220 observation)
- Detrended and seasonally adjusted (temperature, holidays)
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Model overview

- Multi-stage budgeting, 2 levels (+ more efficient estimates; - weak separability assumption)
- Beer brands divided into 6 segments: Premium, Light, Craft, Imported, Dark, Non-alcoholic; each containing 3-5 beer brands
- Linear approximation of Almost Ideal Demand System
LA-AIDS specification

Bottom level (within segment):

\[ w_{int} = \alpha_{in} + \beta_i \ln(Y_{mnt}/P_{mnt}) + \sum_{j=1}^{I} \gamma_{ij} \ln p_{jnt} + \epsilon_{int}, \]  

(1)

Lagged Stone index (+ avoid simultaneity bias)

\[ \ln P_{mnt} = \sum_{i=1}^{I} w_{in(t-1)} \ln p_{int}. \]  

(2)

Upper level (between segment):

\[ w_{mnt} = \alpha_{mn} + \beta_m \ln(Y_{bnt}/P_{bnt}) + \sum_{k=1}^{M} \gamma_{mk} \ln P_{knt} + \epsilon_{mnt}, \]  

(3)
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SUR-GLS fixed effect estimator (capture covariances of error terms, between data variability very low)

Haussman test in most cases suggests endogeneity, but we didn’t use IV estimator ("weak instruments", price setting independent to demand shocks)
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First version:

- CLA calculates the level of sales, that a hypothetical monopolist could lose due to a 5-10 % price increase in order to preserve at least the level of profit before the price increase

- Break-even critical demand elasticity: Price elasticity of demand, under which the original level of profit is equal to the level of profit after the SSNIP
Second version:

- Profit maximizing CLA calculates the level of sales, that a hypothetical monopolist could lose due to 5-10 % price increase in order to achieve a profit-maximizing price.

- Critical demand elasticity is equal to the elasticity of demand, under which the hypothetical monopolist would increase its price by at least 5-10 % in order to set its price on profit-maximizing level.

Evaluation:

- \( \varepsilon > \varepsilon_{c,be} \), then the set of products does not constitute a relevant market rendering the SSNIP not profitable.

- \( \varepsilon < \varepsilon_{c,be} \), the tested set of products is the relevant market.
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## Bottom level results

<table>
<thead>
<tr>
<th>Segment</th>
<th>Brand</th>
<th>Elasticity</th>
<th>Standard Error</th>
<th>Conditional elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Premium</strong></td>
<td>Budweiser</td>
<td>-4.285</td>
<td>0.128</td>
<td>-4.162</td>
</tr>
<tr>
<td></td>
<td>Old Style Regular</td>
<td>-3.194</td>
<td>0.131</td>
<td>-3.145</td>
</tr>
<tr>
<td></td>
<td>Miller Genuine Draft</td>
<td>-3.363</td>
<td>0.037</td>
<td>-2.920</td>
</tr>
<tr>
<td></td>
<td>Miller General Draft</td>
<td>-3.467</td>
<td>0.036</td>
<td>-3.057</td>
</tr>
<tr>
<td><strong>Light</strong></td>
<td>Amstel</td>
<td>-2.998</td>
<td>0.197</td>
<td>-2.929</td>
</tr>
<tr>
<td></td>
<td>Michelob</td>
<td>-2.377</td>
<td>0.102</td>
<td>-2.207</td>
</tr>
<tr>
<td></td>
<td>Coors Regular</td>
<td>-2.434</td>
<td>0.132</td>
<td>-2.282</td>
</tr>
<tr>
<td></td>
<td>Miller</td>
<td>-2.197</td>
<td>0.055</td>
<td>-1.417</td>
</tr>
<tr>
<td><strong>Dark</strong></td>
<td>Augsburger</td>
<td>-2.678</td>
<td>0.095</td>
<td>-2.438</td>
</tr>
<tr>
<td></td>
<td>Berghoff</td>
<td>-2.221</td>
<td>0.073</td>
<td>-1.858</td>
</tr>
<tr>
<td></td>
<td>Becks</td>
<td>-2.976</td>
<td>0.139</td>
<td>-2.706</td>
</tr>
<tr>
<td></td>
<td>Lowenbrau</td>
<td>-1.472</td>
<td>0.136</td>
<td>-1.358</td>
</tr>
<tr>
<td></td>
<td>Killians Irish Red</td>
<td>-3.153</td>
<td>0.121</td>
<td>-2.687</td>
</tr>
</tbody>
</table>
### Table: Overall own price elasticities

<table>
<thead>
<tr>
<th>Category</th>
<th>Brand</th>
<th>Own Price Elasticity</th>
<th>Standard Error</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imported</strong></td>
<td>Heineken</td>
<td>-4.046</td>
<td>0.075</td>
<td>-3.773</td>
</tr>
<tr>
<td></td>
<td>Becks Regular</td>
<td>-4.907</td>
<td>0.075</td>
<td>-4.672</td>
</tr>
<tr>
<td></td>
<td>Molson Golden</td>
<td>-3.054</td>
<td>0.058</td>
<td>-2.947</td>
</tr>
<tr>
<td></td>
<td>Moosehead</td>
<td>-3.237</td>
<td>0.059</td>
<td>-3.106</td>
</tr>
<tr>
<td><strong>Craft</strong></td>
<td>Augsburger Regular</td>
<td>-2.849</td>
<td>0.054</td>
<td>-2.523</td>
</tr>
<tr>
<td></td>
<td>Berghoff Regular</td>
<td>-2.409</td>
<td>0.040</td>
<td>-2.009</td>
</tr>
<tr>
<td></td>
<td>Leinenkugel Premium Regular</td>
<td>-2.038</td>
<td>0.074</td>
<td>-1.833</td>
</tr>
<tr>
<td></td>
<td>Samuel Adams Lager</td>
<td>-5.069</td>
<td>0.135</td>
<td>-4.840</td>
</tr>
<tr>
<td><strong>Non-alcoholic</strong></td>
<td>Coors Cutter</td>
<td>-0.750</td>
<td>0.112</td>
<td>-0.895</td>
</tr>
<tr>
<td></td>
<td>Miller Sharps</td>
<td>-1.784</td>
<td>0.035</td>
<td>-1.057</td>
</tr>
<tr>
<td></td>
<td>Odouls</td>
<td>-2.524</td>
<td>0.066</td>
<td>-2.025</td>
</tr>
</tbody>
</table>
All own-price elasticity falls in (-4,-2), only non-alcoholic beers inelastic demand
The most elastic ones: premium, imported
The least elastic ones: non-alcoholic, dark
## Upper (segment) level

<table>
<thead>
<tr>
<th></th>
<th>Premium</th>
<th>Light</th>
<th>Dark</th>
<th>Imported</th>
<th>Non-alc.</th>
<th>Craft</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\ln(Y/P))</td>
<td>-0.006*</td>
<td>0.004*</td>
<td>0.006*</td>
<td>-0.004*</td>
<td>0.009*</td>
<td>0.010*</td>
</tr>
<tr>
<td>(\ln(P_{\text{Premium}}))</td>
<td>-0.102*</td>
<td>0.050*</td>
<td>0.007*</td>
<td>0.010*</td>
<td>0.002</td>
<td>0.033*</td>
</tr>
<tr>
<td>(\epsilon_{\text{Premium}})</td>
<td>-1.218</td>
<td>0.110</td>
<td>0.017</td>
<td>0.024</td>
<td>0.005</td>
<td>0.074</td>
</tr>
<tr>
<td>(\ln(P_{\text{Light}}))</td>
<td>0.050*</td>
<td>-0.115*</td>
<td>0.016*</td>
<td>0.028*</td>
<td>-0.013*</td>
<td>0.034*</td>
</tr>
<tr>
<td>(\epsilon_{\text{Light}})</td>
<td>0.374</td>
<td>-1.902</td>
<td>0.125</td>
<td>0.213</td>
<td>-0.105</td>
<td>0.266</td>
</tr>
<tr>
<td>(\ln(P_{\text{Dark}}))</td>
<td>0.007*</td>
<td>0.016*</td>
<td>0.017*</td>
<td>-0.007*</td>
<td>-0.002</td>
<td>-0.032*</td>
</tr>
<tr>
<td>(\epsilon_{\text{Dark}})</td>
<td>0.062</td>
<td>0.222</td>
<td>-0.760</td>
<td>-0.113</td>
<td>-0.039</td>
<td>-0.465</td>
</tr>
<tr>
<td>(\ln(P_{\text{Imported}}))</td>
<td>0.010*</td>
<td>0.028*</td>
<td>-0.007*</td>
<td>-0.004</td>
<td>-0.012*</td>
<td>-0.015*</td>
</tr>
<tr>
<td>(\epsilon_{\text{Imported}})</td>
<td>0.097</td>
<td>0.222</td>
<td>-0.053</td>
<td>-1.028</td>
<td>-0.091</td>
<td>-0.112</td>
</tr>
<tr>
<td>(\ln(P_{\text{Non-alc.}}))</td>
<td>0.002</td>
<td>-0.013*</td>
<td>-0.002</td>
<td>-0.012*</td>
<td>0.028*</td>
<td>-0.003</td>
</tr>
<tr>
<td>(\epsilon_{\text{Non-alc.}})</td>
<td>-0.024</td>
<td>-0.134</td>
<td>-0.025</td>
<td>-0.125</td>
<td>-0.747</td>
<td>-0.034</td>
</tr>
<tr>
<td>(\ln(P_{\text{Craft}}))</td>
<td>0.033*</td>
<td>0.034*</td>
<td>-0.032*</td>
<td>-0.015*</td>
<td>-0.003</td>
<td>-0.019*</td>
</tr>
<tr>
<td>(\epsilon_{\text{Craft}})</td>
<td>0.254</td>
<td>0.295</td>
<td>-0.288</td>
<td>-0.142</td>
<td>-0.032</td>
<td>-1.176</td>
</tr>
<tr>
<td>\text{Constant}</td>
<td>0.167*</td>
<td>0.167*</td>
<td>0.167*</td>
<td>0.167*</td>
<td>0.167*</td>
<td>0.167*</td>
</tr>
<tr>
<td>\text{s.d.}</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.001)</td>
</tr>
</tbody>
</table>
Upper level - result evaluation

- Size of elasticities in line with bottom level: higher for premium light segment, lower for non-alc. and dark segment
- Interesting result: negative cross-price elasticities with non-alc. beer segment
- Results of SSNIP

<table>
<thead>
<tr>
<th></th>
<th>SSNIP = 0.05</th>
<th>SSNIP = 0.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>( m )</td>
<td>( \varepsilon )</td>
<td>( \varepsilon_{c,be} )</td>
</tr>
<tr>
<td>Premium</td>
<td>0.175</td>
<td>1.218</td>
</tr>
<tr>
<td>Light</td>
<td>0.161</td>
<td>1.902</td>
</tr>
<tr>
<td>Dark</td>
<td>0.108</td>
<td>0.760</td>
</tr>
<tr>
<td>Imported</td>
<td>0.084</td>
<td>1.028</td>
</tr>
<tr>
<td>Non-alcoholic</td>
<td>0.185</td>
<td>0.747</td>
</tr>
<tr>
<td>Craft</td>
<td>0.150</td>
<td>1.176</td>
</tr>
</tbody>
</table>

Relevant market isn’t larger than segment
Hypothetical monopolist over any one of our proposed segments would have enough market power to implement the SSNIP, making each of the analysed segments a separate relevant market.

Competition concern might be focused on the certain segment not on all of beer.

Limitation:

- credibility/reliability of segment classification
- we analyse only demand side substitution of the market (what about supply-side substitution?)
For Further Reading I


For Further Reading III

