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Application of the Panzar-Rosse Model: An Analysis of the Brewery Industry in the U.S.

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Introduction

• Brewery Industry concentration

• Panzar-Rosse model

Chart from IBISWorld database
Purpose and Contribution

• Goal is to build a foundation of research on the competitive level of the brewery industry in the United States.
  • The increasing level of competition could lead to practices harmful to consumers.
  • Many studies talk about concentration but don’t provide a model to assess actual competition.

• Many past studies using the Panzar-Rosse model only covered the banking industry. This is the first application of the Panzar-Rosse model to the brewery industry.
Lit Review

• Effects of the M&A Wave in Global Brewing
  • While a global study Erik Madsen, Kurt Pedersen and Lars Lund-thomsen talk heavily about the effects of recent merges and acquisitions in the industry.

• The Dynamics of Industry Concentration for U.S Micro and Macro Brewers
  • Victor Tremblay, Natsuko Iwasaki and Carol Tremblay talk about changes in the level of concentration beginning in the 1970s and into the early 2000s
Lit Review cont.

• Assessing Competition with the Panzar-Rosse Model:
  • Jacob Bikker, Sherrill Shaffer and Laura Spierijk
    • Applies the Panzar-Rosse model to the banking industry but also critiques the effectiveness of the model.

• Consolidation and Competition in the Banking Industries of the EU Member and Candidate Countries
  • Adnan Kasman
Why the Panzar-Rosse Model?

- Considerable past success in banking industry
- Revenue test based on a reduced-form equation relating gross revenues to a vector of input prices and other firm-specific control variables
- Creates H-Statistic
  - Sum of input price elasticities reflects the competitive structure
  - $H < 0 =$ neoclassical monopolist or collusive oligopoly
  - $0 < H < 1 =$ monopolistic competitor
  - $H = 1 =$ price-taking competitive firm or industry
Model Structure

logTR = α + β_1 logPC + β_2 logPW + β_3 logPS + β_4 logTW + ψ
log CF + error

- Where dependent variable is total revenue
- Independent variables PC, PW, PS, and TW are price of corn, price of wheat, price of sugar, and total wages.
- CF is other firm-specific control factors
- Model is a time series from 2008 to 2014
- Log specification is used to improve regression goodness of fit
Variables

• Dependent Variable
  • Total Revenue for Industry from IBISWorld

• Independent Variables
  • Input Prices data from U.S Department of Treasury Alcohol and Tobacco Tax and Trade Bureau (TBB)
    • Corn
    • Wheat
    • Sugar
    • Wages

• Control Variables
  • Per capita expenditure on alcohol
  • Per capita disposable income
  • Excise tax on beer
Hypothesis

Due to a recent levels of concentration there will be a less competitive structure in the Industry indicated by an H-statistic that is negative or less than 1.

\[ H = \beta \log(pc+ps+pw+tw) \leq 1 \]
### Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>89.85295</td>
<td>37.04626</td>
<td>2.425425</td>
<td>0.0723</td>
</tr>
<tr>
<td>log(pc)</td>
<td>-0.329674</td>
<td>0.078584</td>
<td>-4.195177</td>
<td>0.0524</td>
</tr>
<tr>
<td>log(ps)</td>
<td>-0.083295</td>
<td>0.079916</td>
<td>-1.042276</td>
<td>0.4067</td>
</tr>
<tr>
<td>log(pw)</td>
<td>0.571103</td>
<td>0.124132</td>
<td>4.600773</td>
<td>0.0441</td>
</tr>
<tr>
<td>log(tw)</td>
<td>-0.150050</td>
<td>0.272543</td>
<td>-0.550555</td>
<td>0.6372</td>
</tr>
<tr>
<td>log(et)</td>
<td>-3.220652</td>
<td>1.384406</td>
<td>-2.326377</td>
<td>0.1025</td>
</tr>
<tr>
<td>log(ea)</td>
<td>1.531941</td>
<td>5.667165</td>
<td>0.270319</td>
<td>0.8044</td>
</tr>
<tr>
<td>log(di)</td>
<td>-2.034806</td>
<td>5.441908</td>
<td>-0.373914</td>
<td>0.7333</td>
</tr>
</tbody>
</table>

- R-squared = 0.888731
- Adjusted R-sq = 0.833096
- Durbin-Watson = 2.569748
- C is all unobserved variables
H-statistic

\[ H = \beta \log(-0.329674 - 0.083295 + 0.571103 - 0.150050) \]
\[ H = 0.008084 \]

- H-statistic was almost 0 so considerably less than 1 meaning Industry operates at monopolistic competitive levels
Conclusion

• Regression strength was acceptable but not great
  • Better data might provide more significant variables

• H-statistic did follow with the assumption that industry would be less than perfectly competitive
  • Policy actions might be made to allow for a more competitive industry