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

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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

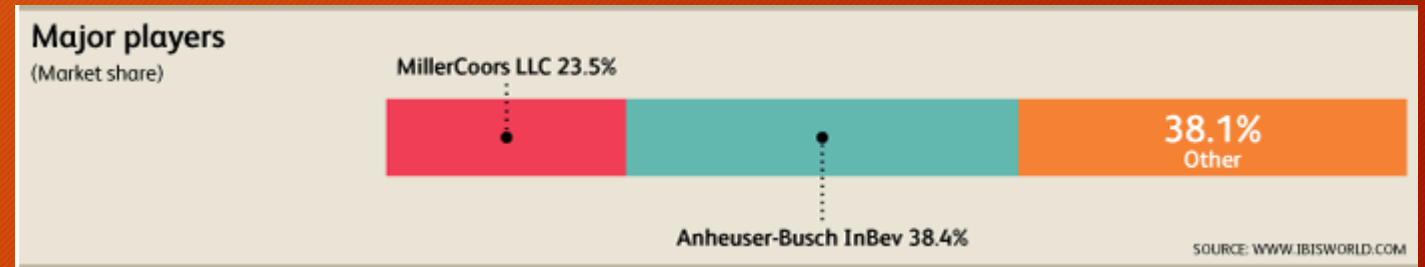


Chart from IBISWorld database



# 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 asses 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 Lundthomsen 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

$$\log \text{TR} = \alpha + \beta_1 \log \text{PC} + \beta_2 \log \text{PW} + \beta_3 \log \text{PS} + \beta_4 \log \text{TW} + \gamma' \log \text{CF} + \text{error}$$

- 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

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

- R-squared = .888731
- Adjusted R-sq = .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

