U.S. Alcohol Consumption: Tax Instrumental Variables in Quadratic Almost Ideal Demand System (QUAIDS)

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Introduction
- Alcohol consumption is the adverse cause of both acute and chronic consequences
- U.S. economic cost of alcohol consumption is 2.3% of GDP, according to Rehm et al. (2009)
- We consider demand analysis for more understanding of alcohol consumption pattern to find the effective policy

Empirical Motivation
The theoretical motivation is the Engel curve, which is used to study the relationship between income and consumption. The Engel curve is a graphical representation of the relationship between income and the quantity of a good consumed. It is named after Ernst Engel, who first proposed the idea in the 19th century. The Engel curve shows that as income increases, the proportion of income spent on basic necessities like food decreases, while the proportion spent on non-essential goods like alcohol increases.

Theoretical Motivation
- "Demand System" versus "Econometrics"
- Prices exogeneity causes measurement error
- Different elasticities at varying consumption levels

Scope of Study
- Annual alcohol consumption of 50 states and the District of Columbia in 1985-2002
- Beer, spirits, and wine
- Clustered data for the light, moderate, and heavy consumptions

Review of Related Literatures
- Analyze alcohol consumption using price variables and economic and demographic characteristics
- Compare the estimations of elasticities
- Consider the exogeneity issue on prices

Objective
- Exogeneity
  - Price data from the American Chamber of Commerce Researchers Association (ACCRA) has been widely used for empirical analysis of the U.S. alcohol consumptions
  - Young and Bielinska-Kwapiz (2003) found the measurement errors, thus the biased and inconsistent linear estimators, and suggested to use state and federal taxes as the instrumental variables
  - In Hausman and Leonard (2005), the instrumental variables could mitigate the simultaneity problem in the AIDS model
- Different responsiveness in price
  - Ponicki 2005, “Alcohol Taxes: What They Can Do, and What We’ve Done with Them”, Prevention Research Center
  - Young and Bielinska-Kwapiz 2003, “Alcohol Consumption, Beverage Prices and Measurement Errors”, J. of Studies on Alcohol and Drugs, 64:230-238

Empirical Results
Trend Analysis of Consumption
- Increasing trends with very small coefficients

Nonparametric Estimation of Consumption
- Positive cross-price elasticities implies simultaneous excise taxes imposed for the effective alcohol reduction policy

Conclusion and Policy Implication
- Law of Demand in nonparametric linear form with small slope downward trends, except at the higher price levels for spirits and wine
- Locally-smoothed Engel curves for consumption shares illustrate that spirits and wine are normal goods but not for beer
- Income has positive effects except for beer at the high level of income
- There is strong endogeneity in wine price data
- We have improvement in estimation from using the set of all taxes for spirits and wine
- Find asymptotic normal, but there exist multicollinearity and heteroskedasticity
- Thus, using the Principal Component Analysis (PCA) and the weighted covariance matrix
- Improvement for the linear models from using the instrumental variables is inconclusive
- However, the QUAIDS model has more reasonable variations of responsiveness from prices and income, when using the tax instruments

Acknowledgement
Mr. William R. Ponicki, Prevention Research Center, for his generosity to provide the datasets