Elasticity of Demand for Cigarettes in the US: Evidence from Quantile Regression Analysis

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INTRODUCTION AND MOTIVATION

- Tobacco is the leading cause of preventable and premature death in the US.
- 443,000 people die annually due to tobacco use.
- Annual deaths exceed $210 billion in direct medical costs and lost productivity.
- Over 3.5 million young people under 18 smoke their first cigarette every day and over 1,000 become daily smokers.
- Most of these young Americans will become addicted to nicotine by young adulthood.
- 99% initiate smoking by age 26.
- Taxation has been one of the main tools available to policymakers for reducing tobacco use and regulating the industry.
- It is intended to increase prices for tobacco products and, hence, reduce its consumption while generating revenues for the government.
- Price and income elasticities of demand for cigarettes and other tobacco products are essential elements of tobacco taxation policies.
- Estimation of elasticities across consumption levels (quantiles) is important for the implementation of tobacco consumption patterns and can better aid designing more effective tax policies.

OBJECTIVE

- Previous literature on cigarette elasticities relied on the conditional mean effects of price, income, and other determinants of cigarette demand.
- This latter approach does not recognize the heterogeneity across different consumption levels that may be reached by a vast data set of consumer income and preferences.
- Therefore, elasticity estimates that are obtained via standard econometric models may likely result in erroneous policy advice and biased forecasts of future income and preferences.

What the regression curve does is give a grand summary for the average of the distributions corresponding to the set of φ, ψ. We can go further and compute several different regression curves corresponding to the various percentage points of the distributions and thus get a more complete picture of the ad.


The objective of this study is to analyze demand for cigarettes in the US using quantile regression framework, which allows to estimate demand elasticities across the different consumption and income states.

Our approach accounts for these inherent differences in cigarette consumption and has the promise of leading to more informed policies.

DATA

- Stratified, national, landline, and cell phone survey of non-institutionalized adults aged 18 years and older residing in the 50 states or District of Columbia.
- Data are representative and comparable at both national and state levels.
- The sample design also provides national estimates for subgroups defined by gender, age, and race/ethnicity.
- Dataset includes 118,508 observations.
- Sample used in this analysis is for 16,923 individuals who have reported currently using cigarettes.

METHODS

- We employ a quantile regression framework to estimate the demand for cigarettes in the US.
- Quantile regressions allow us to evaluate the income and demand elasticities across different consumption levels (quantiles).
- OLS model is:
  \[ \log(y) = \beta_0 + \beta_1 \log(x) + \beta_2 x + \beta_3 D + \epsilon \]
  where:
  - Y is a measure of the quantity demand (cigarettes).
  - X is a vector of explanatory variables (income, age, etc.).
  - D is a vector of dummy variables.

  Corresponding quantile regression model is:
  \[ \log(y) = \beta_0 + \beta_1 \log(x) + \beta_2 x + \beta_3 D + \epsilon_q \]
  where q is the qth quantile.

CONCLUSIONS AND DISCUSSION

- Heavy smokers still respond to higher cigarette prices by reducing cigarette consumption.
- Price elasticity of demand differs across quantiles, implying that smokers in different consumption groups respond differently to changes in cigarette price.
- Specifically, price elasticities are found to be -0.649, -0.386, and -0.179 for consumers in the 25%, 50%, and 75th percentiles, respectively. Therefore, heavy smokers reduce cigarette consumption to a much lesser extent relative to lighter smokers in response to price increases.
- Traditional methods (OLS) to estimating cigarette demand yield an elasticity estimate of -0.513, which is an inaccurate estimate for relatively heavier smokers and could be misleading for policy purposes.
- For heavy smokers educational attainment and income growth have only marginally negative effects on cigarette consumption as compared to relatively lighter consumers.