Estimating Demand Curves for Goods Subject to Excise Taxes

e.g. tax on gasoline, on cigarettes, on beer.

What would be the effect of a tax on, say, gasoline?

Often interested in measuring the

Own-price elasticity of demand

Why a horizontal (i.e. perfectly elastic) supply curve?

Answer: For most countries, they are price takers, and have to accept the world price for gasoline.

This supply price fluctuates over time, tracing out points on the demand curve. This allows us to identify the demand curve.

Goal: Estimate a demand curve that is either

Linear: \( q = a + bP \)

Log: \( \ln(q) = A + B \ln(P) \) Here \( B \) is the own-price elasticity of demand

Step 1. Choose variables.

\( Q_d = f(P, P_{other}, \text{Income, tastes, pop, income distribution}) \)

\( Q_d: \text{quantity of gasoline consumed per capita} \)

\( P: \text{Price of gasoline paid by consumer; deflated to give real prices.} \)

\( P_{other}: \text{Electricity? Is becoming important where electric cars are becoming popular (e.g. Tesla)} \)

\( \text{Natural gas? Rarely used by vehicles. Exception: Bangladesh.} \)

\( P \text{ of diesel fuel. Choice is often between a gasoline (petrol) engine and a diesel engine.} \)

\( P \text{ of cars themselves. E.g. Singapore, cars are very expensive. Need a permit in order to buy a car. Auction of limited number of permits (to keep pollution and congestion low). A permit costs now about $50,000. Then need to buy the car! So few cars, and low demand for gasoline.} \)

\( \text{Tastes ??} \)

\( \text{Income Real GDP per capita} \)

Based on theory, and on availability of data.
Step 2. Build dataset. Often takes the most time.

Step 3. Exploratory data analysis

Step 4. Basic OLS regression

Step 5. Explore other functions. Here, log form.

Step 6. If using time series, deal with autocorrelation. Otherwise, our p-values are too low (usually).
   
   Use Durbin-Watson test. If D-W statistic is close to 2, then no autocorrelation.


   
   Long-run elasticity: \(-0.26/(1-0.72) = -0.26/0.28 = -0.93\).