

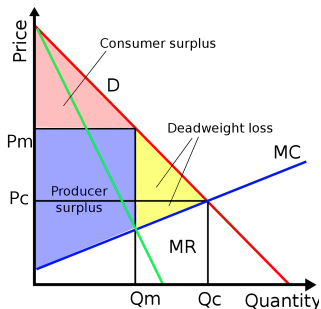


Cannabis Data Science

# Saturday Morning Statistics

December 11<sup>th</sup>, 2021

# Who bears the cost of quantity restrictions?



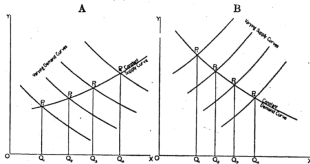
Effects of a quantity restrictions  
on a market

Source: SilverStar at en.wikipedia

It depends...!

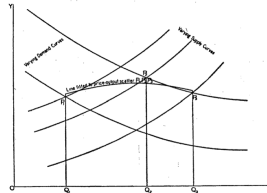
# The identification problem

FIGURE 3. PRICE-OUTPUT DATA REVEAL—  
(A) SUPPLY CURVE  
(B) DEMAND CURVE



The Tariff on Animal and Vegetable Oils by  
Phillip G. Wright (1928)  
Retrieved from: <https://scholar.harvard.edu>

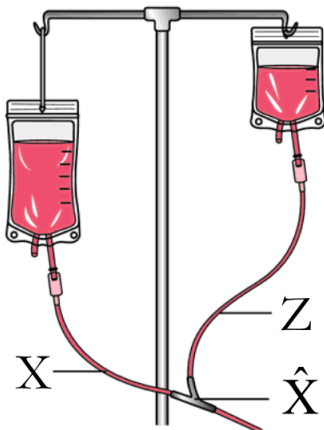
FIGURE 4. PRICE-OUTPUT DATA FAIL TO REVEAL EITHER SUPPLY OR DEMAND CURVE.



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The change in price and quantity depends...!

**We need a cannabis supply IV, STAT!**



## Why do we need an IV?

- **Reverse causation** – changes in the dependent variable change the value of at least one of the independent variables.  $Y = \text{Price}$   
 $X = \text{Quantity}$
- **Omitted variables** – there are variables that affect both the dependent and independent variables that are not included in the model.
- **Measurement error** – the independent variables are subject to non-random measurement error.

## What happens if we don't use an IV?

- Our explanatory ~~(independent)~~ variables may be endogenous.
- If our explanatory variables are endogenous, then any OLS estimates are biased and inconsistent.

## What makes a good IV?

- $Z = \text{Energy?}$
- ① The instrument must be correlated with the endogenous explanatory variable(s). The more correlated the better.  $X = \text{Quantity}$

- $Z$
- ② The instrument cannot be correlated with the error term in the explanatory equation. This is the **exclusion restriction**.  $\gamma = \text{Price}$

## What variables can we use as an IV?

- ➔ 1 Energy prices?
- ➔ 2 Changes in labor supply?
- 3 Building material prices?
- 4 Real estate prices?



## **Future work:** Start preparing forecasts for 2022!

- ① Supply chain factors.
- ② Inflation.
- ③ Domestic spending.
- ④ Employment



**Thank you for coming.**

Take some time and discuss any conclusions drawn.