Incidence Primer

Lecture 3 Supplemental

ARE 264

January 26, 2021

Why talk about incidence?

- Lecture 3 is our setup lecture on equity issues
- There we will talk about who bears the burden of pollution or of policy
- This requires that we know some fundamentals about incidence, which I will review here

Why talk about incidence?

- A secondary goal of Lecture 3 is to discuss:
  - How to model general equilibrium effects of a tax
  - How to model environmental policies as taxes

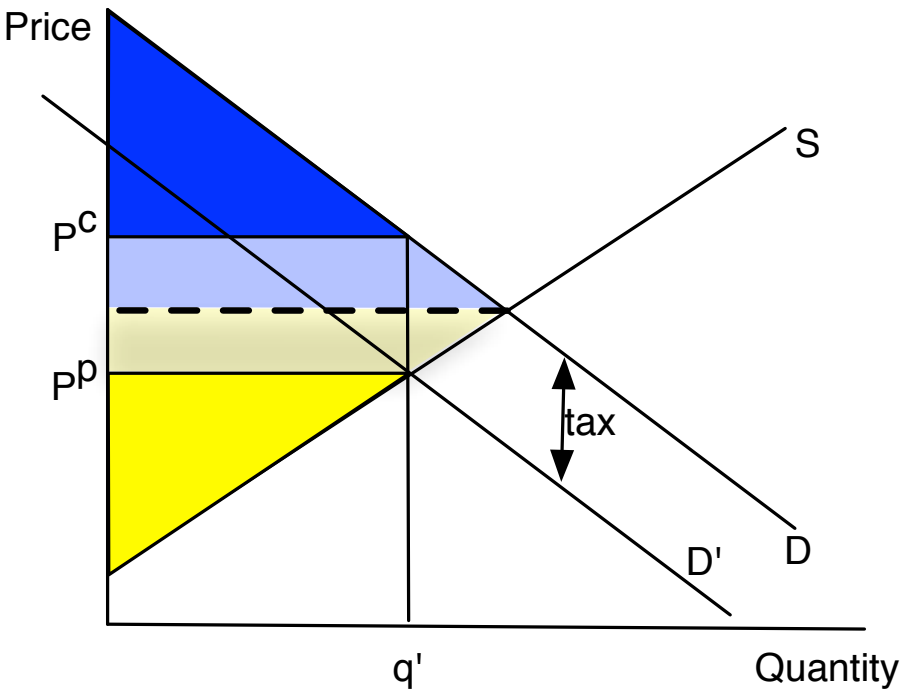
- Canonical starting point is the two-sector Harberger model
- Fullerton and Heutel readings for next lecture adapt Harberger model to environmental policies

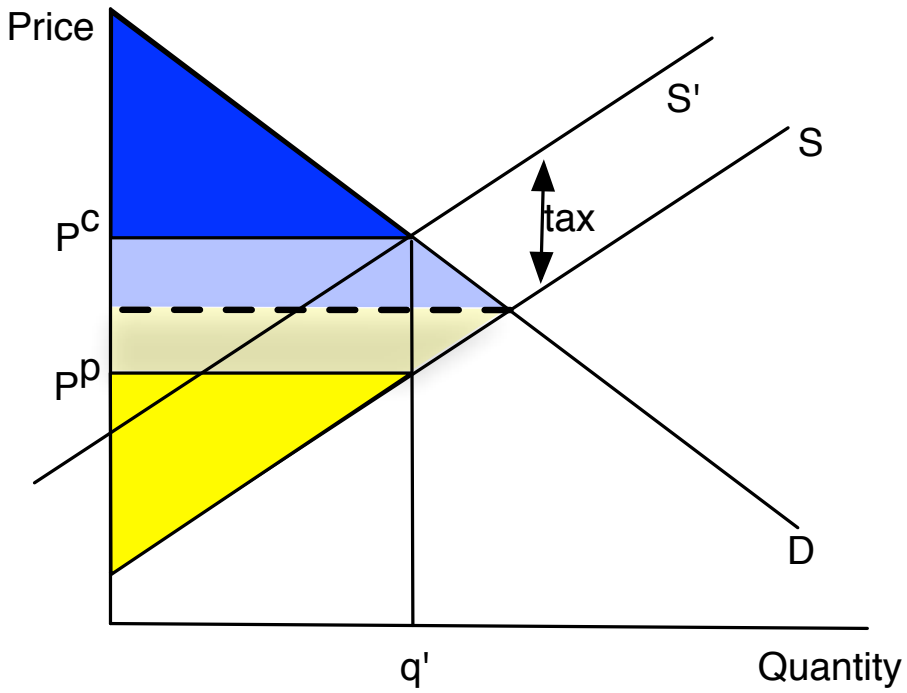
Four principles of tax incidence

1. Who cares who pays?
2. People pay taxes
3. Inelasticity is expensive
4. In general, anything can happen

Credit: Jim Hines

1. Who cares who pays?





- Final outcomes do not depend on who **remits** the tax—whether consumer or producer has to give tax revenue to government
- Shift supply or demand, get same outcome
- We say: **statutory incidence** is irrelevant

- Metaphor: imagine a "tax can" (government tip jar) at the register of a store
- Consumer buys a \$10 shirt, owes 10% sales tax
  - Consumer can give producer \$10, put \$1 in can
  - Or, consumer can give producer \$11, and producer puts \$1 in can

Who cares who pays?

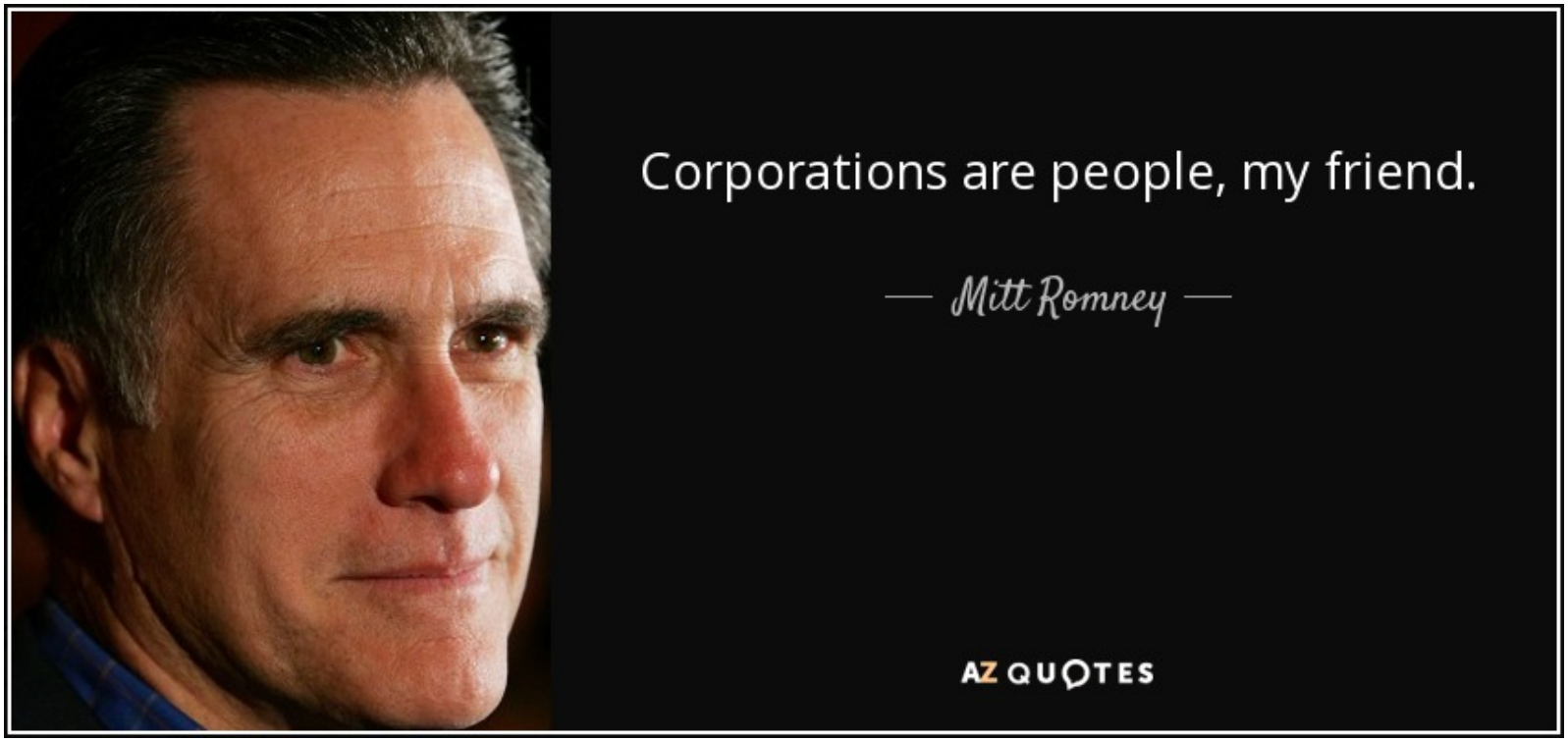
Interesting caveats—statutory incidence relevant if...

- Prices inflexible: minimum wage, price floor, price ceiling, or other sticky price
- If people respond to before and after tax prices or wages differently
- Evasion and enforcement may depend on statutory incidence

- Chetty, Kroft and Looney (2009): experimental evidence that people under-respond to non-salient taxes
- Busse, Silva-Risso and Zettelmeyer (2007): car buyers capture nearly all of "consumer cash", but very little of "dealer cash"

  Interpret as asymmetric information
- Sallee (2011): Prius subsidy goes to buyer during wait list period

2. People pay taxes



"...Everything corporations earn ultimately goes to people. Where do you think it goes?"

2. People pay taxes

- Mitt Romney was correct: corporations are people too
- It is not right to say that businesses or corporations or producers bear the burden of taxation
- It is the owners or workers or customers who bear the burden
- Incidence analysis requires tracing through how taxes affect all people through all channels. Consider a tax on coal:

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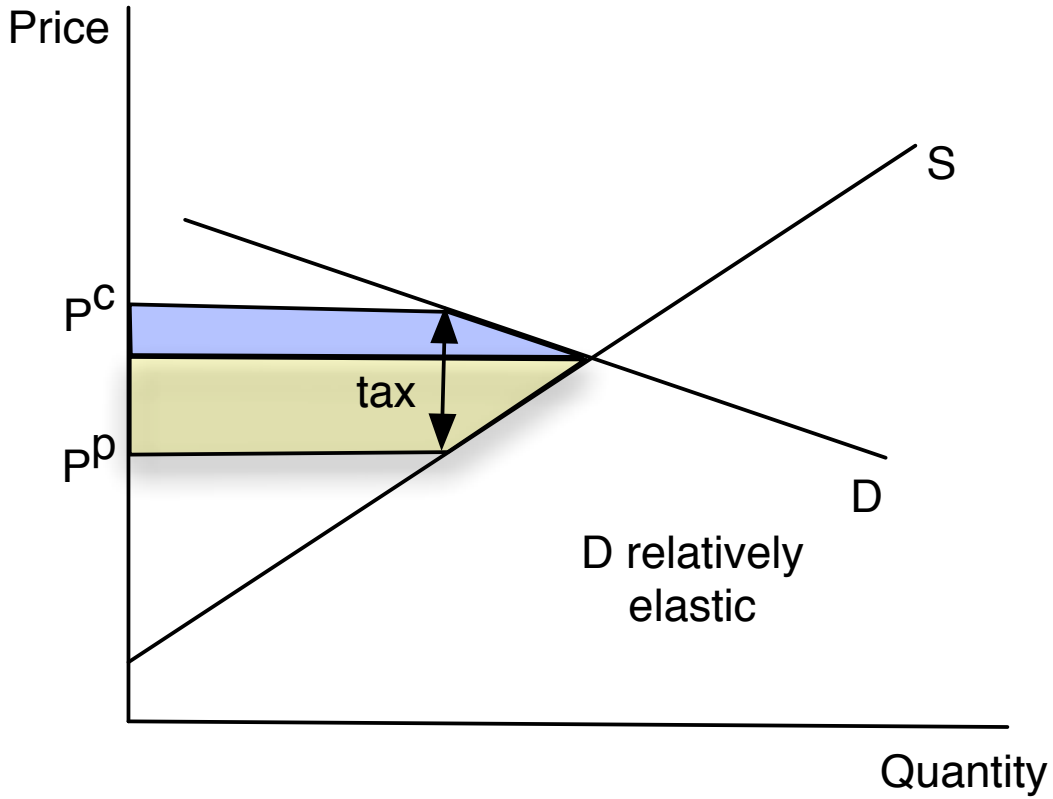
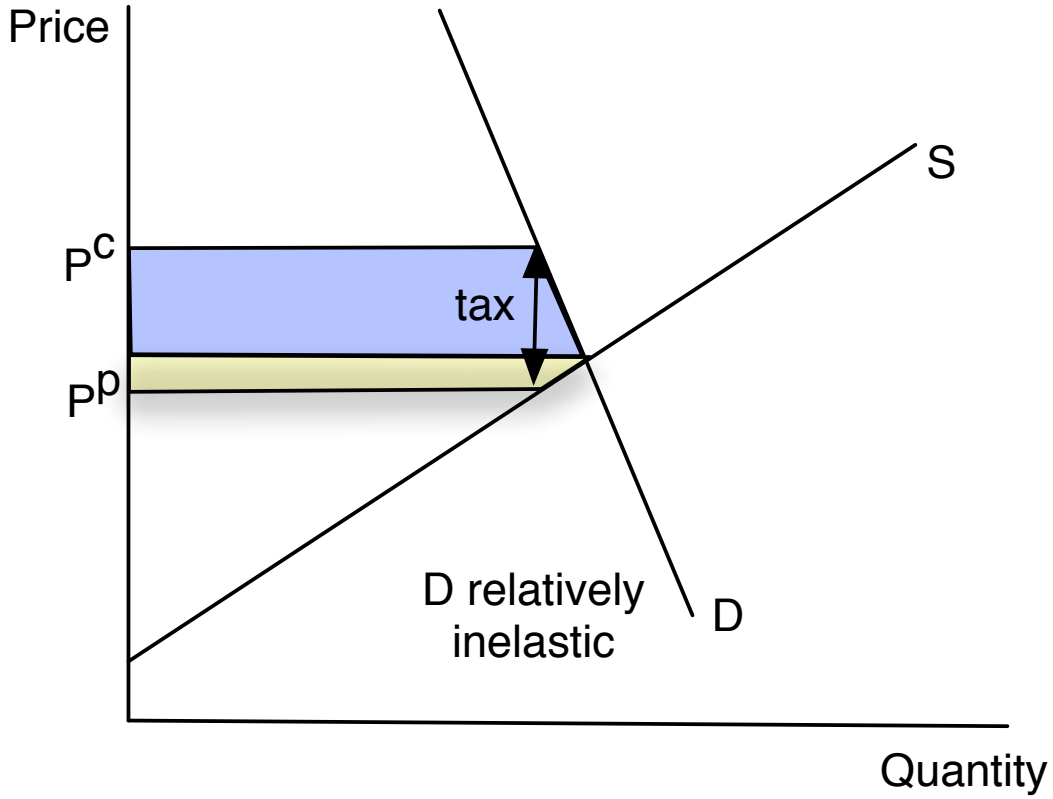
3. Inelasticity is expensive



- If statutory incidence does not determine who bears the burden of a tax, then what does?
- Between consumers and producers, it is the relatively inelastic who pay more

3. Inelasticity is expensive



- In this example, demand relatively inelastic
- The inelastic side of the market bears more of the burden

3. Inelasticity is expensive

- If statutory incidence does not determine who bears the burden of a tax, then what does?
- Between consumers and producers, it is the relatively inelastic who pay more
- Graphical version...
- Algebraic version:
  - Demand: $D(p+t)$
  - Supply: $S(p)$
  - $D(p+t) = S(p)$
- Increase tax, what happens to p (which is producer price)?

3. Inelasticity is expensive

$$D(p+t) = S(p)$$

Differentiate wrt t:

$$D'\left(\frac{\partial p}{\partial t} + 1\right) = S'\frac{\partial p}{\partial t}$$

Solving:

$$\begin{aligned}\frac{\partial p}{\partial t} &= \frac{D'}{S' - D'} = \frac{D'\frac{p}{D}}{S'\frac{p}{D} - D'\frac{p}{D}} \\ &= \frac{\eta_D}{\eta_S - \eta_D}\end{aligned}$$

3. Inelasticity is expensive

$$\frac{\partial p}{\partial t} = \frac{\eta_D}{\eta_S - \eta_D}$$

- Where $\eta_S > 0$ and $\eta_D < 0$; interpret as fraction of elasticity attributed to consumers
- Change in producer price is $\frac{\partial p}{\partial t} \leq 0$
- Change in consumer price is $1 + \frac{\partial p}{\partial t}$

- $\eta_D = 0 \Rightarrow \partial p / \partial t = 0$
- $\eta_S = 0 \Rightarrow \partial p / \partial t = -1$
- $\eta_D = \infty \Rightarrow \partial p / \partial t = -1$

What are some things that are really inelastic?

- Land
- Resource deposit

2. People pay taxes, II

- Incidence can mean several things:
  1. How does burden fall between producers and consumers?
  2. Which consumers or producers are affected?
- Now consider simple setup for thinking about the latter
- Consumer faces prices p_j on goods $j = 1, ..., n$
- Have endogenous income M^i

2. People pay taxes, II

- Start with value function $V^i(p_1, ..., p_n, M^i)$
- Differentiate with respect to a tax t

$$\frac{\partial V^i}{\partial t} = \sum_{j=1}^{n} \frac{\partial V^i}{\partial p_j} \frac{\partial p_j}{\partial t} + \frac{\partial V^i}{\partial M^i} \frac{\partial M^i}{\partial t}$$

- Note that $\frac{\partial V^i}{\partial p_j} = -x_j^i \frac{\partial V^i}{\partial M^i}$
- (Why? See from differentiating Lagrangean of max U wrt p_j)
- Welfare loss from price rise is quantity times MU income

$$\frac{\partial V^i / \partial t}{\partial V^i / \partial M^i} = -\sum_{j=1}^{n} x_j \frac{\partial p_j}{\partial t} + \frac{\partial M^i}{\partial t}$$

2. People pay taxes, II

$$\frac{\partial V^i/\partial t}{\partial V^i/\partial M^i} = -\sum_{j=1}^{n} x_j \frac{\partial p_j}{\partial t} + \frac{\partial M^i}{\partial t}$$

- Welfare impact of a tax change for consumer i is:
- Price change for each good times quantity i buys
- Change in income from tax (e.g., wage change)
- Obvious, but powerful result for assessing which people will "pay" a tax

4. In general, anything can happen

- Much of the discussion above is **partial equilibrium**, which means that we are considering only one market
- **General equilibrium** models incorporate ripple effects on other markets
- These types of considerations can radically change incidence from more simple intuition

Harberger (1962) model

- Two sectors (corporate, non-corporate)
- Two factors (capital, labor)
- Total factor supplies fixed, but factors freely mobile between sectors
- Constant returns to scale
- Workers, government and owners of capital have identical homothetic preferences
  - This implies that redistribution does not affect prices

- Question: who bears burden of a tax on capital in the corporate sector? (interpret as the corporate income tax)
- Answer: it depends. Bottomline: does demand for capital go up or down?

Harberger (1962) model

- K must earn same return in either sector
- Not possible for K in corporate sector to bear burden differently from K in non-corporate sector

- First step: corporations shift demand from K to L
- This reduces demand for K
- Unambiguous effect to reduce r

Harberger (1962) model

- Second step: price of corporate output rises
- This shrinks corporate sector; non-corporate sector grows

- Suppose corporations are **capital-intensive** relative to non-corporate sector
- Then sectoral shifts reduces demand for K; reinforces first effect

- But, if corporate sector is labor intensive, shift toward non-corporate raises demand for K
- This counteracts first effect; can be stronger
- Possible that r rises
- Labor could bear full burden of corporate income tax!

- Harberger model emphasizes that incidence depends on:
  - Elasticity of substitution between K and L
  - Elasticity of demand for outputs
  - Relative intensity of inputs in each sector

- Typically solved by log-linearization. See Fullerton and Metcalf (2002) "Tax Incidence" Handbook of Public Economics. They provide a process that can be readily followed/adapted.
  - $W = w(1+\tau)/p$
  - Log to linearize: $ln(W) = ln(w) + ln(1+\tau) - ln(p)$
  - Differentiate: $dW/W = dw/w + d\tau/(1+\tau)$
  - Denote rates of change: $\hat{W} = \hat{w} + \hat{\tau} - \hat{p}$

- Next lecture, discuss how to adapt this model to study environmental policies