Instrument Choice:

(Or, Do I Really Want to Price Pollution?)

Lecture 3

ARE 264

January 24, 2022

Preparing for lecture 4

- bCourses prompt on Jacobsen & van Benthem due before class
- Background reading is Borenstein

Lecture 2 Recap

1. **What should we know about tradable permits?**
   - A tradable permit system can mimic cost effectiveness of a tax. Efficiency is independent of permit allocation.
2. **What is the Weitzman P vs Q model?**
   - Weitzman's model suggests that the relative slopes of supply and demand determine whether a price or quantity instrument is more efficient when there is uncertainty about costs
3. **What criteria might determine which instrument is best?**
   - Goulder and Parry suggest: Efficiency, Cost effectiveness, Equity/distribution, Robustness to uncertainty, Political feasibility, Political flexibility or robustness, Administrative costs, Enforcement

Outline

1. What criteria might determine which instrument is best?
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3. Discussion: the Coase Theorem

Today's lecture: Which one is best?

Source: Celtic Life

What policies are used to deal with environmental externalities?

1. Pigouvian tax (price instrument)
2. Tradable emissions permits (quantity instrument)
3. Subsidies for emissions reductions
4. Performance standards
5. Technology mandates
6. Technology (R and D) subsidies

Note: see Goulder and Parry (2008) for related material that reviews instrument choice

Criteria: how might we choose between alternatives?

1. Efficiency
2. Cost effectiveness
3. Equity/distribution
4. Robustness to uncertainty
5. Political feasibility
6. Political flexibility or robustness
7. Administrative costs
8. Enforcement

Observation A: Market-based instruments are cost effective

- Important: we achieve cost effectiveness without knowing anything about the cost of abatement, how that varies across producers, and how to optimally tilt between scale effects (changing x) and abatement actions (changing a)

- **Practical punchline:** in reality, we rarely know marginal damages at the optimum, so the proper Pigouvian tax is unknowable. But, this is **not** an excuse to deviate from market mechanisms and implement command and control. Market instruments deliver cost effectiveness with little required information.

Observation B: Regulatory alternatives can be cost effective

- If we know everything about all the relevant cost and utility functions, then other direct mandates or other policies can be just as effective
  - Note that we would need all of that information in order to know the optimum resource allocation, which we (usually) require in order to get full efficiency from a tax/permit system

- The advantage of market-based instruments therefore is that less information is required to ensure cost effectiveness (not full efficiency/optimality)

- Cost-effectiveness differences across instrument often large, but this is not guaranteed
  - Austin and Dinan (JEEM 2005): CAFE 65% more expensive than gas tax per gallon saved
  - Newell and Stavins (JRegE 2003): carbon abatement in power sector 50% lower under emissions tax than performance standard
  - Fowlie, Knittel and Wolfram (AEJ 2012): NO_x abatement costs twice as expensive for power plants as for transportation

- Direct regulatory mechanisms "less inefficient" when heterogeneity limited
- Performance standards can approach cost effectiveness as output-reduction small

Observation C: Equity matters, but need not be taken in isolation

- We will later discuss two ways to view equity
- One view, which I call **optimistic separability**, suggests that equity and efficiency issues can simply be severed and treated separately
- In broad terms, the idea is that if you don't like the distributional effects of a policy, you should just pair your policy with a tweak to the income tax (for example)
- The Kaplow article expresses a strong form of that view
- (The other is to take the equity implications of a given policy at face value)

Observation D: What do we know about political feasibility?

- Political feasibility is obviously important
- In particular, if you are interested in climate, the problem seems not to be solving for good policy designs in pure economic terms, but rather in crafting a policy that can be implemented

  - Area for potential research

- In short, we like market-based instruments because they are cost effective
- But there are caveats

- Our definition of cost effectiveness up to now is what Goulder and Parry (2008) call **narrow cost effectiveness**
- Administrative costs are often important and can justify an alternative policy

- Even within our narrow definition, there are reasons why the Pigouvian prescription needs to be modified, and sometimes this can imply other policies are more cost effective. In one example, later in class we will see how a performance standard can be more cost effective than a tax

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Weitzman result, via Pizer and Prest

$$\Delta^O = \frac{\sigma_\theta^2}{2c_2^2}(c_2 - b_2)$$

- Δ^O is the ex ante benefit of choosing prices ex ante versus quantities
- where c_2 is the slope of MC, b_2 is the slope of MB
- σ_θ^2 is the variance of the shift parameter on MC (i.e., the uncertainty about MC)

Pizer and Prest 2019

- How would you summarize the basic idea and main result of Pizer and Prest?
- In notation, the relative gain of a price instrument over quantity instrument is:

$$\Delta^O = 2\frac{\sigma_\theta^2}{2c_2^2}(c_2 - b_2) \quad \text{(Weitzman with 2 periods)}$$

$$\Delta^U = \frac{-(\sigma_\eta^2 + (b_2/c_2)^2\sigma_\theta^2}{2(b_2 + c_2)} \quad \text{(Pizer and Prest)}$$

Pizer and Prest 2019

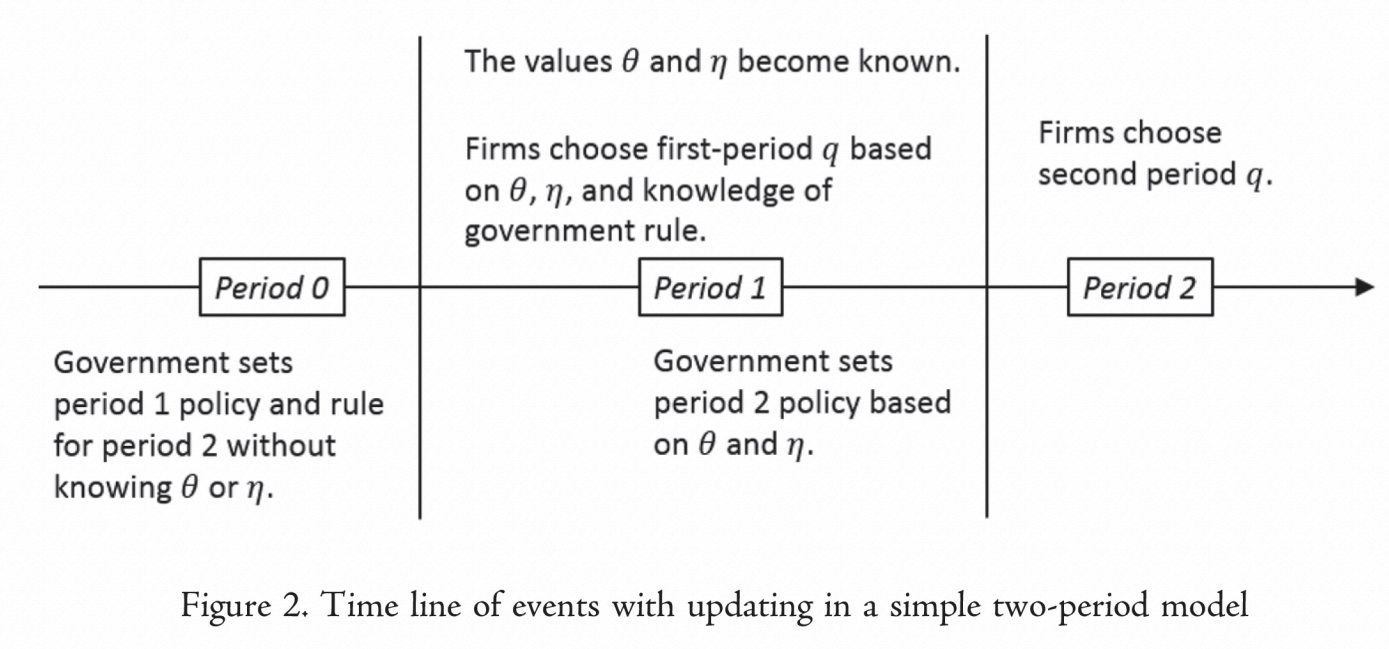

Figure 2. Time line of events with updating in a simple two-period model

- Main idea: firms resolve uncertainty before taking any action
- Thus, if government will update policy later, quantity policies have an advantage (lead to first best) because second period quantity policy impacts first period incentives via banking

Pizer and Prest 2019

- Does the calculation regarding SCC at the end add anything?
- Do you find the argument convincing?
- Why published in JAERE?
- Could you have written this paper? Would it have been a good job market paper?

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Expecting the Unexpected: Emissions Uncertainty and Environmental Market Design†

By Severin Borenstein, James Bushnell, Frank A. Wolak, and Matthew Zaragoza-Watkins*

We study potential equilibria in California's cap-and-trade market for greenhouse gases (GHGs) based on information available before the market started. We find large ex ante uncertainty in business-as-usual emissions and in the abatement that might result from non-market policies, much larger than the reduction that could plausibly occur in response to an allowance price within a politically acceptable range. This implies that the market price is very likely to be determined by an administrative price floor or ceiling. Similar factors seem likely to be present in other cap-and-trade markets for GHGs. (*JEL* D47, D81, Q54, Q58, R11)

- If this was your idea, how would you go about conducting the analysis?
- Where does all the uncertainty in demand for emissions come from?

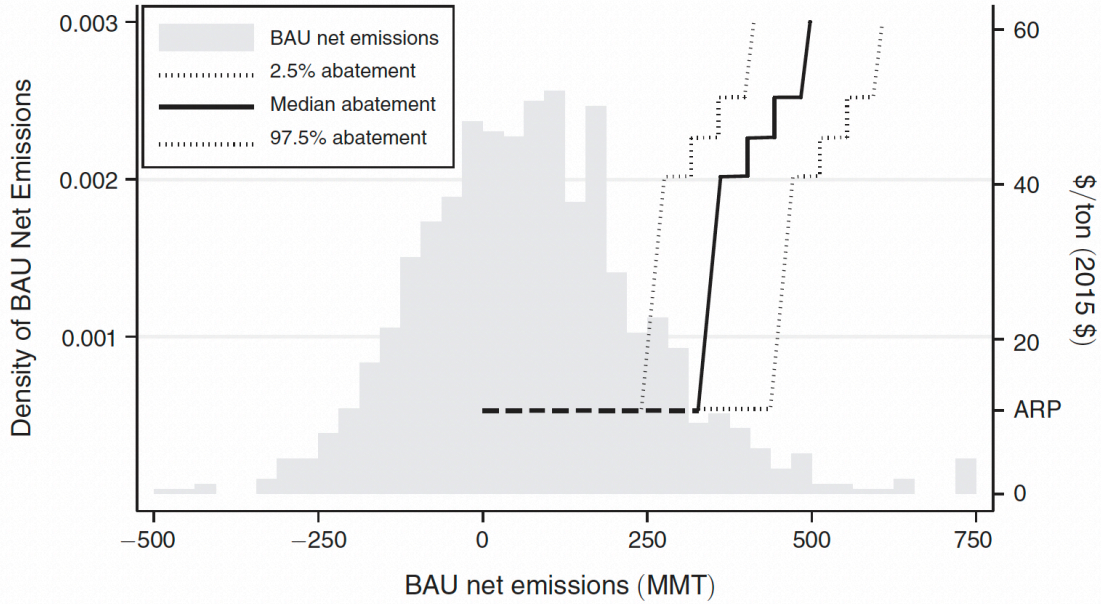

FIGURE 4. NET EMISSIONS AND ABATEMENT SUPPLY, 2013–2020

Note: BAU net emissions are 2013–2020; BAU emissions less allowances not in APCR.

- 94% ex ante probability that program will be at $10 floor; 5% probability at "ceiling"
- 1% chance of interior solution
- Ex ante, the cap and trade program is a tax set at the floor with some added risk on the margin

If time allows...collective think aloud

- There has been much debate about the merits of price versus quantity instruments for carbon
- How would you evaluate the difference, and do you think it matters?

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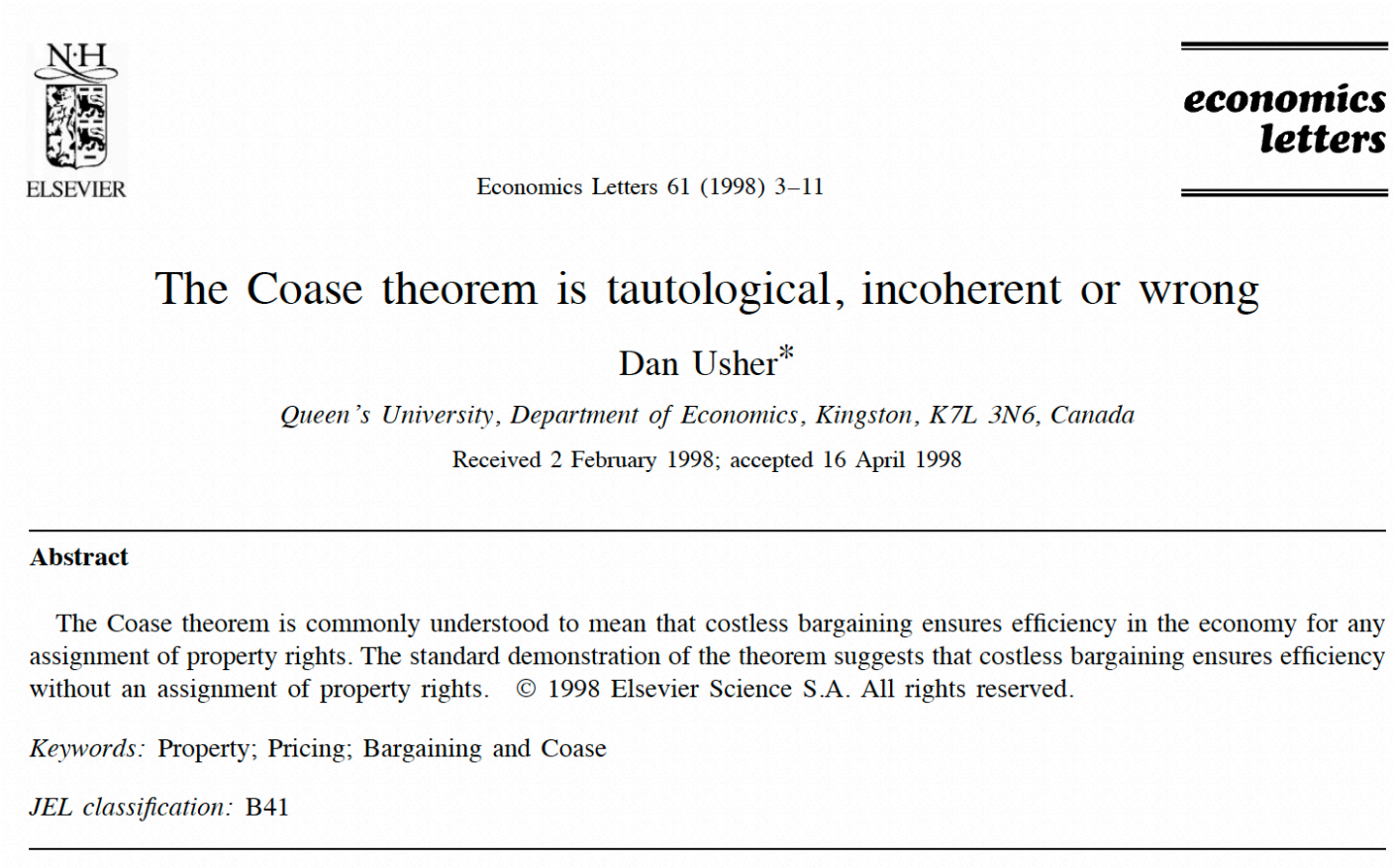
- Roughly, the Coase Theorem is usually stated as "no policy is needed for efficiency so long as property rights are clear and bargaining is cheap; and efficiency does not depend on to whom property rights are assigned"
- Posner 1993 (cited in Usher 1998): "If transaction costs are zero, the initial assignment of a property right—for example, whether to the polluter or to the victim of pollution—will not affect the efficiency with which resources are allocated."

- After spending time with the original article, is that what you understood the paper to assert?
- What other key ideas are in the paper?

- The Coase Theorem is a big idea
- Those who dislike government action point often point to the theorem to suggest there is no need for policy
- Those who like government action dismiss it: bargaining is costly; bilateral bargaining isn't efficient; free riding

- A better interpretation is that Coase (and more clearly Ostrum) forces us to contemplate transaction costs and institutions
  - Ellickson (1991): "The essence of Coase's argument...is that transaction costs are large and that economic actors arrange their institutions with an eye to these costs" (cited in Usher 1998)
- **Government is one way of overcoming transaction costs, but so is direct bargaining, and so are various other institutions**

Usher (1998)



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Economics Letters 61 (1998) 3–11

economics letters

The Coase theorem is tautological, incoherent or wrong

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Abstract

The Coase theorem is commonly understood to mean that costless bargaining ensures efficiency in the economy for any assignment of property rights. The standard demonstration of the theorem suggests that costless bargaining ensures efficiency without an assignment of property rights.

Keywords: Property; Pricing; Bargaining and Coase

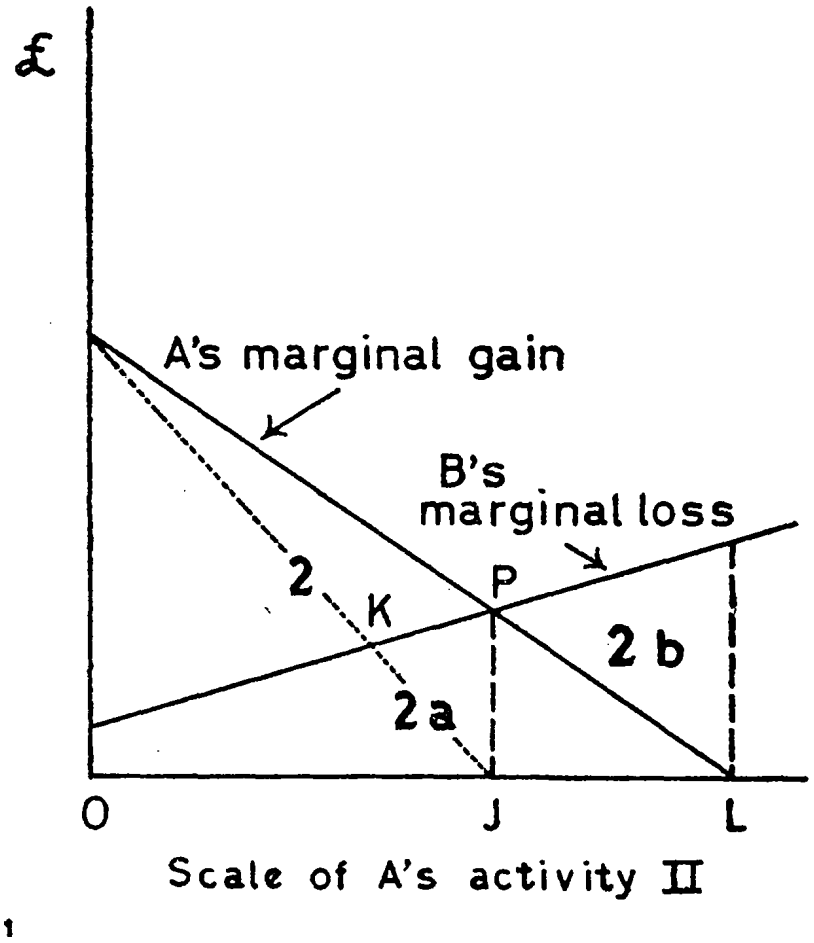
JEL classification: B41

- If transaction costs are zero, then there is in fact no need for property rights at all!
- Further, if transaction costs are zero, there is no need for prices or markets

There is more in Coase 1960 than the "Theorem"

- If bargaining is feasible and is taking place, the Pigouvian tax **creates** an inefficiency
  - See Turvey (1963) for a useful diagram; replicated in Baumol and Oates p. 33
  - Call this "Bargaining in the Shadow of a Pigouvian Tax"
- Should we tax "victims"? (e.g., tax the laundry for locating next to the smokey factory)
  - See Baumol (1972): a formalization of the problem demonstrates clearly that this is not true; the Pigouvian tax is sufficient for optimality
  - Note further that it is wrong to compensate victims, except in a lump sum manner

Fixing a non-existent problem is a problem



Turvey (1963)

- Efficient allocation is J
- Bargaining will achieve J in absence of policy
- Tax on A shifts MB curve
- New outcome is K

- Tax + Coasian bargaining = inefficiency

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