Second-Best Policy II

Or, What if Other Stuff is Messed Up?

Lecture 12

ARE 264

February 24, 2022

Lecture recap

① **What is the additivity property and when is it relevant?**
  - Second-best tax on a dirty good often has additively separable Pigouvian tax with second-best ("Ramsey") component

② **What is the marginal cost of public funds?**
  - MCPF represents welfare loss required to raise $1 revenue

③ **What are the tax interaction and revenue recycling effects?**
  - Tax interaction effect = taxing dirty good lowers real wage, exacerbates pre-existing distortion
  - Revenue recycling = using revenue to cut distortionary taxes ameliorates pre-existing distortion

④ **What intuition should we hold regarding the double dividend?**
  - We very likely want to tax below Pigouvian prescription (strong double dividend fails), but it is very valuable to use revenue to cut distortionary taxes (weak double dividend fails)

Some limits of the Pigouvian prescription

- The Pigouvian prescription is a useful default (reference point), but there are reasons why it needs modification:

- What if I can't tax the externality directly? (Diamond, JKSvB, sneaky first best)
- What about general equilibrium? (Double dividend, etc.)
- What if there is another market failure?
- What if the market already fixed the problem? (Coase)
- What about equity? (Kaplow view)

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- What about general equilibrium? (Double dividend, etc.)
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- What about equity? (Kaplow view)

- Today we discuss how general equilibrium considerations may alter the Pigouvian prescription

Outline

1. **What is the marginal value of public funds?**

2. **Goulder, Hafstead and Williams**

3. **What other distortions might exist that complicate the Pigouvian prescription?**

4. **Boomhower and Davis: how to build a paper**

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2 Goulder, Hafstead and Williams

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Marginal value of public funds

- A series of papers by Hendren has advanced an alternative to the MCPF, called the **marginal value of public funds**. Discussion here based on Finkelstein and Hendren JEP 2020

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- Concept aims to characterize the cost-benefit ratio of some government expenditure

- $\text{MVPF} = \dfrac{\text{Beneficiaries' Willingness to Pay}}{\text{Net Cost to Government}}$

- Key advantage is that Net Cost takes into account all of the ways that behavior changes in response to the program. You need the net effect, but not a decomposition of the channels. Claim is that this is more empirically relevant

Marginal value of public funds

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    - Sometimes an expenditure delivers benefits and reduces cost, yielding an "infinite" MVPF (Hendren and Sprung-Keyser 2020)

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- In contrast to the MCPF, to evaluate an expenditure, the MVPF can remain agnostic about how the expenditure is financed

- To compare across groups of people, still need welfare weights

- MVPF isn't a cure all, but it seems useful and readily adaptable to environment/energy/resources

Brief aside: WTP

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- But WTP depends on income, so low-income people have lower WTP

- Is it right to weigh benefits to wealthy people more?

- Just a reminder that WTP isn't everything and doesn't actually escape the need for taking a stand on SWF and aggregation

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Goulder, Hafstead and Williams (2016)

- What is the research question?
- What is the main contribution?
- What are the strengths and weaknesses of the paper?

Goulder, Hafstead and Williams (2016): analytical model

- Exceptionally clear exposition of intuition

- "In general, anything can happen."

- The way that externality-correcting policies affect real factor prices and therefore affect economic welfare is likely to be economically significant

- It might even overturn our basic intuition that ranks alternative <u>types</u> of policies

Goulder, Hafstead and Williams (2016): numerical analysis

- Why is this the right tool for the job?

- It is very difficult to do causal empirical work around general equilibrium issues

- If you can think of a way to graft causal analysis into these types of models, I suspect it would be very impactful

- GHW was not built in a day

- Any parting thoughts?

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Other market failures

- Market power
- Non-marginal cost pricing
- Co-benefits
- Behavioral frictions
- Leakage

- Any of these issues can alter optimal policy to deviate from the Pigouvian prescription

- In practice, are these issues a big deal?

What research questions might one ask about second-best settings like the one described here?

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- If a first-best Pigouvian tax is unobtainable, what is the second-best tax scheme?

- If we impose a second-best policy, how much welfare is lost compared to the first-best?
- I.e., how bad is the second-best?

- If we are stuck with the second-best, is a different instrument better than a tax (tradable permits)?
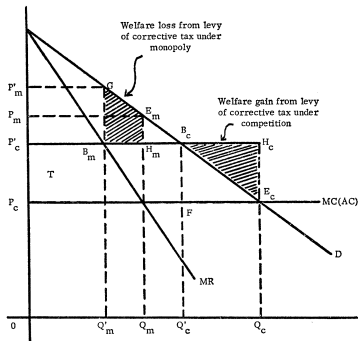
Market power and the Pigouvian prescription

FIGURE 1

EXTERNAL DISECONOMIES,
CORRECTIVE TAXES, AND
MARKET STRUCTURE

This note is presented as a contribution to the continuing dismantling of the Pigovian tradition in applied economics, defined here as the emphasis on internalizing externalities through the imposition of corrective taxes and subsidies. My central point is much more

- Source: Buchanan (1967)

- Pigouvian tax can lower welfare when a pre-existing distortion exists

- PS 1 derives optimal corrective tax for monopolist

- See Barnett (1980) for a treatment of this problem

Buchanan's critique

- For a negative externality, the market power works in a "helpful" direction compared to marginal cost pricing
- We want to reduce quantity, and the monopolist does so
- A monopolist could even "overshoot," justifying a subsidy on a dirty good
- Buchanan: the Pigouvian prescription will generally "overshoot," and quite possible that overshooting is so bad that Pigouvian prescription lowers welfare

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- Generally, the presence of market power leads to optimal tax that modifies the Pigouvian prescription (question 1)

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- Generally, the presence of market power leads to optimal tax that modifies the Pigouvian prescription (question 1)
- But, market power is <u>endogenous</u>, so if alternative policy structures <u>alter</u> market power differently, we could get different ranking of policies (question 3)

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  - Cement industry, major source of pollution, characterized by market power
  - Like Buchanan, find that inefficiencies due to market power strongly counteract benefits of carbon tax; at low SCC, imposing a tax causes <u>net harm</u>
  - Emphasizes role of leakage
  - Conclude that <u>alternative policies</u> are better than carbon tax!

- Impressive and successful paper because it is technical, but it is technical for a reason. The structural entry/exit model is a necessary tool for answering the question, which is traceable to a classic idea

Non-marginal cost pricing

- Market power is, fundamentally, a reason that prices do not reflect marginal costs

- This can also occur for other reasons, like market regulation

- See Davis and Muehlegger (RAND 2010) and Borenstein and Bushnell (Annual Review 2015, NBER wp 2018)

Leakage

- Policy prescriptions can also be changed significantly by leakage concerns; changing both the optimal tax and whether a tax is best instrument

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- Fowlie, Reguant and Ryan 2016 also features leakage
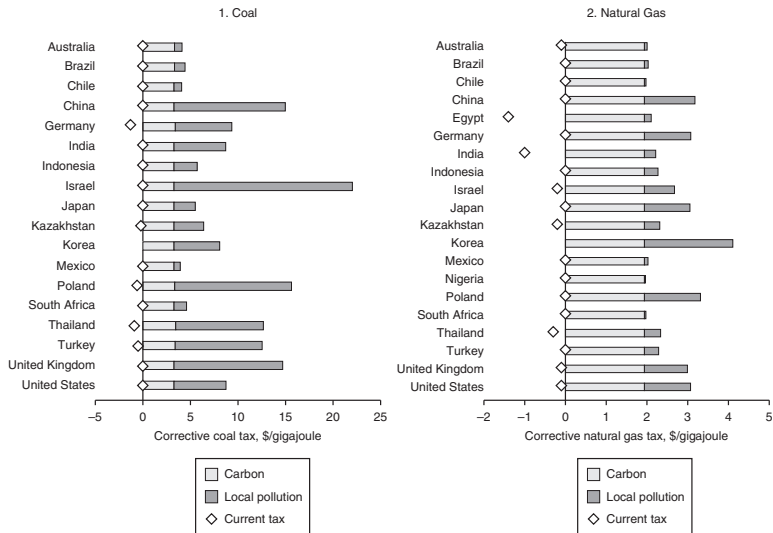
Behavioral frictions

- If private actors are not fully optimizing, this can also alter either the Pigouvian prescription or the preferred policy instrument

- We will spend a week on this

Co-benefits

- One action often leads to multiple types of pollution

- This matters for welfare analysis if the "other" pollutants are not priced at social marginal cost

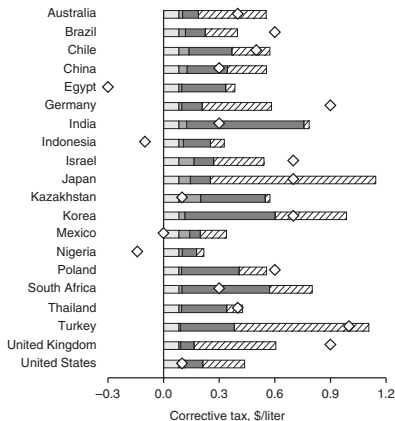- Frequently described as **co-benefits**

- First draft of Knittel and Sandler was called "Cleaning the Bathwater with the Baby: The Health Co-Benefits of Carbon Pricing in Transportation"
- The VMT regressions were motivated as relevant to comparing a gas tax to CAFE (=fuel economy performance standard for cars)
- It did not have the Diamond model (as I recall...)

- (An intermediate draft was titled "The Gas Tax Sucks")

Figure 1.1 Corrective Fuel Taxes to Reflect Environmental Costs, Selected Countries, 2010

Source: Parry et al. 2014 IMF "Getting Prices Right"

3. Gasoline

4. Motor Diesel

Corrective tax, \$/liter

Corrective tax, \$/liter

Legend (Gasoline): Carbon, Local pollution, Accident, Congestion, Current tax

Legend (Motor Diesel): Carbon, Local pollution, Accident, Congestion, Road damage, Current tax
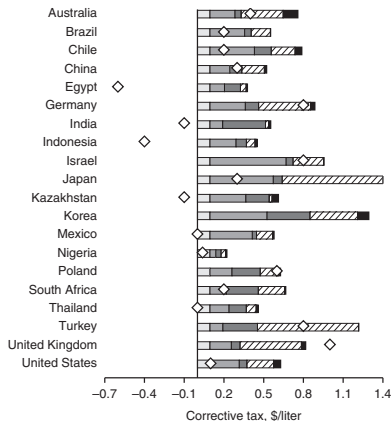
Source: Parry et al. 2014 IMF "Getting Prices Right"

Parry and Small (2005)

- What is the optimal gas tax?

- A gas tax is poorly targeted to fix mileage-related externalities

- Endogenize choice of miles traveled as well as fuel economy

- Focus on fiscal interactions, as well as per gallon versus per mile externalities

- This paper is marries the fiscal interaction idea with basic co-benefit issues

Parry and Small intuition

- **Adjusted Pigouvian Tax:** below marginal social damage level because environmental taxes are less efficient at raising revenue than are labor taxes

- **Ramsey Tax:** Gasoline is a consumption good, should be taxed. Theory says higher taxes for (a) leisure complements (Corlett-Hague intuition) and (b) inelastic goods (Ramsey intuition)

- **Congestion feedback:** Reducing congestion increases labor supply, which alleviates distortions

TABLE 1—BENCHMARK CALCULATIONS OF THE OPTIMAL GASOLINE TAX RATE
(All figures in cents/gal at U.S. 2000 prices)

	United States	United Kingdom
Elements in equation (2.9)		
Fuel efficiency, M/F (miles/gal)	22.6	25.6
Marginal external cost, MEC_F	83	123
Pollution—fuel component, E^{P_F}	6	6
Pollution—distance component, $E^{P_M} \cdot \beta M/F$	18	20
Congestion component, $E^C \cdot \beta M/F$	32	72
Accident component, $E^A \cdot \beta M/F$	27	25
Adjustment to MEC_F for excess burden, $MEC_F \cdot [(1 + MEB_L)^{-1} - 1]$	−9	−19
Components of optimal gasoline tax rate		
Adjusted Pigovian tax	74	104
Pollution, fuel-related	5	5
Pollution, distance-related	16	17
Congestion	29	61
Accidents	24	21
Ramsey tax	26	23
Congestion feedback	1	7
Optimal gasoline tax rate (t_F^*)	101	134
Naive gasoline tax rate,[a] MEC_F^1	176	348

[a] The naive rate is MEC_F computed from (9b) with $M/F = M^0/F^0$ and $\beta = 1$.

Take home message

- In practice, additional distortions can have significant impact on policy design

- Fiscal distortions (factor prices) are a ubiquitous concern
- Co-benefits often important, sometimes dwarf targeted externality (e.g., Mercury regulations justified primarily from VSL from air pollution)
- In some cases, market power may be significant issue
- Leakage often a major concern
- Behavioral distortions can be important as well (coming soon)

- Other market distortions will generally alter optimal tax, but can also alter rank of preference over types of policies

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(b) Refrigerators

Subsidy falls
from $170
to $110

Subsidy falls
from $110
to $30

Subsidy falls
from $30
to $0

Minimum
to participate

Percentage of Households Participating

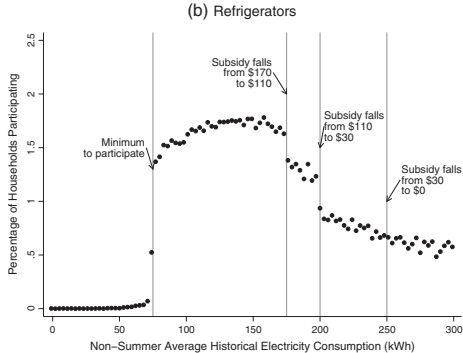Non–Summer Average Historical Electricity Consumption (kWh)

Fig. 5. Program participation.

Source: Boomhower and Davis (2014)

- If you have this figure, how do you build a paper?

- Boomhower and Davis (2014) consider how fiscal interactions affect interpretation of inframarginal recipients of green subsidy

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- Setup: consumers choose whether or not to adopt energy efficient action
- Adoption yields social marginal benefit

- Question: how do fiscal distortions affect the welfare impact of a green subsidy?

$$W = U(q) - C(q) + \tau q + qs - \eta qs$$

- Quantity of adoption q depends on subsidy rate s
- U and C are private benefits and costs
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- If $\eta = 1$, last two terms cancel

$$\frac{dW}{ds} = [U' - C' + \tau - (\eta - 1)s] \frac{dq}{ds} - (\eta - 1)q$$

- First term relates to marginal participants—what is net welfare impact of getting new adopters
- Second term relates to inframarginal transfers—level of q represents people already adopting, so raising s increases transfer to them without changing externality

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- But, when q is very large; then second term dominates

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- But, when q is very large; then second term dominates
- In the limit: as adoption saturated, η determines welfare
- **Key observation: inframarginal transfers matter when revenue is distortionary**

$$\frac{dW}{ds} = [U' - C' + \tau - (\eta - 1)s]\frac{dq}{ds} - (\eta - 1)q$$

- If $\eta = 1$, then setting $\tau = s$ is optimal ($dW/ds = 0$)
- If $\eta > 1$, then optimal subsidy will be below marginal benefits

Boomhower and Davis

- Combines basic theoretical reasoning with nice identification
- CBA for energy efficiency subsidies complicated by fiscal interactions
- Fiscal interactions will erode CBA for subsidy programs

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