

INEFFICIENT POLICIES IN THE GREEN TRANSITION

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INTRODUCTION

TWO APPROACHES TO CLIMATE POLICY



Taxing Pollution



Supporting Clean Alternatives

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Economists recommend taxing pollution:

- Reduces emissions cost-effectively during the transition
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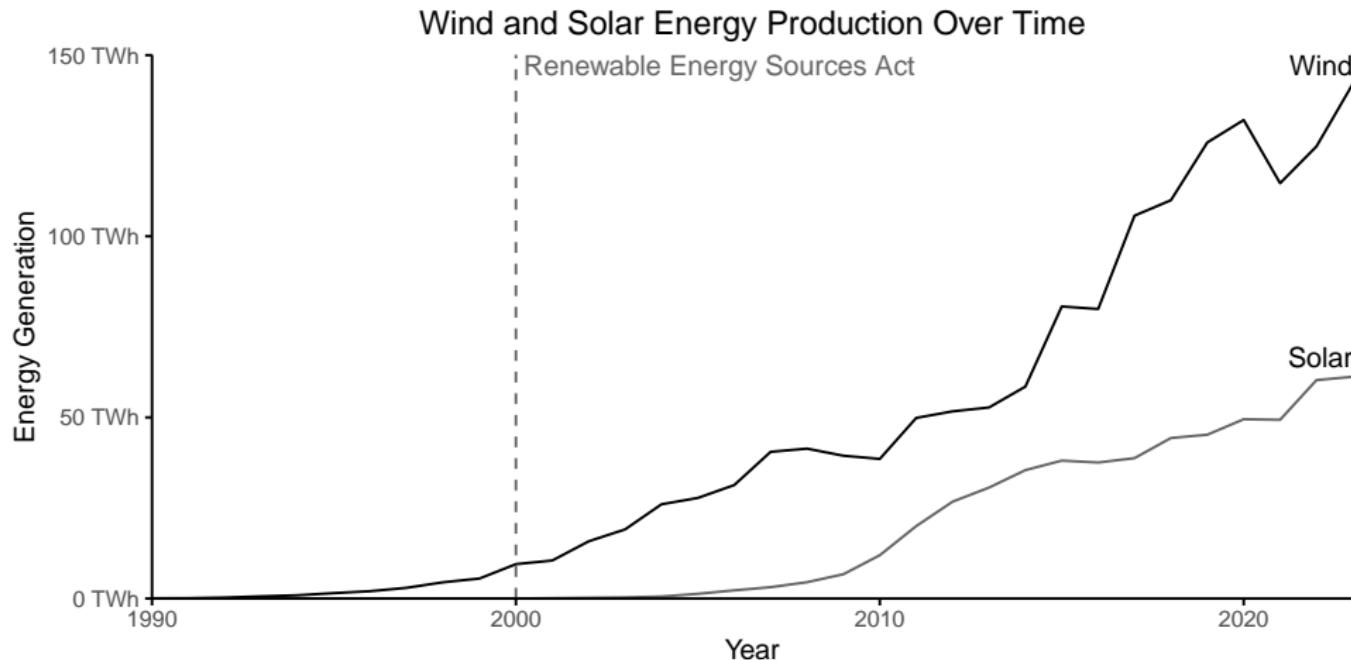
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Variation across country, and **within country** over time.

Pattern: policies that support green alternatives → carbon taxes.

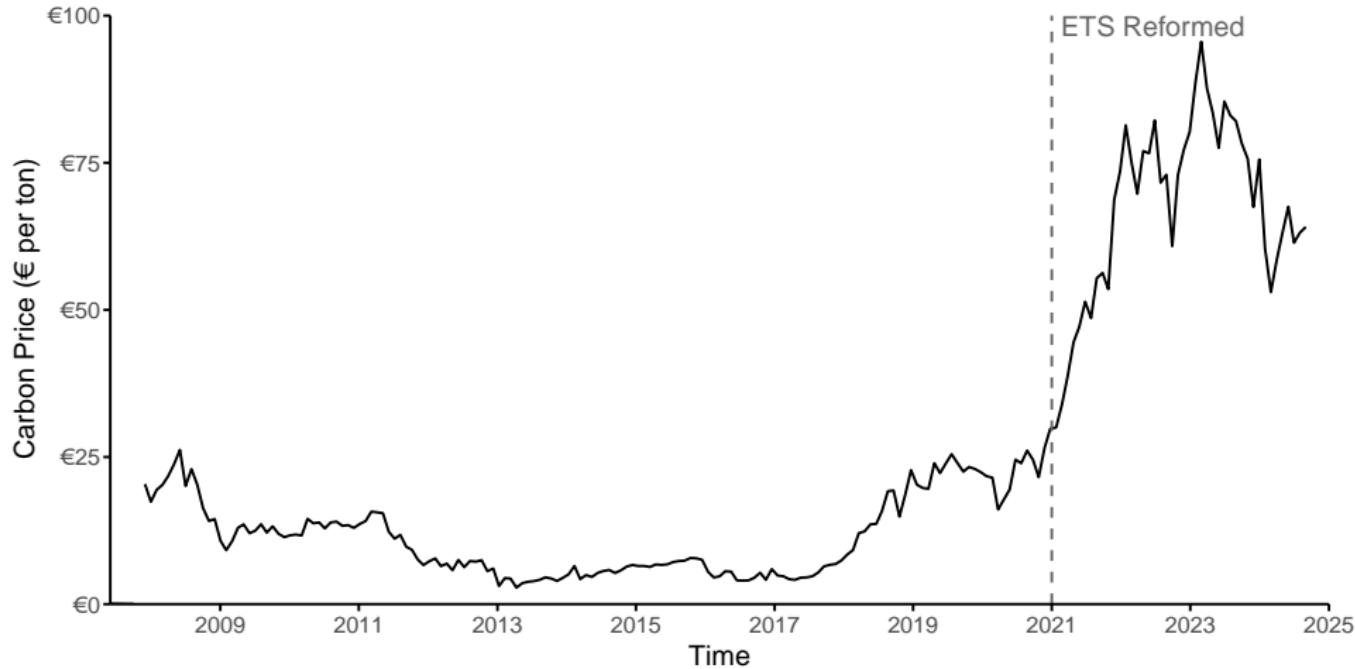
GERMANY

2000: Renewable Energy Sources Act



GERMANY

EU Emissions Trading System (ETS) starts in 2005, reformed in 2021
Germany prices carbon in the heating and transportation sectors in 2021



CANADA – 2005 PROJECT GREEN

Burning Our Money to Warm the Planet

*Canada's Ineffective Efforts to
Reduce Greenhouse Gas
Emissions*

Mark Jaccard, Nic Rivers,
Christopher Bataille,
Rose Murphy, John Nyboer and
Bryn Sadownik

CANADA – 2018 FEDERAL CARBON PRICE

Canada passed a carbon tax that will give most Canadians more money

By rebating the revenue to households, disposable income rises, which can be a boon for the Canadian economy



Prime Minister Justin Trudeau answers a question on Parliament Hill in Ottawa on Thursday, Oct. 25, 2018. Photograph: Canadian Press/REX/Shutterstock

ACCOUNTING FOR SUBSIDIES?

Strategic policy sequencing: use subsidies to build a coalition today, introduce carbon pricing tomorrow (Meckling et al 2015, 2017; Pahle et al 2018).

Efficient policies impose costs on polluters → not feasible if polluters are politically powerful.

Subsidies that induce investments in green capital concentrate benefits in pivotal constituencies.

These investments change preferences in the future, making carbon pricing feasible.

QUESTIONS

Why are carbon prices initially too low?

Under what conditions is the policy sequencing strategy feasible?

How is the sequencing strategy affected by polarization?

Can non-binding policies such as net-zero commitments have real effects?

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This paper: dynamic model of climate policymaking.

MY APPROACH

Two policies: a carbon tax and a subsidy for green investments.

Policy requires approval by a legislature.

Legislators represent constituencies that differ in how “easy to decarbonize” they are.

Polluter districts are initially a majority.

Risk of turnover: the policymaker can be replaced by an environmentally unfriendly politician in the future.

KEY IDEAS

Legislative bargaining → need to **build a coalition**.

The coalition has to include green legislators and **pivotal polluting districts**.

Green and polluter legislators have different demands. They impose **political constraints**.

Polluter districts oppose carbon taxes, but are willing to accept subsidies.

Subsidies require green investments, which **change the preferences** of polluting districts in the future.

Once investments are sunk, carbon taxes become politically acceptable.

PREVIEW OF RESULTS

Carbon tax is initially below optimal, and the subsidy is above optimal.

In the second period, if the initial policymaker stays, optimal carbon tax.

Economic prospects of decarbonization improve → policy sequence more likely to start.

Proposer too green or not green enough → no climate policy.

The effect of polarization is ambiguous.

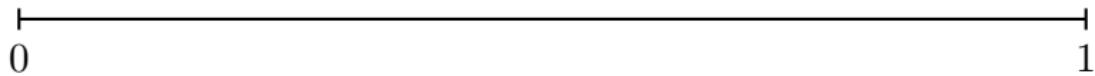
Under some conditions non-binding policy can have real effects by changing expectations.

ROADMAP

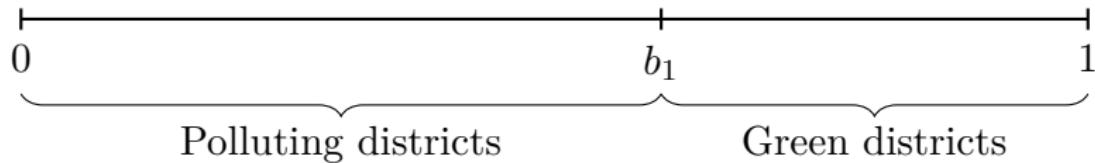
1. The Model
2. Results
3. Extensions
4. Empirical Implications

THE MODEL

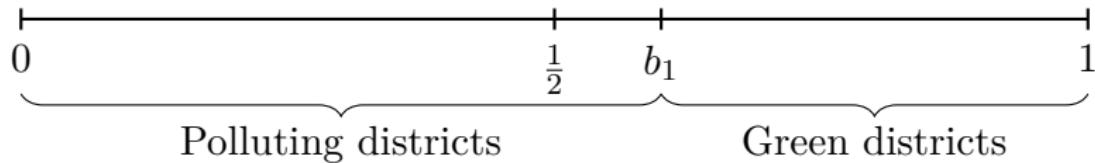
THE MODEL – ECONOMY



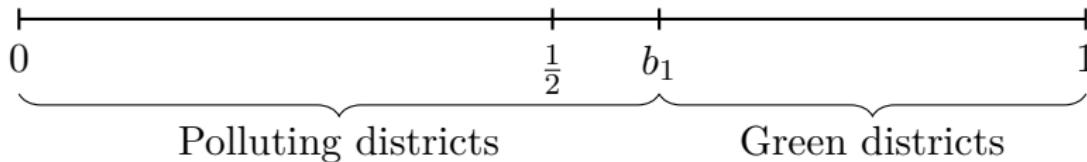
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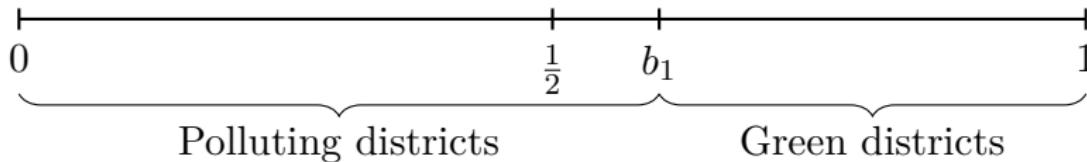
THE MODEL – ECONOMY



Production function is Cobb-Douglas with $\alpha = \frac{1}{2}$ using final good and capital.

- Polluting technology produces y at cost $\frac{1}{2}y^2$.
- Green technology in district i produces Aiy at cost $\frac{1}{2}y^2$.
- $A > 1$ measures the productivity of green technology.

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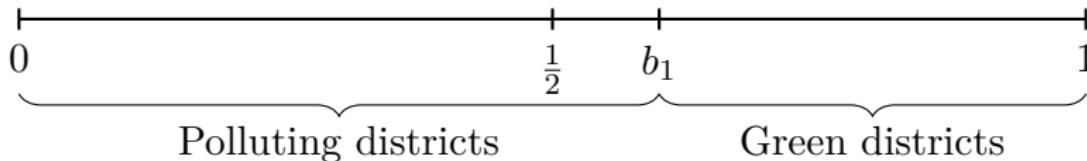


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Polluting district i can invest in green capital and transition at cost $c \geq 0$.

THE MODEL – POLICIES

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Investment subsidy $s \geq 0$.

Lump-sum transfer T .

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THE MODEL – POLITICS

The districts are represented in a legislature.

Initially no climate policy, and the proposer is G .

In each period $t = 1, 2$:

1. Proposer chooses a carbon tax τ_t ; in the first period, also a subsidy s .
2. If a majority of districts prefer it to the status quo, it is implemented, and becomes the new status quo.
3. Districts make production and investment decisions.
4. The next period proposer is determined: with probability ρ the current proposer is replaced by B .

In the second period T is automatically determined to balance the budget.

THE MODEL – PREFERENCES

Agents maximize discounted expected utility with discount factor δ .

Legislators only care about consumption π_{it} .

Proposer P 's payoff in period t is

$$W_P = \int_0^1 \pi_{it} di - 1_{P=G} \lambda \underbrace{\int_0^{b_t} y_{it} di}_{\text{emissions}}.$$

λ is the social cost of carbon.

RESULTS

POLICY WITHOUT POLITICS

If the proposer decides policy in both periods,

- **carbon tax equals the social cost of carbon:** $\tau_1 = \tau_2 = \lambda$,
- investment subsidy not used: $s = 0$. It is an **inefficient instrument** for reducing emissions.

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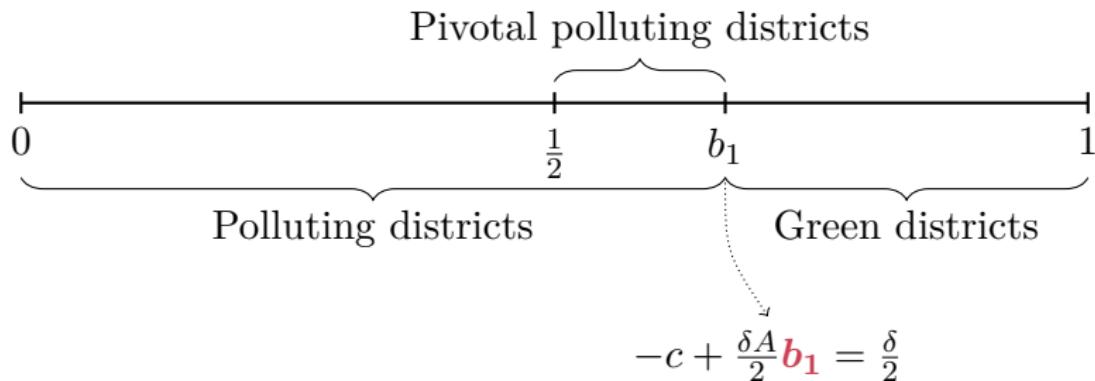
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Turnover explains the use of subsidies, but not the sequencing.

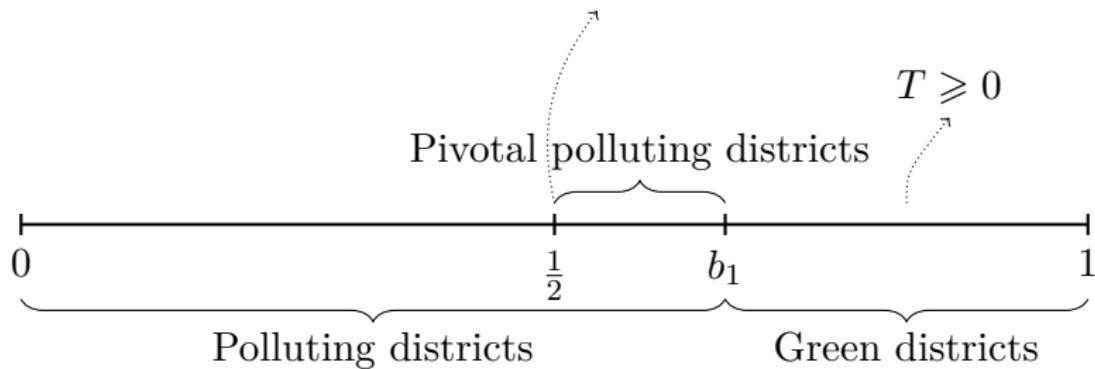
LEGISLATIVE BARGAINING

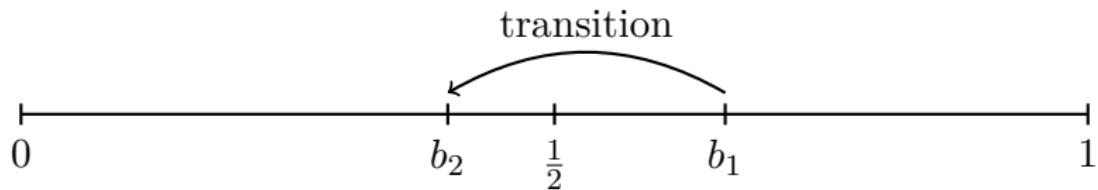
Polluting districts are a majority, so a **winning coalition** must include some of them.

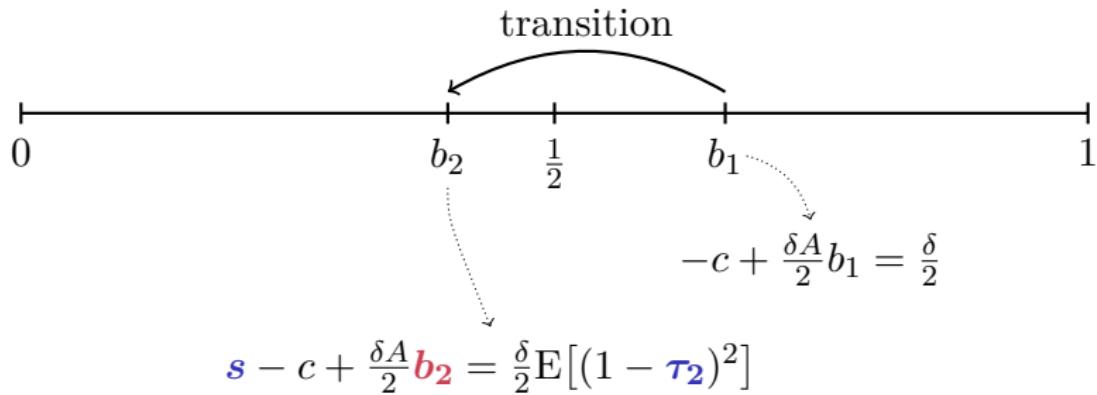
- Strategy: use the subsidy to induce the pivotal districts to accept policy today and transition.
- In the second period there is a green majority, so the policymaker can implement an optimal carbon tax.

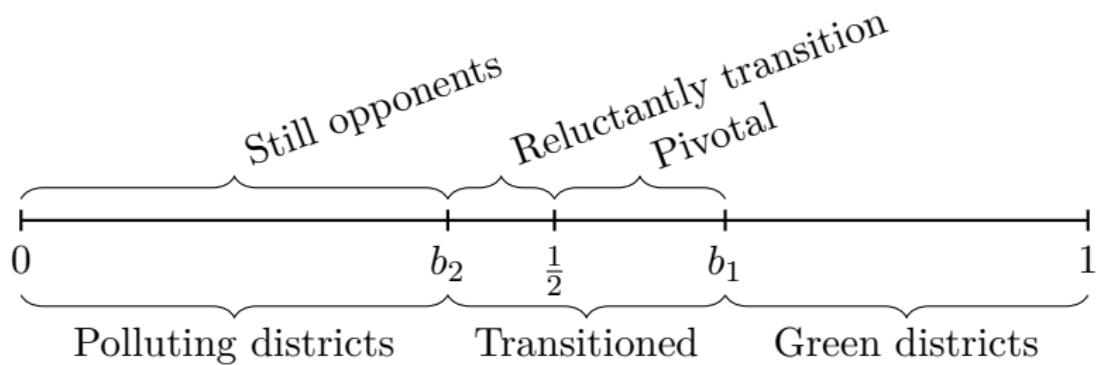


$$\frac{1}{2}(1 - \tau_1)^2 + s - c + \frac{\delta A}{2} \frac{1}{2} + T \geqslant \frac{1}{2} + \frac{\delta}{2}$$









POLITICAL CONSTRAINTS

$$\frac{1}{2}(1 - \tau_1)^2 + s - c + \frac{\delta A}{4} + T \geq \frac{1}{2} + \frac{\delta}{2} \quad (\text{Polluting Districts})$$

$$T = b_1\tau_1(1 - \tau_1) + \delta b_2 E[\tau_2(1 - \tau_2)] - s(b_1 - b_2) \geq 0 \quad (\text{Green Districts})$$

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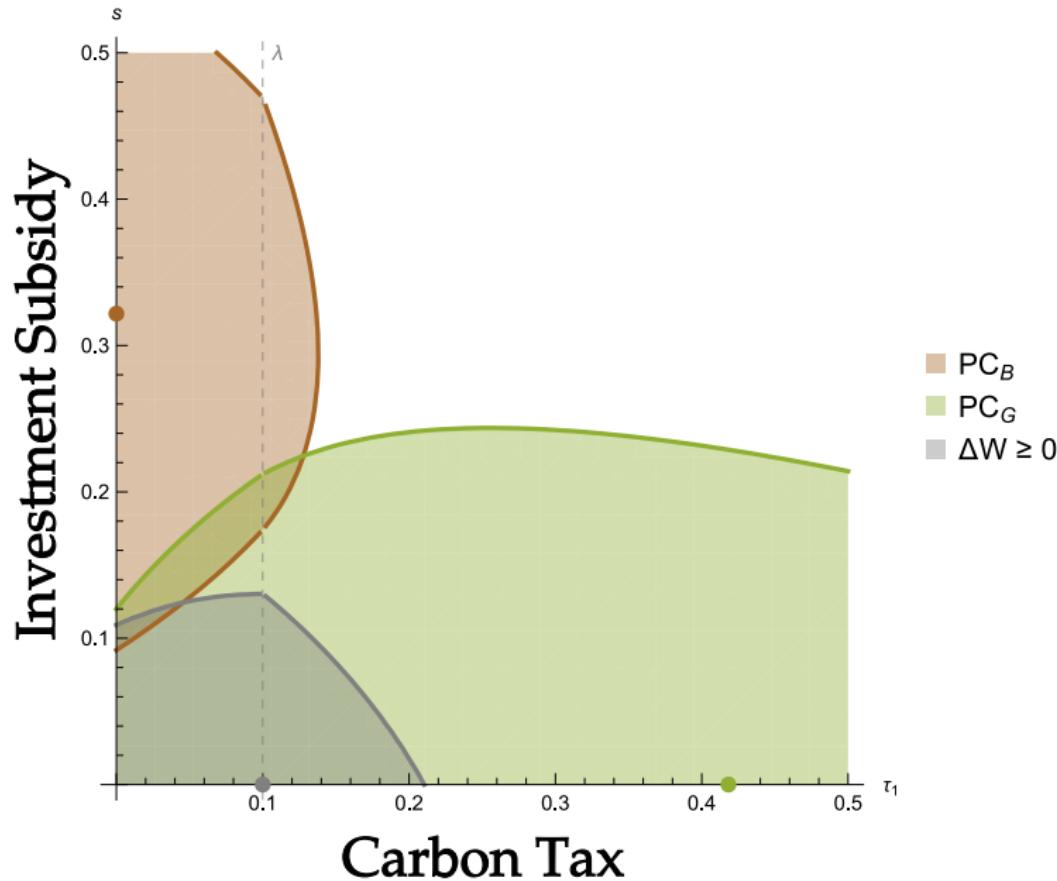
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POLITICAL CONSTRAINTS



WHY ARE CARBON TAXES LOW?

Proposition. *In equilibrium either the first-period carbon tax is below the social cost of carbon and the subsidy is positive, or no climate policy is enacted, i.e., $\tau_1 < \lambda$ and $s > 0$, or $\tau_1 = s = 0$.*

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Why? Tradeoff:

- Imposing costs on polluters today requires more subsidies to provide compensation:
 $\tau_1 \uparrow \Rightarrow s \uparrow$.

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Improving opportunities in the green sector or reducing capital costs.

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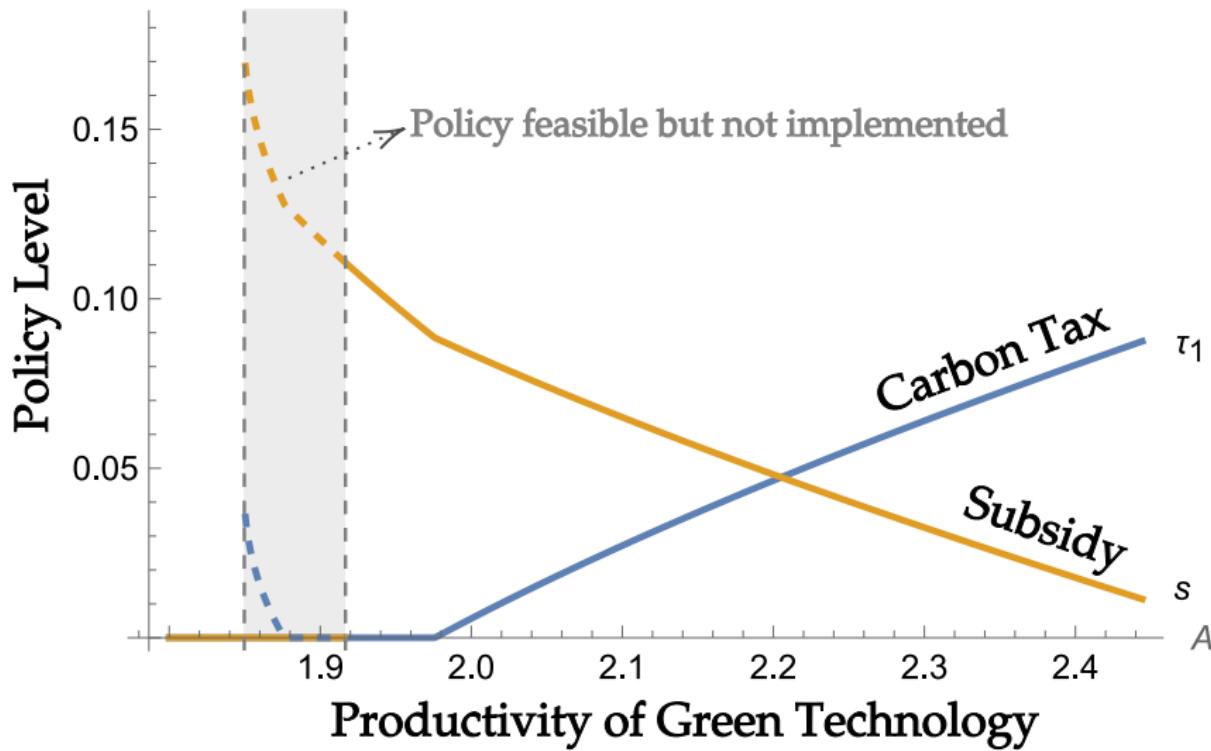
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First force dominates.

Political constraints are feasible if and only if green technology is sufficiently advanced, and capital costs are sufficiently low.

EFFECT OF GREEN TECHNOLOGY



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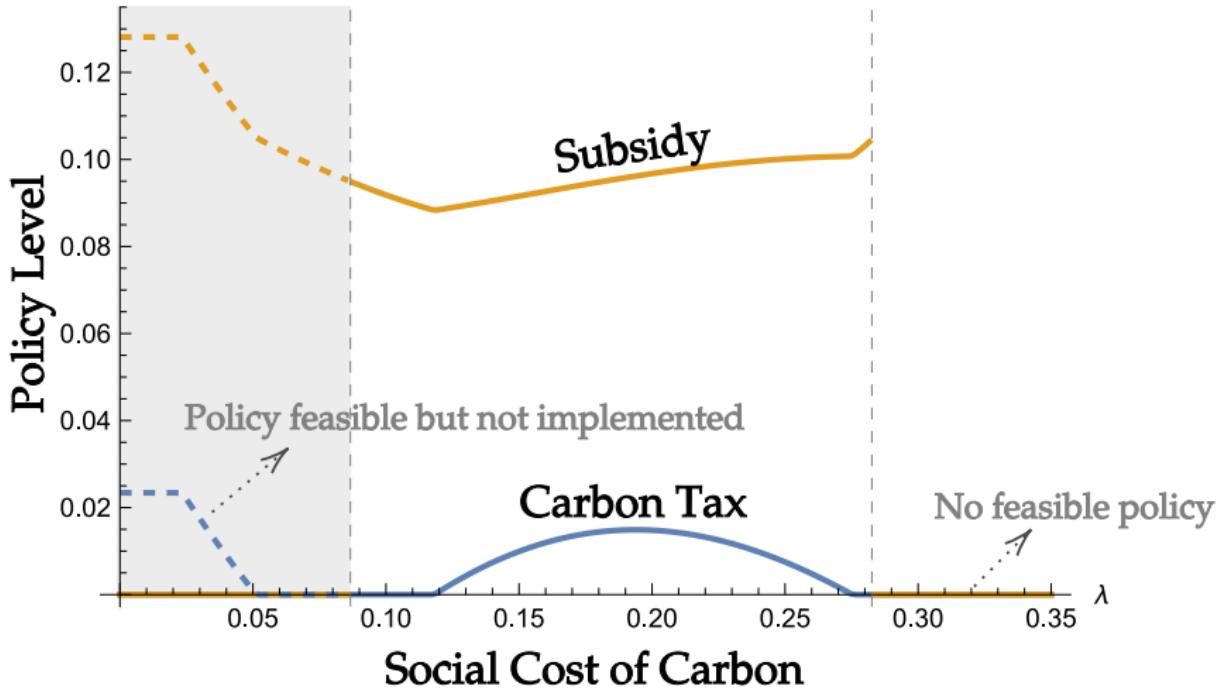
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The effect is ambiguous.

Result: if A is not too large, increasing the social cost of carbon makes the constraints less likely to be feasible.

SOCIAL COST OF CARBON



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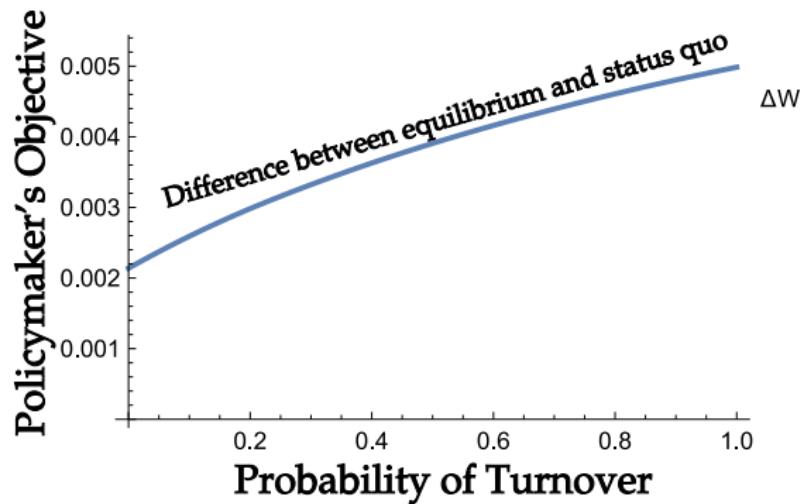
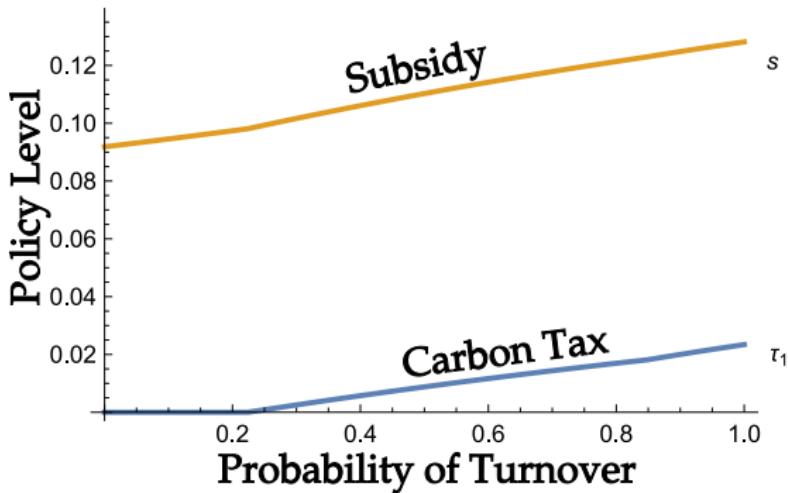
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The effect is again ambiguous.

Result: if b_1 is high, increasing the probability of turnover relaxes the constraints.

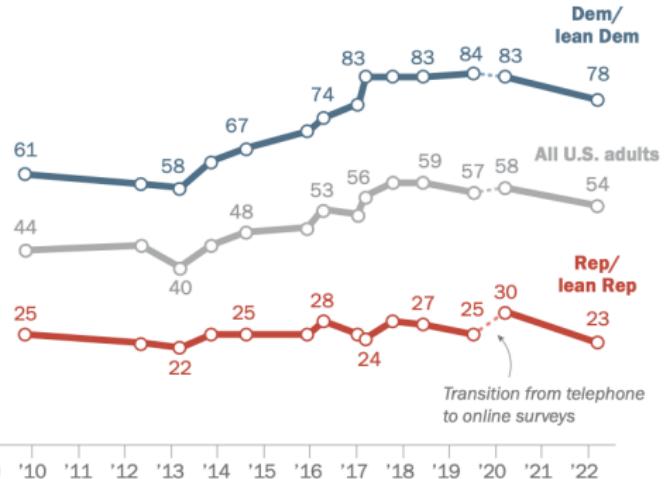
EFFECT OF RISK OF TURNOVER



GROWING POLARIZATION IN THE U.S.

54% of Americans view climate change as a major threat, but the partisan divide has grown

% of U.S. adults who say global climate change is a major threat to the country

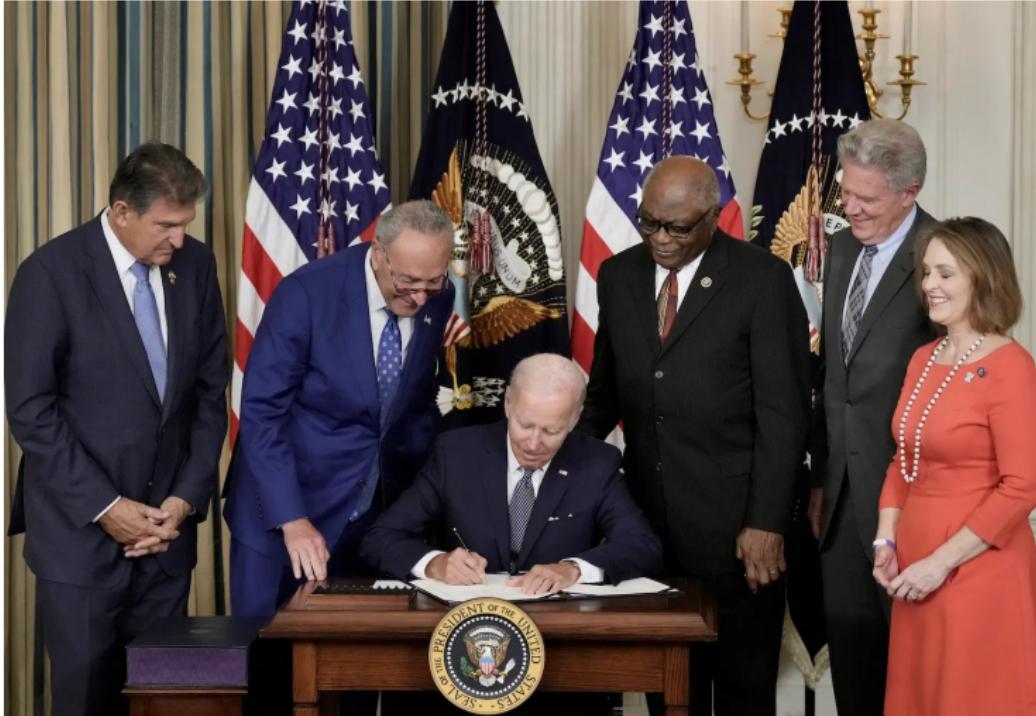


Note: Respondents who gave other responses or did not give an answer are not shown.

Source: Survey conducted March 21-27, 2022.

PEW RESEARCH CENTER

AND YET



Biden signing the Inflation Reduction Act. Drew Angerer / Getty Images

SUMMARY OF RESULTS

Can policy sequencing account for initially low carbon prices?

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SUMMARY OF RESULTS

Can policy sequencing account for initially low carbon prices?

- Yes, because there is a tradeoff between carbon prices and inefficient compensation.

Under what conditions is the strategy feasible?

- Carbon abatement technology needs to be sufficiently advanced.
- The social cost of carbon cannot be too low nor too high.

How is the sequencing strategy affected by polarization?

- The effect is ambiguous. The risk of the opposition taking agenda-setting power in the future can relax the political constraints today.

EXTENSIONS

Targeted transfers and subsidies

- Information constraint.
- Mechanism design approach. Main tradeoff remains.

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Green preferences

- Polluting districts still oppose carbon taxes.
- Under restrictive conditions first-best can be implemented.
- In general same tradeoff as without concerns for climate.

EMPIRICAL IMPLICATIONS

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Main causal claim

Subsidies → investments → attitudes toward climate policy ↑ → carbon pricing.

EMPIRICAL IMPLICATIONS

Industry level predictions

- Subsidies break the “fossil fuel coalition” into three types:
 - “Decarbonizable” industries support subsidies.
 - “Reluctant” industries oppose subsidies, but take them.
 - Hard to abate industries remain opponents.
- Exciting research agenda: study the effects of green industrial policies in real time.
 - IRA, EU Green Deal, South Korea’s Green New Deal, Sweden’s Green Industrial Leap.
- Main question: does opposition to carbon taxation diminish as a result?
 - Firm-level analysis: we can look at lobbying and campaign contributions.
 - Individual-level analysis: we can look at voters’ attitudes over time.

EMPIRICAL IMPLICATIONS

Country level predictions

- Subsidies → investments → attitudes toward climate policy ↑ → carbon pricing.
- Mediators: structure of the economy and political institutions.
- Structural version of the model → testable predictions.

BROADER CONTRIBUTION

Political economy creates a linkage between the two approaches:

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Theoretical contribution: climate policymaking in a legislative bargaining model.

- Microfounded and dynamic political constraints.
- The political power of industries is not fixed and policy can reduce it.

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- Microfounded and dynamic political constraints.
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Policy implications:

- *Some* inefficient policies are good because of their policy feedback effects.

THANKS!

Paper: juandodyk.github.io/files/jmp.pdf

Slides: juandodyk.github.io/files/jmpresentation.pdf

My email: juandodyk@g.harvard.edu

Comments welcome!

DELETED SLIDES

THE CHALLENGE OF CLIMATE POLICY

Climate change mitigation is an urgent political challenge.

We know how to solve it: carbon pricing (Acemoglu et al 2016, Blanchard et al 2023).

Carbon prices are below the social cost of carbon.

- Only 1% of global emissions priced above the recommended level (World Bank)

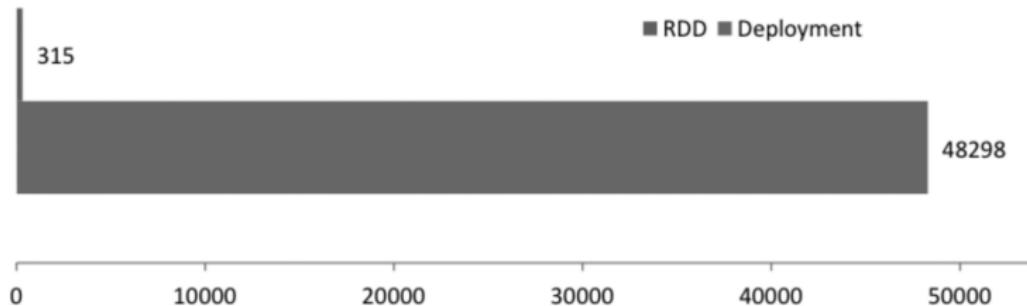
Instead, countries use a wide range of policies, some of which reduce emissions at much higher economic costs.

However, variation across country.

Within country pattern: inefficient policies lead to carbon pricing.

EUROPEAN UNION

2001: Renewable Energy Directive



Subsidies to R&D vs. deployment in wind and solar energy in the top six European countries (2010).
Source: Zachmann et al. (2014).

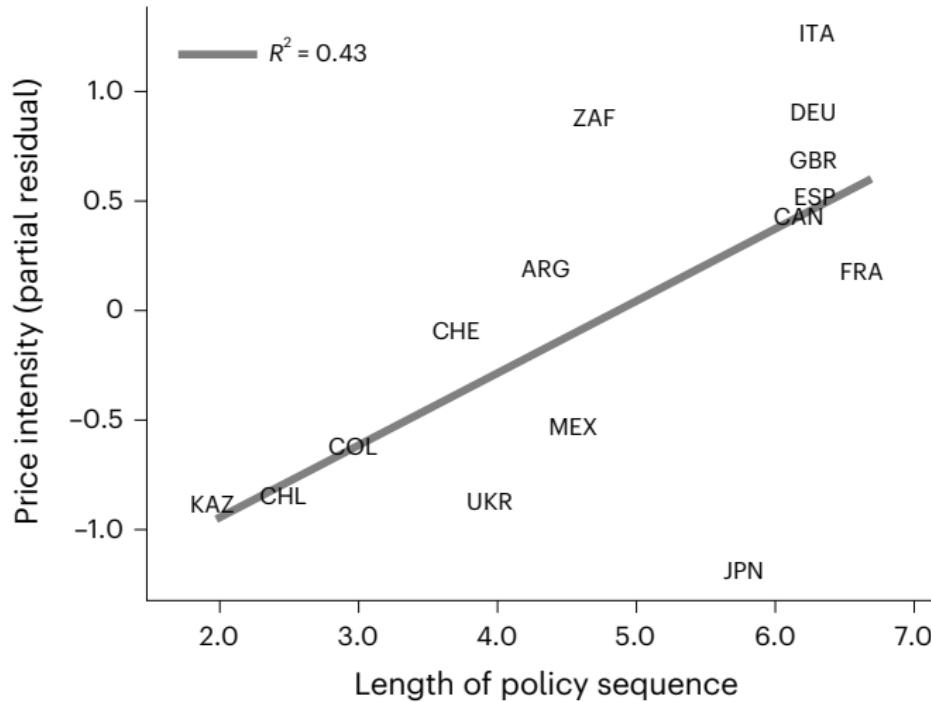
EUROPEAN UNION

2003: Emissions Trading System (ETS) introduced

2021: ETS reformed



EVIDENCE



Source: Linsenmeier et al, 2024, "Policy sequencing towards carbon pricing among the world's largest emitters", *Nature Climate Change*.

DISCUSSION OF THE ASSUMPTIONS

- Green investment as a binary decision:
 - as a result of the EU ETS, “firms [paid] an up-front fixed cost to invest in alternative ‘clean’ production technologies that reduce marginal variable costs” (Colmer et al 2024).
- Expectations of future policy impact economic decisions today (Ramadorai and Zeni 2024).
- Productivity of clean technology is heterogeneous across constituencies:
 - the cost-competitiveness of renewable energy depends on location (Davis et al 2023),
 - the advances in decarbonization technology depend on industry (Victor et al 2019).
- Carbon-intensive interests hold political power (because of their representation in the legislature) regardless of which party controls the agenda (Mildenberger 2020).
- Investments in green capital change preferences:
 - Subsidized rooftop solar panels → support for climate policies and the Green party in Germany ↑ (Alberdi 2024).
 - Wind turbine installations → Democratic vote shares ↑ (Urpelainen and Zhang 2022).
 - Fuel-efficiency regulations on cars led some car manufacturers to resist Trump’s decision to roll back those regulations (Vormedal and Meckling 2023).

PROPOSER'S INCENTIVES

Proposer cares about aggregate consumption and carbon emissions.

The tradeoff is determined by the SCC λ .

These objectives are in tension:

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Result. *There is a policy that satisfies the political constraints and the proposer prefers over the status quo only if the social cost of carbon is not too low.*

PROPOSER'S INCENTIVES

Proposer cares about aggregate consumption and carbon emissions.

The tradeoff is determined by the SCC λ .

These objectives are in tension:

- Reducing carbon emissions requires either reducing production or increasing investment.

Result. *There is a policy that satisfies the political constraints and the proposer prefers over the status quo only if the social cost of carbon is not too low.*

Risk of turnover $\uparrow \Rightarrow$ worse policy tomorrow, so willingness to accept a compromise \downarrow , but less inefficient investment, so willingness \uparrow .

The second effect can dominate.

TARGETED TRANSFERS AND SUBSIDIES

Assumption: government cannot target transfers nor subsidies to pivotal opponents.

Not entirely true in reality:

- Cap-and-trade systems target free allowances to reduce opposition.
- “Just transition” strategies bundle redistributive policies (Bolet et al 2023).
- “Climate bargains” tie regulations to public investments (Meckling and Strecker 2023).
- Many subsidies and regulations are technology- and industry-specific (Gawel et al 2017, Cullenward and Victor 2020).

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However, transfers are not surgically targeted, and their logic responds to lobbying incentives (Hanoteau 2014, Winkler 2022), not optimal coalition building.

Targeted subsidies are subject to information asymmetry.

Mechanism design approach: targeting allowed, but informational constraints.

- This expands the set of policies, but the fundamental tradeoff persists.
- Idea: districts with low opportunities for decarbonization are protected by the incentive compatibility constraint. They can pretend to be pivotal.

OTHER POLICY INSTRUMENTS

Production subsidies

- They also incentivize investments, but inefficiently.
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Emissions-intensity standards

- They mandate producers to keep their emissions below a threshold.
- Examples: renewable-portfolio standards for utilities, CAFE standards for cars.
- They are equivalent to a revenue neutral combination of a carbon tax and a production subsidy.
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Feed-in tariffs

- They force utilities to buy energy from renewable sources at a given price.
- Without volatility in supply or demand they are equivalent to an RPS.

GREEN PREFERENCES

Assumption: legislators only care about the economic welfare of their constituency.

We can assume that legislators care about climate.

If the SCC is not too large then polluting districts still oppose carbon taxes.

Legislators are more willing to implement climate policy, and equilibrium policy is more ambitious, but the fundamental tradeoff persists.

POLITICAL CONSTRAINTS

Two determinants:

1. Economic benefits of decarbonization
 - Relax polluting districts' constraint.
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1. Economic benefits of decarbonization
 - Relax polluting districts' constraint.
 - Tighten green districts' constraint.
 - More polluting districts transition \Rightarrow less fiscal revenue.
2. Expected future carbon tax
 - Increases fiscal revenue directly.
 - But more districts transition \Rightarrow less fiscal revenue.
 - Overall effect is ambiguous.

EFFECT OF GREEN TECHNOLOGY

Result. *If economic agents are sufficiently patient, an increase in the productivity of green technology A or a decrease in the cost of capital c relax the political constraint imposed by polluting districts and tighten the political constraint imposed by green districts.*

If the constraints are feasible and A increases or c decreases, then the constraints continue to be feasible.

EFFECT OF GREEN TECHNOLOGY

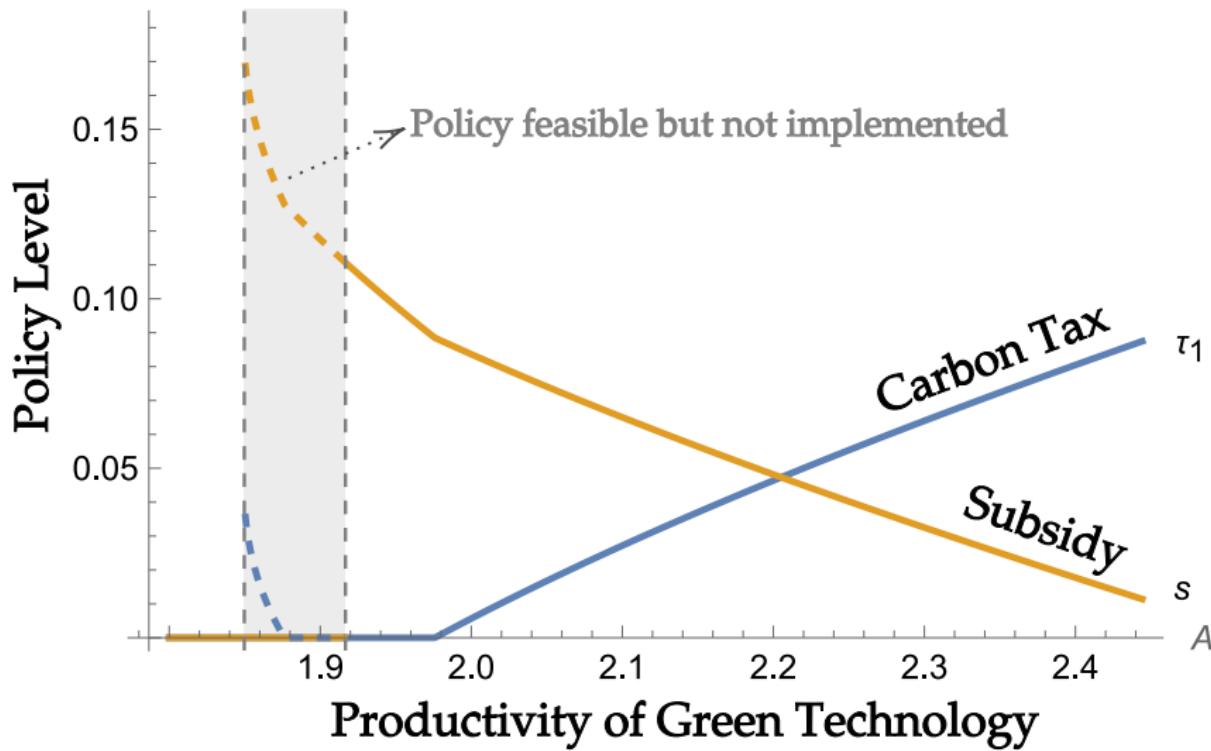
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If the constraints are feasible and A increases or c decreases, then the constraints continue to be feasible.

Implication:

- The constraints are feasible if and only if the net benefits of decarbonization are sufficiently large.

EFFECT OF GREEN TECHNOLOGY



SOCIAL COST OF CARBON

Result. *If the productivity of green technology is not too large, the political constraints are feasible only if the social cost of carbon is not too large.*

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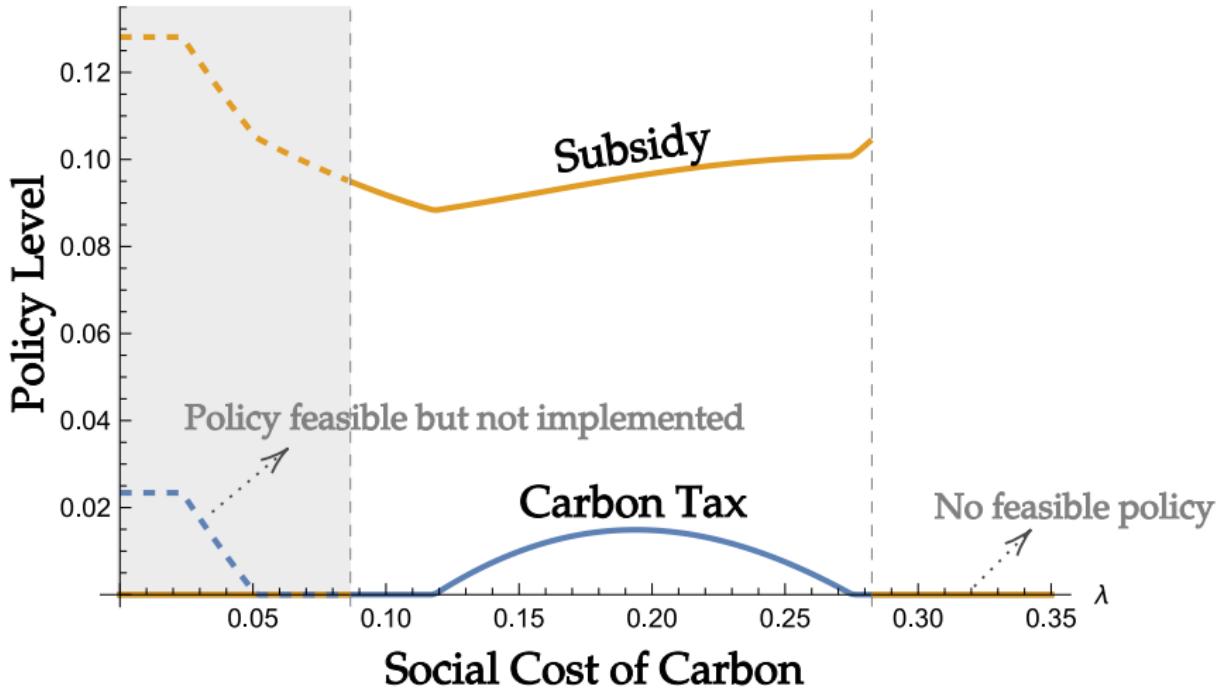
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Why?

- Second and third forces push in different directions.
- If SCC is large the third force dominates.

Implication: if the proposer is too committed to fight climate change \Rightarrow political constraints harder to satisfy.

SOCIAL COST OF CARBON



RISK OF TURNOVER

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Same forces.

Implication: risk replacement by opponent to climate change mitigation can help start the policy sequence.

Polarization on climate \Rightarrow this risk \uparrow .

GREEN EXPECTATIONS AND SOFT COMMITMENTS

There are two equilibria if initial political opposition is not too strong.

- If the initial policy proposal fails, but agents expect that a green proposer will implement an optimal carbon tax in the second period, some will invest in green capital.
- If enough invest, in the second period green districts form a majority, and the expectation is fulfilled.

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$$b_1 \leq \frac{1}{2} + \frac{(1 - \rho)\lambda(2 - \lambda)}{A}.$$

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Rationale for soft commitments such as net-zero targets or NDCs.

- But this logic only works under some conditions, and equilibrium policies are still not first-best.

GREEN EQUILIBRIUM

