Inefficient Policies in the Green Transition

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Introduction

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)

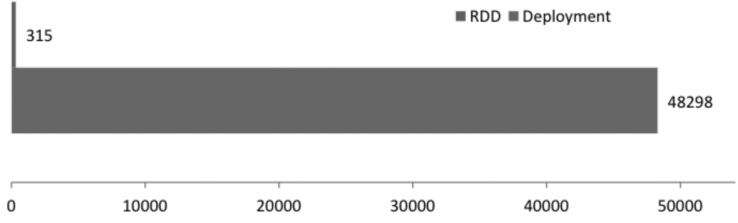
Instead, countries use a wide range of policies, some of which reduce emissions at much higher economic costs.

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).

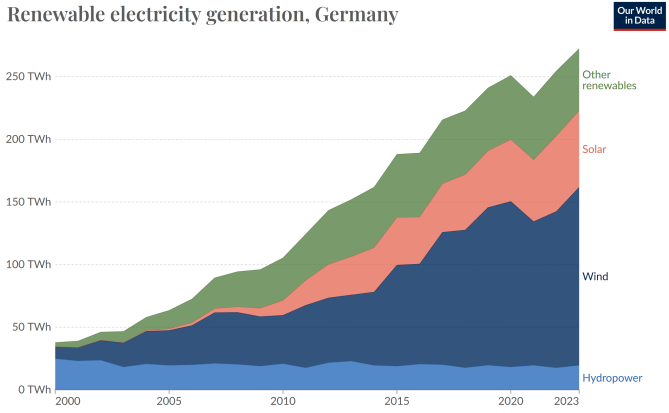
European Union

2003: Emissions Trading System (ETS) introduced

2021: ETS reformed

Germany

2000: Renewable Energy Sources Act



Germany – Carbon Pricing

2001: Reluctant to join the EU ETS

2021: Expands the coverage of the ETS to heating and transportation sectors

Germany's carbon pricing system for transport and buildings

#Climate & CO2 #Cost & Prices

The German government decided to put a price on greenhouse gas emissions in the transport and building sectors from 2021 as a key instrument to help reach its climate targets. It starts with a fixed price, which increases every year before allowances are auctioned from 2026 onwards. This factsheet explains the details of the system, legal doubts and expected distributional effects, as well as its integration into a new EU emissions trading system. [UPDATES with 2022 report on the system]

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

Argument

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.

Key: inefficient policies have policy feedback effects.

Questions

Why are inefficient instruments used in equilibrium?

Why are carbon prices initially too low?

Under what conditions is the policy sequencing strategy feasible?

How is the sequencing strategy affected by polarization?

Do non-binding policies such as net-zero commitments matter?

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 "decarbonizable" they are.

"Brown" districts are initially a majority.

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

Key Ideas

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

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

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

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

Subsidies require green investments, which **change the preferences** of brown 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 $\rightarrow$ policy sequence more likely to start.

Proposer too green or not green enough $\rightarrow$ 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

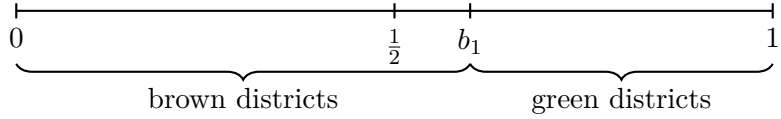
The Model

The Model – Economy

Districts $i \in [0, 1]$.

Invested in either green or brown sector: $\chi_i = 1$ if brown, $\chi_i = 0$ if green.

- Initially $[0, b_1]$ are brown, $(b_1, 1]$ green, with $b_1 > \frac{1}{2}$.
- Brown district i can invest in green capital and transition at cost $c \geqslant 0$.



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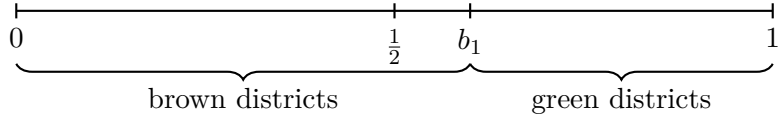

One good in the economy besides capital.

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

- Brown district uses $\frac{1}{2}y^2$ units to produce y.
- Green district i uses $\frac{1}{2}y^2$ units to produce Aiy.
- $A > 1$ measures the productivity of green technology.

Brown production leads to carbon emissions: producing y units $\rightarrow$ emitting y tons.

The Model – Policies

Carbon tax $\tau \in [0, 1]$.

- Brown districts pay τy, so their income is $\frac{1}{2}(1-\tau)^2$.
- Green districts are not affected, and their income is $\frac{1}{2}Ai$.

Investment subsidy $s \geqslant 0$.

Lump-sum transfer T.

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 stays; otherwise, 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

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

λ is the social cost of carbon.

Results

Benchmark – Unconstrained Proposer

If the proposer decides policy in both periods,

- **carbon tax equals the social cost of carbon**: $\tau_1 = \tau_2 = \lambda$,
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Turnover explains the use of subsidies, but not the sequencing.

Legislative Bargaining

Brown 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 a green policymaker can implement an optimal carbon tax.

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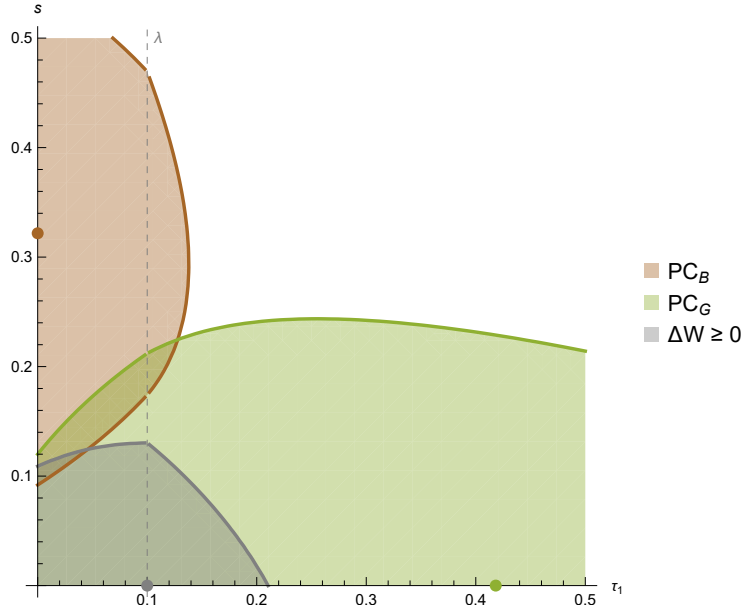
The need to build a coalition imposes two **political constraints**:

- Brown districts demand subsidies as compensation for the costs of transition.
- Green districts demand intertemporal budget balance.

Numerical Example



Main Result

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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When can the proposer start the policy sequence?

- Political constraints have to be feasible.
- Proposer prefers some acceptable policy over the status quo.

Political Constraints

Two determinants:

1. Economic benefits of decarbonization

- Relax brown districts' constraint.
- Tighten green districts' constraint.
  - More brown districts transition ⇒ less fiscal revenue.

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2. Expected future carbon tax

- Increases fiscal revenue directly.
- But more districts transition ⇒ 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 brown 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.

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Implication:

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

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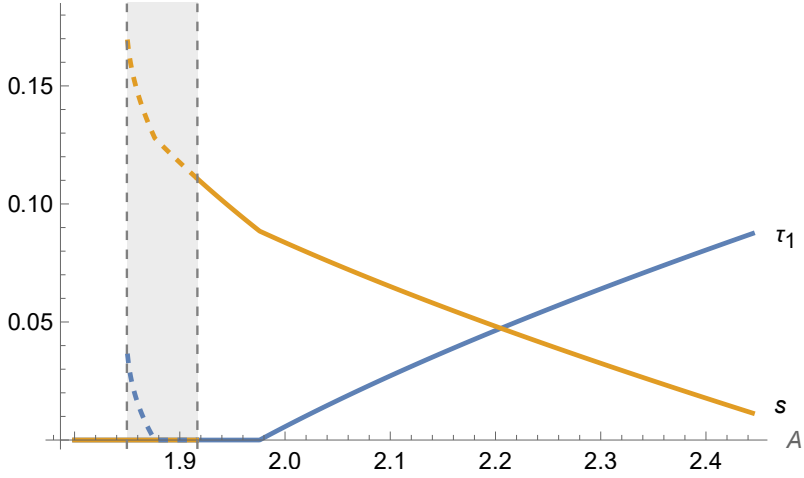

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- Second and third forces push in different directions.
- If SCC is large the third force dominates.

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

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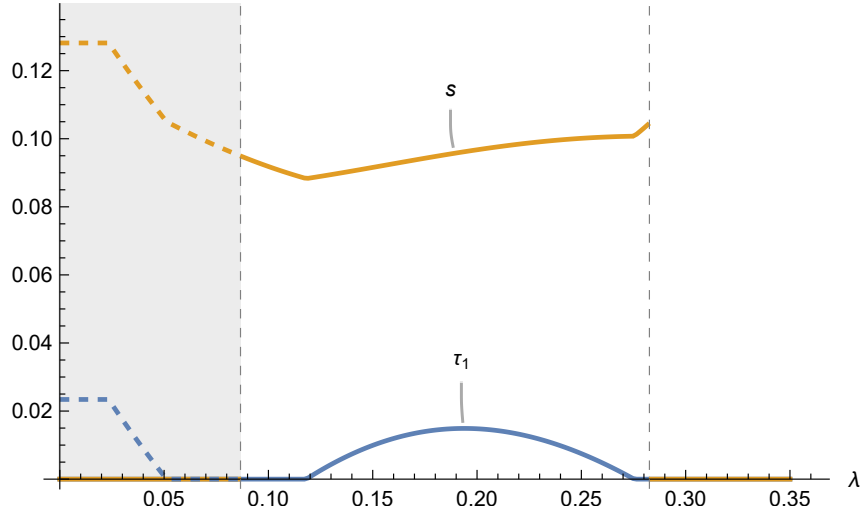

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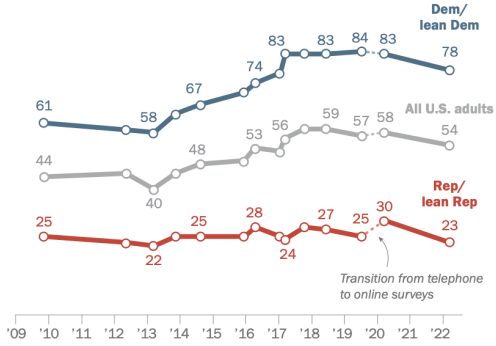
Polarization on climate $\Rightarrow$ this risk $\uparrow$.

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.

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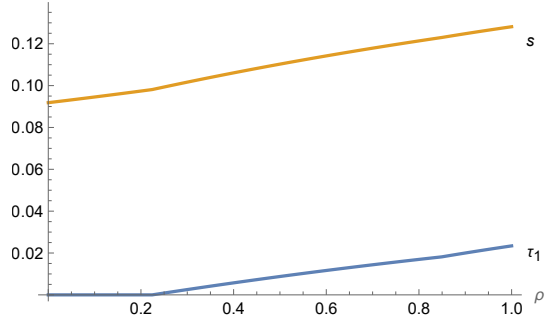
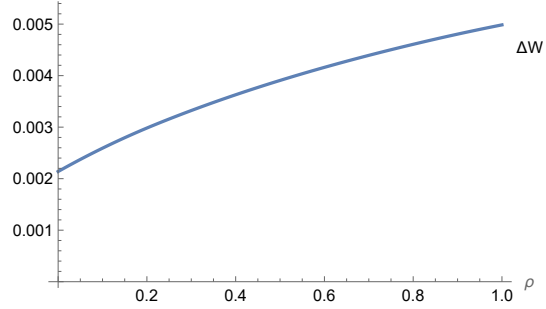
And yet

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

Effect of Risk of Turnover





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

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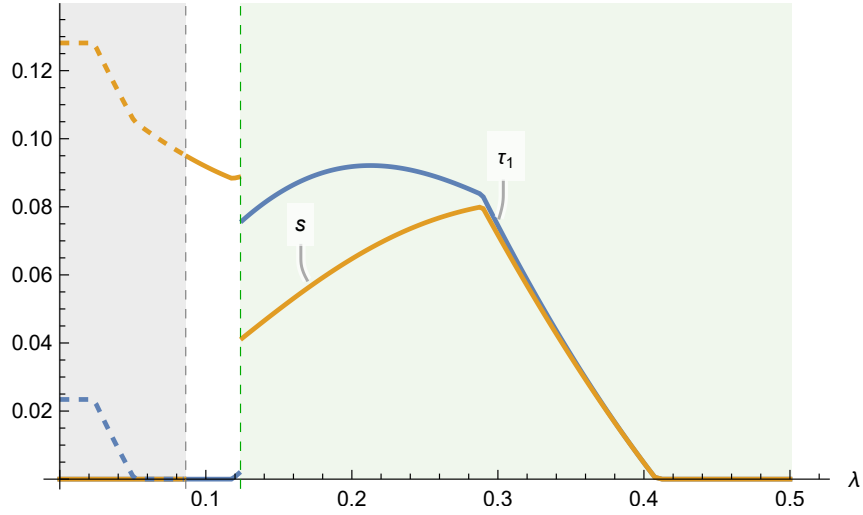
Rationale for soft commitments such as net-zero targets or NDCs.

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

Green Equilibrium



Extensions

Targeted transfers and subsidies

- Information constraint.
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Green preferences

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

Conclusion

Summary of Results

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Do non-binding policies such as net-zero commitments matter?

- Yes. If the initial opposition is not too strong there are two equilibria. Switching to the "green" equilibrium makes it possible to enact more stringent policies.

Empirical Implications

Country level:

- Subsidies $\rightarrow$ investments $\rightarrow$ attitudes toward climate policy $\uparrow \rightarrow$ carbon pricing.
- Mediators: structure of the economy and political institutions.
- Quantitative version of the model $\rightarrow$ testable predictions.

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Individual level:

- Individual takeup of subsidies → support for stringent policy (e.g., Alberdi 2024).
  - I offer a mechanism, but there are alternative explanations.
- Policy sequencing has tradeoffs.
  - We should expect a backlash and a new cleavage, but at the same time a net increase in support for the green transition (e.g., Gazmararian and Krashinsky 2024).
- Exciting research agenda: study the effects of green industrial policies in real time.
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Industry and firm level:

- Expectation: "decarbonizable" industries → subsidies 👍, hard-to-abate → 👎.
- Expectation: firm receives subsidies → opposition to carbon pricing ↓.

Contribution

Methodological contribution: climate policymaking in a legislative bargaining model.

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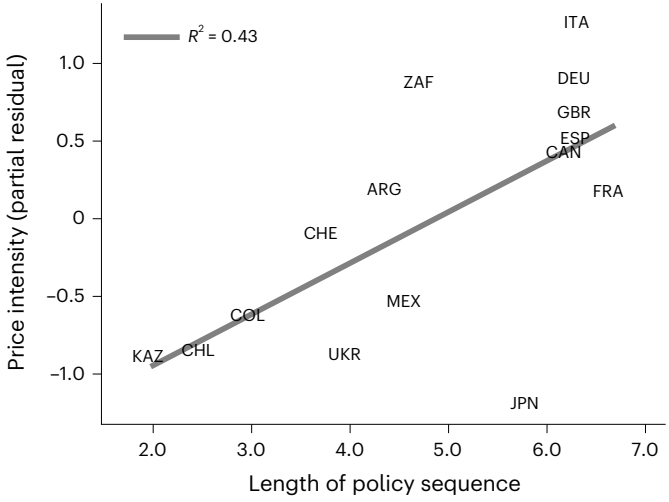
Paper: `juandodyk.github.io/files/jmp.pdf`
Slides: `juandodyk.github.io/files/jmpres.pdf`
My email: `juandodyk@g.harvard.edu`

Comments welcome!

Deleted Slides

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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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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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

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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 brown districts still oppose carbon taxes.

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