

# Frisch Centre Contributions to Environment and Energy Research

In Celebration of 15 Years of the Ragnar  
Frisch Centre for Economic Research

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# The range of contributions

- Over 80 refereed journal publications in the field of Environment and Energy
- Distinguished by their:
  - Policy relevance
  - Scientific rigor
  - Portfolio of approaches: applied theory; detailed numerical models, experimental economics; survey and econometrics.
- Topics include:
  - Trans-boundary pollution
  - Carbon leakage
  - Climate agreements
  - Imperfectly competitive energy markets
  - The role of “non-economic” incentives (morality)

# The unifying themes

- Markets are imperfect
  - Environmental economics: markets under-provide (global) public goods. The problem is compounded where there are international and inter-generational spillovers, as with the climate.
  - Energy economics: energy markets are imperfectly competitive. These markets are dynamic, complicating analysis.
- The fact that we live in a second-best world makes policy advice model (i.e. situation) – specific. Economists are “many-handed”. Economic research as a mosaic.

# Plan for these remarks

- I'll illustrate the kinds of research questions the Frisch Centre has addressed, and the types of insights that research provides, using a series of examples.
- These are illustrative, not exhaustive. I've left out many interesting and important topics.

# Climate agreements, oil exploration, market power

- How does a global carbon tax affect the incentives to invest in oil exploration? How does this relation depend on market structure and on the shape of tax trajectory?
- Carbon tax leads to fall in net-of-tax producer oil price and reduction in exploration incentives; but slower price rise may increase production and promote exploration.
- Model simulations suggest that a rising tax trajectory is likely to encourage non-OPEC exploration, shifting market share away from OPEC.

# OPEC and Signatories of a Climate Agreement

- How do the incentives of climate agreement signatories and OPEC members interact to affect fossil fuel prices? One agent's optimal policy depends on the other agent's action: the typical setting in a game.
- Timing of actions can be important. E.g., does OPEC want to respond to, or to “lead” in setting its policy?
- A numerical model suggests that in equilibrium OPEC adopts the “follower” position.

# Climate agreements: target emissions or R&D development?

- What are the alternatives to a climate agreement that targets emissions? Kyoto set limits on carbon emissions; other proposals focus on projects that make low-carbon alternatives cheaper.
- Positive spillovers in technology can make it important to subsidize R&D. An international agreement would pick the R&D subsidy level above the level chosen by individual countries.
- For a given price of carbon, an agreement on R&D subsidies leads to lower emissions and higher welfare.

# Climate agreements with R&D that reduces abatement costs

- What is the effect of allowing trade in emissions permits amongst members of a climate agreement?
- Countries decide whether to join an agreement. The agreement determines allowable per-country emissions, but in this setting, countries choose their own R&D level.
- Given this setup, marginal abatement costs differ over the heterogeneous countries in the optimal (second best) outcome.
- Trade in emissions permits makes it impossible to support this outcome.



# Energy markets and market power

- How does producer market power affect policy outcomes?
- Policies designed to regulate fuel consumption may have different consumption and price effects in perfectly competitive versus monopolistic markets.
- Market structure influences policy effectiveness, leakage, and relative prices.
- Under monopoly, stricter fuel standards lead to higher consumer prices.

# Emissions-permit allocation and electricity markets

- How does the distribution of pollution permits (licenses to pollute) affect firms' production decisions? The basic point: conditioning the allocation of permits on firm's actions alters their production incentives.
- Replacing grandfathered emissions allocations with output-based allocation increases use of gas-powered generation and increases the cost of reducing emissions.
- This is an example of the use of a large quantitative model to compare alternative policies.

# The “double-dividend” and environmental policy

- By raising production costs, emissions restrictions might decrease demand for labor, aggravating unemployment.
- But revenue from emissions taxes or permit sales can be used to lower labor taxes, increasing labor demand. Theory can't determine which tendency dominates.
- A general equilibrium model of Spanish economy suggests that carbon permits together with lower taxes on skilled labor increases labor demand and dampens cost increases.
- Policy recommendations are model-specific.

# Trans-boundary pollution and international labor mobility

- Standard result: Self-interested nations under-regulate international pollution because they do not take into account the effect of their pollution on other countries.
- Mobile workers move toward cleaner countries (better quality of life). Countries have an incentive to regulate pollution. to attract these workers.
- One equilibrium involves efficient level of regulation. (Existence of other equilibria implies need for international coordination.)
- Result reminiscent of Factor Price Equalization Theorem

# Domestic inefficiencies, international trade, and trans-boundary pollution

- Standard trans-boundary pollution setting leads to an equilibrium in which countries choose emissions level to maximize their welfare, contingent on other nations' emissions.
- However, in presence of domestic distortions, the equilibrium outcome might be even worse: countries have suboptimal welfare levels conditional on other nations' emissions.
- By choosing (domestically) tradable emissions quota (instead of, for example, a tax) as policy instrument countries avoid this “extra” inefficiency.

# Climate policy and the “Green Paradox”

- Climate policy designed to limit future carbon emissions may have the unintended consequence of shifting emissions earlier in time, worsening the problem.
- Variation of climate policy across countries further complicates the difficulty of predicting the effect of policy reform on climate outcomes.
- Another instance of the value of formal modelling – if there were simple (useful) conclusions, we would already know them.

# Green preferences, social relations, and public policy

- People have multiple motives. Their incentives to behave in socially responsible ways may depend on their beliefs about what others do.
- The dependence of individual actions on their beliefs about others' actions can lead to multiple equilibria.
- Temporary taxes can be used to coordinate on a socially desirable equilibria.
- However, those taxes might decrease incentives to “do the right thing” for moral reasons, undermining the good equilibria. (Example of experiment charging parents fees when they pick their children up from day care.)

# Experimental economics

- Socially beneficial commitments might be a screening device that helps “pro-social” people to find each other.
- Subjects self-select into blue or red group. Former receive a fixed payment; latter donates payment to Red Cross.
- Each group then plays a “public good game” (where group payoff depends on collective contributions: an incentive to free ride). Contributions (and payoffs) higher in the red group.



# Public goods and the formation of groups

- People may be willing to contribute more to a public good as a means of obtaining membership in a popular group.
- By making group membership endogenous (rather than assigned from the outside) it may be possible to elicit more public-spirited behavior.
- This insight has applications to social interactions in schools and to multi-task teamwork in work situations.

# Public policy and individual's moral motivation

- Socially responsible behaviour (e.g. recycling) partly motivated by desire to protect self-image as moral person and partly by economic incentives (e.g. opportunity cost).
- Self-image involves determined by comparing own behaviour with endogenous “morally ideal” behaviour.
- Public policy that changes economic incentives to promote the activity can backfire by weakening the moral ideal.
- Survey evidence is consistent with model.

# Conclusions

- The Frisch Centre has made important contributions to the fields of Environmental and Energy Economics.
- The standard of excellence it has established during the last 15 years gives it a target for the next 15.