

Economics and Environmental Policy Research Network

Research Symposium

March 1st – 2nd, 2018

Session Notes for Plenary III: Carbon Pricing, Climate Policy Mixes and Clean Innovation Outcomes

1. Context of Discussion

The presentations in this session covered two main focus areas:

1. The Role of Policy Mixes

Many environmental economists argue that actions to achieve a low carbon economy and climate mitigation should rely heavily, if not entirely, on carbon pricing. However, there is evidence (e.g. lessons from the German Energiewende and the UK's offshore wind deployment) to suggest that the ideal climate policy is not just a carbon price, but that there may be benefits to be achieved from integrating different policy tools, including green technology and innovation policies. In other words, pricing can be seen as a necessary, but not necessarily a sufficient, approach.

One component that could be included in a climate policy mix is renewable energy policy. At present, only 12% of the world is covered by some kind carbon pricing market, at a relatively low price of \$8/ton. However, almost all countries in the world have some kind of renewable energy policy, complementing their climate change policies. The development and implementation of a policy mix that integrates carbon pricing and renewable energy policy will require a better understanding of the different linkages and impacts that components of this policy mix have on each other.

Innovation-focused policies are other likely components of a climate policy mix. Low carbon innovation is much more than just the development of a new technology. It includes diverse other domains, including supply chains, financing, customers, markets etc. Ideally, a policy mix would contain policies that encompass these various domains, not just stimulating innovation directly, but also addressing behavioural and market issues.

2. Innovation Decision Science

Clean energy innovation decision science is the study of decision-making as it relates to the connection between innovative activities and governance at different levels. It looks at how technologies are invented, incorporated into commercial designs, and adopted and used by consumers and organizations, as well as how new innovations interact with existing governance structures. It brings social science considerations to the technology and innovation field. A number of existing programs (e.g. cap and trade system for SO_x and NO_x) have been examined through this decision science lens, tracking the innovations these programs spawned.

Within this realm of innovation decision science, there are three major theories that have potential to improve how we currently approach green innovation. The first is Economic Theory, which allows us to

take into account how market failures interact across clean energy value chains. The second is Design Theory, where for instance the passage of a new fuel standard opens up a cascade of vehicle design decisions, ranging from tailpipe design to the choice of tires etc. Finally, Consumer Theory presents a marketing framework that lets us think about how someone actually approaches a purchase (e.g. Who does the buying? What are they buying? What appeals to them?) allowing us to match policy reform to consumer preferences.

The subsequent discussion explored:

- A possible sequence of priorities for policy makers in creating a policy mix: start by removing perverse subsidies; price the bad and reward the good; address knowledge market failures and capital market failures; address other issues like coordination problems, network externalities, economies of scale, competition, lumpy capital and costs, and government involvement.
- The need to change the narrative around energy transition from having to move to clean energy because it's cleaner, to wanting to move to clean energy because it's cheaper. This narrative has historically been made more gloomy by our tendency to over-estimate the cost of regulation.
- The importance of sending strong signals that there will be continued policy support and investment in a particular transition for an extended period of time. For instance, when it comes to offshore wind in the UK, there were strong signals that there would be ongoing investment in this area and now there is much focus on getting better at providing this service locally.
- The importance of not just thinking about competition and new companies displacing old ones, but rather focusing on bigger picture questions. For instance, instead of asking whether China or the US will be the main actor in the steel industry of the future, thinking about what the building materials of the future will be.
- The importance of realizing we have a bias towards start-ups, and not forgetting about the rewards from incremental innovation and existing large firms.
- Policy advice for Canada with respect to climate change policy. Possible suggestions included looking to case studies of other countries who have faced and overcome similar barriers to those being experienced in Canada. Additionally, the knowledge created through innovation is hard to fully pin down in advance, hence we should err on the side of creating more knowledge and controlling less where it goes. Furthermore, it is important for Canada to generate a steadfast perception that low carbon is where we are going and that this represents an enormous economic opportunity. Companies need assurances that this really is the direction we are going in. Finally, the current situation in the US could represent an opportunity such that Canada could take the lead on work within cross-boundary industry groups focused on how to influence policy.

2. Research Questions Identified

The following specific research questions/ideas emerged from the discussion:

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- **What drives cost reductions in renewables?** Some European researchers argue that the dropping price of renewables and their increased uptake are proof that the current subsidies in place are working. But correlation does not necessarily mean causation. Research has already examined the impact of patents on the price of renewables, but how do we take the next step and identify, across different countries, what actually drives the reduced costs we are seeing? What policy impacts really drive down the costs? For instance, what impact do China's subsidies on solar panel R&D have on deployment of solar in the EU? What is the role of learning in this cost reduction, and how do we measure this given that some learning is with installers and some with manufacturers?
- **What are efficient subsidies for renewables?** What is the optimum size / scale of these?
- **How does the degree of leakage from policy mixes compare to the degree of leakage from individual policies like pricing?**
- **What is the role of expectations in terms of policy outcomes and achievement of goals?**
- **What is the right "mix" of policies (pricing + renewable standards, etc.)? How do we prioritize the "mix"?** For instance, the current policy mix for renewables in the EU is primarily focused on deployment and subsidizing the uptake of renewables - how much emphasis should ideally be placed on R&D? What goes into a policy mix? How do we both find and incentivize achieving this right balance?
- **Removing perverse subsidies?** Some of these are very subtle and well-hidden. How do we identify them and eliminate them?
- **Role of research / innovation / commercialization subsidies?** What is the ideal mix of these and others?
- **How do we identify, measure and address knowledge market failures and capital market failures?**
- **How can thinking about consumer preferences / behavior (i.e. decision science) help us achieve more effective clean innovation outcomes?** What else can decision science offer to clean innovation research?
- **How can thinking about design theory help us achieve more effective clean innovation outcomes?**
- When it comes to mission-oriented innovation, each country has its own mission. E.g. steel: China wants to make it; US wants to keep it. **How to compensate losers in such a situation? What are the best ways to compensate the losers in a variety of situations?** What novel datasets can we use to look at the implications of "losing" being experienced in different countries and how those have pass-on impacts?
- **What is the role of learning by doing?**
- Economists are typically bad at predicting outcomes from policy implementation (e.g. EU ETS). **Is it possible to improve such policy outcome predictions? If not, how do we incorporate recognition of this poor predictability within the policy implementation process?**

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- **What trends or conclusions emerge from a series of case studies of learnings from other countries/sectors, etc.?** e.g. Sweden NOx policy / tax-refund. What were implications of this policy? How did they push this policy through? What can Canada learn from this?
- **Should we sever climate policy from innovation policy?**
- Exploring cases where technologies compete with other technologies: **questions on the dynamics of innovation and the structure of different industries are still very much to be explored.**
- **How do we resolve the tension between driving down renewables costs globally versus individual countries wanting to retain their competitiveness and profitability in a certain field?** E.g. for the sake of global climate mitigation, the price of EV's should go down as rapidly as possible. But for Germany's economy, this driving down of price has impacted their ability to be competitive as an EV battery manufacturer.
- **How to transition from short-run incentives aimed at facilitating the entry of new actors in a sector to longer-term incentives focused on post-market entry priorities?** The initial short-run incentives are not necessarily good for the long run, so we have to think up-front about how our policies are going to evolve over time and as the sector matures.