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Delegating climate policy to a supranational authority: a theoretical assessment☆

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ABSTRACT

This paper studies the delegation of climate policy to a supranational environmental authority. We develop a simple model of a world consisting of a large number of countries, which derive utility from energy consumption. Countries suffer from global warming and local air pollution, both caused by the combustion of fossil fuels, and decide individually on investments in clean technologies for energy production. A supranational environmental authority decides for each country on the maximally permitted amount of greenhouse gas emissions. We demonstrate that the authority faces a dynamic inconsistency problem that leads to welfare losses, but these losses can be kept small if the authority is endowed with an optimally designed mandate. The optimal mandate penalizes the cost of local air pollution very heavily relative to the cost of global warming. However, delegation of climate policy faces a further difficulty, as countries have a recurrent incentive to change the authority's mandate over time.

1. Introduction

Many scientists today consider global warming the biggest threat humanity has ever faced. It will lead to severe disruptions of everyday life around the globe and it is an extremely difficult problem to tackle. The difficulties arise primarily for two reasons. First, global warming is due to strong negative external effects of economic activity (in particular energy production and transportation) which complicates its solution by simple market mechanisms.[1] Second, it is a phenomenon that can only be addressed on a global basis. To be effective, measures against global warming have to be implemented on a broad international scale, which requires difficult and protracted negotiations between many heterogeneous countries with very diverse goals; (see, e.g., Barrett, 2003 or Nordhaus, 2013). In the past, such negotiations often had limited success

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[1] Stern (2007, p. 1) refers to global warming as "the greatest example of market failure we have ever seen".

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or failed altogether.[2] Against this background, there have been several proposals to create a supranational environmental authority (SEA) with the explicit mandate to fight global warming, and to delegate decision power over certain climate-relevant policies to this authority. Their proponents include academic researchers (e.g., Esty, 1994, Whalley and Zissimos, 2002, Helm et al., 2003, Biermann and Bauer, 2005, Barnes et al., 2008, Grosjean et al., 2016), economic policy advisors (e.g., German Council of Economic Experts, 2013) and political commentators (e.g., The Politic, 2014).

In the present paper we take these proposals as a starting point and assess the desirability of delegating climate policy to a supranational authority. We develop a stylized model of a world consisting of a large number of countries, which derive utility from energy consumption but suffer from the negative consequences of emissions generated by fossil fuel combustion. These consequences take two forms. First, emissions of carbon dioxide (CO_2) and other greenhouse gases contribute to global warming, and hence cause global costs that are not internalized by the individual countries. Second, emissions of compounds such as sulfur dioxide (SO_2) or black carbon ($PM_{2.5}$) cause local air pollution, and hence local costs. All countries can mitigate the negative side-effects of their energy consumption by investing into clean technologies for energy production. Each country decides individually on its investment into clean technologies, but its decision over emissions (climate policy) is delegated to an SEA, which imposes emission quotas for each country.[3] We abstract from potential difficulties concerning the countries' compliance with the quotas set be the SEA and the implementation of policies via appropriate instruments, such as tradable pollution permits. We also abstract from uncertainty about the true economic costs of local air pollution and global warming.[4] Instead, our main focus is on the incentives and the dynamic behavior of the authority.

We first show that, even if all countries respect the SEA's policy prescriptions and the authority has global welfare as its mandate, the optimal climate policy is dynamically inconsistent. *Ex ante*, the SEA finds it optimal to set tight emission quotas in order to induce countries to invest into clean technologies. *Ex post*, after the investments are sunk, providing investment incentives is no longer important, and tight emission quotas are no longer optimal. Rather, the authority would like to relax emission quotas to allow for more energy consumption. Individual countries anticipate that the authority will eventually not find it worthwhile to enforce tight emission quotas, which reduces their incentive to invest into clean technologies already from the start. Discretionary behaviour of the authority therefore causes under-investment into clean technologies, over-pollution and, accordingly, a welfare loss relative to the situation when the authority has commitment power.

We then demonstrate that the dynamic inconsistency problem can be ameliorated by giving the SEA a mandate that differs from the maximization of global welfare. In particular, an SEA that is endowed with an optimally designed mandate can implement a discretionary policy with significantly smaller welfare loss than a benevolent SEA. The optimal mandate attaches a *higher* weight to the *local* cost of emissions (local air pollution) than the individual countries themselves, and a relatively low *or even zero* weight to the *global* costs (the damage due to global warming). The intuition behind this seemingly counter-intuitive result is as follows. An authority that is less willing to accept local air pollution has a stronger incentive to enforce tight emission quotas *ex post*, even for those countries that invest little into clean technologies. Moreover, its incentive to impose tight quotas is largely independent of the stock of greenhouse gases in the atmosphere. A mandate with a large weight on local air pollution costs thus provides partial commitment to the authority, which alleviates its time-inconsistency problem. Given a large weight on local air pollution, it is further optimal to put a relatively small weight on global warming costs, in order not to distort the optimal trade-off between clean and dirty energy consumption too much. The optimal mandate is thus of the spirit *act local, solve global*, a spirit that has recently been promoted by the IMF in the context of energy policy.[5]

Finally, we show that the optimal mandate of the authority is not state-invariant but depends on the initial stock of greenhouse gases in the atmosphere. The higher is this stock, the more *environmentalist* the mandate of the authority should be, i.e. the higher the optimal weights on the costs of emissions relative to the utility benefits of energy consumption. Intuitively, this is because an environmentalist authority provides stronger incentives for large initial investments in clean technologies, which ensures a fast reduction of greenhouse gases. As the stock of greenhouse gases is reduced over time, however, the optimal mandate becomes less and less environmentalist. This creates another dynamic inconsistency problem, this time on the side of the individual countries. Even if they can commit to set up an SEA and to respect its policy prescriptions, as we do assume throughout our analysis, they have a recurrent incentive to change the authority's mandate as the stock of greenhouse gases evolves over time.

Our framework is a modification of the model used by Harstad (2012), Harstad (2016), and Battaglini and Harstad (2016), which was developed to analyze international environmental agreements. We depart from this framework along three dimensions. First, as the purpose of our analysis is to study optimal delegation of climate policy, emission levels are not decided and negotiated by individual countries but imposed by an SEA. Second, we describe the world as consisting of many small countries rather than a finite number of (large) countries. This rules out strategic interactions between coun-

[2] The Copenhagen Summit in 2009 is often mentioned as a prime example of failure; see, e.g., the results of the Symposium on International Climate Negotiations summarized in Cramton et al. (2015). Barrett (1994) argues that international environmental agreements need to be self-enforcing and, therefore, they are not likely to be signed by many countries unless the global benefits of cooperation are small.

[3] Note that an alternative interpretation of our model is that of an environmental protection agency (EPA) which has the power to impose emission standards on firms on a national level. Due to the global nature of global warming, however, we prefer to think of the authority as a supranational one.

[4] Compliance, implementation, and uncertainty are clearly all very important in practice. Yet, addressing these issues is beyond the scope of the present theoretical analysis and left for future research.

[5] See, e.g., Parry et al. (2013) or Clements and Gaspar (2015).