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Endogenous environmental policy for small open economies with transboundary pollution☆

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ABSTRACT

We analyze how governments set their environmental policies if pollution is transboundary and countries are too small to affect world market prices. Assuming that governments are self-interested (rather than maximizing social welfare) we use a common agency framework to portray the calculus of political support-maximizing governments that find themselves in a situation of strategic interaction created by transboundary pollution. Our model shows how distortions created by the strategic interaction of national governments interact with distortions that arise due to the political processes in both countries. For instance, strong environmental lobbies may improve welfare as they counteract the distortion caused by the international externality, yet only up to a point. Instead of assuming interior solutions as most of the literature does, we show that corner solutions are a realistic possibility and derive conditions under which they occur. Moreover strong political distortions may create instability and thus lead to corner solutions.

1. Introduction

This paper examines how lobby groups in pluralistic societies affect the determination of environmental policy if countries are linked through transboundary pollution and if their political support maximizing governments are unable to alter prices on the global goods markets.

It is widely recognized that environmental policy formation is influenced by lobby groups. Such lobby groups are present at international conferences such as those in Kyoto, Doha, Lima or Paris; they also affect the formulation of national policies. While environmental lobby groups advocate stricter environmental standards, industry associations often lobby for lower standards in order to retain competitiveness in international markets. Governments seeking to maximize political support respond systematically to such lobbying.[1] The resulting equilibrium regulation differs considerably from the Pigouvian rule, thus creating a politically motivated distortion of environmental policy (Aidt, 1998). Yet, this may not be the only distortion in the formation of environmental policy.

Transboundary pollution gives rise to a second distortion. If national environmental policies remain non-cooperative even welfare maximizing governments internalize the environmental externalities only to the extent that they affect their own country (Markusen, 1975). This begs the question how these two distortions interact. How do politically-motivated, self-interested governments set environmental policies in the presence of transboundary pollution? What does this entail for the space of optimal policies and the properties of the equilibria (existence, uniqueness, stability, and interior equilibrium versus corner solution)? This is the concern of our paper.

The analyzed situation is realistic and relevant for most countries and a wide range of pollutants. First, transboundary pollution poses serious challenges to the environment in almost all parts of the world. It affects all air pollutants that are not global and water pollutants in international waters or in rivers flowing through different countries.[2] Second, many

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[1] Cf. Binder and Neumayer (2005) and Fredriksson et al. (2005) for empirical evidence on the political influence of environmental lobby groups and List and Sturm (2006) on the relative importance of voters and lobby groups for environmental policies of US states.

[2] Examples are abundant, such as sulphur oxide emissions originating from China accounting for half of Japan's sulphate depositions (Ichikawa and Fujita, 1995, Lu et al., 2010) or 'brown clouds' created by air pollution with hotspots in East Asia, Indo-Gangetic Plain in South Asia, Southeast Asia, Southern Africa, and the Amazon Basin (Akimoto, 2003, Ramanathan et al., 2008). A third example are transboundary SO_2 emissions in Scandinavia. Cansier and Krumm (1997) find that tax rates in Sweden are three times higher than in Denmark, which is only partly due to abatement cost differentials and therefore is hardly explained by welfare-maximizing behavior alone. A related example is the environmental degradation of the Baltic Sea: It is affected by fishing, riverine pollution, and atmospheric nitrogen deposition from the neighboring states (HELCOM, 2010). Gren (2001) demonstrates the inefficiency of uncoordinated environmental policy for the Baltic Sea.

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countries are small in international commodity markets and their environmental policies have hence no effect on their terms of trade. Strategic interaction between neighboring countries thus results from transboundary pollution, not from trade policies. Lastly, it is commonly acknowledged that governments do not simply maximize social welfare, but balance opposing interests in their support-maximizing calculus according to the political influence of the different interest groups. Yet, most analyses of environmental policy formation either assume social welfare maximizing governments or disregard the strategic interaction created by transborder pollution (or assume that countries can influence their terms of trade through their environmental policy). We do not.

Our study adds to the literature on endogenous environmental policy. Fredriksson (1997) analyzes the effects of world price changes and lobbying on the politically optimal environmental tax rate. He shows that pollution may increase in presence of an abatement subsidy because the pollution tax is reduced due to a change in lobbying influence. Schleich (1999) introduces a second policy instrument and analyzes the choice between domestic taxes and tariffs when the externality is in production or consumption. Schleich and Orden (2000) generalize the small economy case to the large economy setting. Aidt (1998) assumes that pollution stems from the use of an input rather than from production and demonstrates how a politically optimizing government deviates from the social optimum in deciding on its environmental policy.[3] Fredriksson and Svensson (2003) analyze the effects of interaction of corruption and political instability on endogenous environmental policy. They show that political instability has a negative effect on the stringency of environmental policy if corruption is low and a positive effect if corruption is high. Damania et al. (2003) investigate how the effect of trade liberalization on environmental regulation is affected by corruption levels.[4] These papers use a common agency model like we do to portray the political game that determines environmental policy. Yet, they do not take into account the strategic interaction governments are exposed to in the international arena when deciding on their environmental policies. In such a framework, environmental policies are determined by domestic considerations alone.[5] We depart from this by analyzing strategic interactions created by transborder pollution.

Conconi (2003) has analyzed endogenous environmental policy formation in a situation of international strategic interaction. She portrays two large open economies, which jointly determine their trade and environmental policies. In her model, strategic interaction occurs through terms of trade effects created by domestic environmental policies: When a large country taxes the production of a polluting good, the world market price rises and, as a consequence, foreign production and foreign emissions increase (thus giving rise to 'emission leakages'). Conconi shows that under free trade and in the presence of strong emission leakages, environmental lobbying might actually lower emission taxes as unilaterally formulated taxes will tend to increase degradation. In her setup, strategic interaction occurs only because countries are large on commodity markets, an assumption that does not hold for most countries exposed to cross border pollution.

The literature on environmental fiscal federalism models strategic interactions of environmental policies between jurisdictions with self-interested governments; however these interactions do not arise because of environmental externalities. In Fredriksson (2001) they take place between different layers of the federal state, as he analyzes the interaction between centrally set pollution taxes and abatement subsidies given by the federal states. Fredriksson et al. (2006) show that decentralized environmental policy setting leads to weaker environmental policies if capital is mobile, which is in the spirit of traditional tax competition literature and the analysis by Brennan and Buchanan (1980). Datt and Mehra (2015) analyze the effects of intergovernmental fiscal transfers from a welfare-maximizing central government to political support-maximizing local governments on environmental policies.

Our paper is related to these works, but deviates from them in significant aspects: We analyze two open economies that are small on globalized world markets and thus cannot affect world market prices; an assumption which we consider sensible for most economies. These countries are exposed to transboundary pollution, which creates a situation of strategic interaction between the two governments that are assumed to maximize their political support.[6] We employ the common agency model developed by Bernheim and Whinston (1986) and introduced by Grossman and Helpman (1994) to the literature on endogenous policy formation and assume functionally specified interest groups (environmentalists and industrialists).

We consider the three key elements of our model – political support maximizing governments, transboundary pollution, and small open economies unable to alter world prices – to be very realistic for understanding environmental policy formation for most countries and a number of pollutants. Yet, except for Persson (2012), this combination has not been studied. Either the international repercussions of domestic environmental policies are disregarded (e.g. Fredriksson (1997); Aidt (1998); Fredriksson and Svensson (2003)) or strategic interaction occurs because terms of trade are altered through environmental policies (Conconi, 2003), which is not very realistic for many countries. Persson (2012) is the only other contribution that has the same three key elements, yet his approach is very different from ours: he studies a Nash bargaining process over environmental policies, whereas we look at non-cooperative behavior. In addition his model setup is also more restrictive than ours. He assumes constant marginal disutility from environmental damage, which we consider debatable as disutility should increase with rising pollution levels. This affects best response functions and the equilibrium. Moreover, he assumes unique and stable interior equilibria, while we show that under many – equally realistic – conditions interior solutions do not exist, and that, instead, corner solutions prevail. Thus unlike almost the entire literature on endogenous policy formation we study explicitly the properties of equilibria, rather than assuming that they are interior, unique, and stable (which they are in the Bernheim and Whinston, 1986 setup, but not necessarily in the deviations from it). Thus our contribution lies in the analysis of a very important case of environmental policy formation hardly studied before in a rigorous manner, giving explicit consideration to existence, stability and uniqueness of the equilibrium.

We show that politically optimal tax rates will exacerbate the environmental degradation compared to welfare-maximizing governments' policies if industrial lobbying groups are relatively strong; tax rates can even be negative in equilibrium, for one country or for both; a situation that cannot occur in the benevolent dictators' equilibrium. In contrast, high relative political power of environmental groups may improve welfare, especially if the marginal environmental damage caused by production is high, as their lobbying offsets the inefficiency created by strategic interaction of the two governments. In that case the political game leads to a higher welfare than non-cooperative social planners would be able to achieve. Even a marginal increase in the size of the

[3] Hillman and Ursprung (1994) analyze the influence of environmental concerns on endogenous trade policy, but they do not study environmental policy formation. Bommer and Schulze (1999) consider the effect of trade liberalization on endogenous environmental policy.

[4] The interaction of trade and environment has been subject of an extensive literature; for instance there is a large literature on the effects of trade liberalization on the environment (cf. Schulze and Ursprung 2000); for recent examples cf. Fæhn and Holmøy (2003) and Gumilang et al. (2011) among others. A different strand of the literature has analyzed the effect of environmental policy on international competitiveness (see e.g. Xu, 2000). The literature on endogenous environmental policy deviates from this approach as it portrays governments that are not maximizing social welfare, but rather their political support, which is only in part determined by social welfare considerations.

[5] Strategic interaction in the determination of environmental policy is analyzed in the literature on transboundary pollution (e.g. Markusen, 1975) and the literature on strategic environmental policy (e.g. Barrett, 1994). Both strands of literature, however, do not take into account the political-economic rationale in environmental policy formation. For a survey of the literature see Rauscher (2005).

[6] We thus exclude environmental regulation of *global* pollutants which can be analyzed only in a multi-country setting (cf. Barrett, 2003).

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