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# Strategic interaction and institutional quality determinants of environmental regulations

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ABSTRACT

We provide a framework that links the impacts of own and neighboring measures of institutional quality as well as neighboring country environmental regulations on environmental regulation stringency in own country. We estimate a Spatial Panel Durbin model to identify significant determinants of environmental regulations for several European countries. We find no evidence of strategic interaction as the environmental regulations implemented by a neighbor have no significant impact on environmental regulations implemented in the own country. The higher the quality of government institutions in a country, the more stringent the implementation of environmental regulations. Additionally, some institutional quality variables significantly positively impact the stringency of environmental regulations in neighboring countries.



## 1. Introduction

The regulatory setting and the policies enforced by own and neighboring jurisdictions may affect the level and effectiveness of the regulatory stringency adopted by a government when implementing environmental policies. Some theoretical models point to suboptimal environmental standards when decentralized governments set regulations (Barrett, 1994; Kennedy, 1994; Kunce and Shogren, 2002; Oates and Portney, 2003). Policy makers may set lax environmental regulations or fail to enforce them in the hopes of providing a more attractive business setting or if they free-ride on the benefits from strict environmental regulations from a neighboring region in the case of a transboundary pollutant. Empirical studies show some support for this strategic interaction across counties, states and, to a lesser extent, countries (Brueckner and Saavedra, 2001; Fredriksson and Millimet, 2002; Murdoch et al., 1997).

A different strand of literature focuses on the role of government institutions, such as government tenure or the ability to execute legislation, in determining economic policy. Government institutions may affect the economic policies chosen (Acemoglu et al., 2003) which could be an underlying factor in determining the existence of strategic interaction.

The objective of this work is to examine if there is strategic interaction of *implemented* environmental regulations among neighboring countries and determine the role of institutional factors within a country in affecting the *implemented* environmental regulations stringency. We distinguish between *legislated* and *implemented* environmental regulatory stringency

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since the two are not necessarily equivalent especially given the institutional quality within a country. For example, a country may legislate a strict pollution tax but because of lack of enforcement, the *implemented* level of the pollution tax may be very lax. We define environmental stringency as the level of environmental regulation and the amount of the legislated regulation implemented by a regulatory agent. First, we test if the levels of *implemented* environmental regulations in select European countries depend on the *implemented* environmental regulations of neighboring countries when we account for institutional quality. Second, we determine the extent to which own and neighbor's institutional quality affects the implementation of environmental regulations. This is the first study that we are aware of that estimates if strategic interaction of *implemented* environmental regulations exists between countries and examines the role of institutional spillovers on environmental regulatory choices among neighboring countries.[1]

Strategic regulatory interactions may occur in the presence of tax/fiscal competition or in the presence of transboundary pollution (Ulph, 2000). Evidence of fiscal competition exists across local governments within states when deciding property taxes (Brueckner and Saavedra, 2001) and measures that control growth of a city (Brueckner, 1998). Case et al. (1993) show that a state's level of per capita expenditure positively correlates with its neighboring state's spending level per capita. Given the relative uniformity of institutional quality in adopting a fiscal policy within a state or across a federal system, such fiscal competition is not surprising. We determine if such strategic interaction exists across countries with more variable institutional quality.

Strategic interaction with environmental regulations controlling for transboundary pollutants across U.S. states may occur where own regulations depend on the regulations of neighbors (Fredriksson and Millimet, 2002; Fredriksson et al., 2004; Levinson, 2003; Konisky, 2007). Others suggest that strategic interaction where environmental regulations become less stringent to attract investment, has not occurred across U.S. states with respect to some specific environmental standards (Millimet and List, 2003). Across European countries, evidence of strategic interaction exists with environmental regulations that control sulfur and nitrogen oxide emissions (Murdoch et al., 1997). Others report mixed results at the country level (Barrett, 1994; Ederington et al., 2005). The above studies do not control for the role of institutions in determining strategic interaction of environmental regulatory decisions within the country and its neighbors.

This work contributes to the existing literature by estimating an empirical model that allows neighboring policies and government institutions to impact regulations. First, we examine if strategic interaction of environmental regulations exist across countries while accounting for institutional quality, by using a measure of *implemented* environmental policies instead of the legislated policy. To do so, we use a measure of environmental regulation stringency developed by Van Soest et al. (2006) which is the shadow price of energy to more accurately reflect the stringency or laxity of implemented environmental regulations over time and across countries. Second, we examine the impacts of government institutions on implemented environmental regulations through two channels: a direct regulatory enforcement channel and an indirect technology channel. Finally, we examine if any institutional spillovers affect environmental regulations of neighboring countries through the same channels.

We empirically test the determinants of environmental regulations stringency by estimating a Spatial Panel Durbin model. We employ a *regulation based measure* that more accurately reflects the stringency or laxity of a regulation over time and across countries (Brunel and Levinson, 2016). Our estimates show no significant effect of a neighboring country's environmental regulations on own environmental regulation stringency. Thus, we do not find evidence of strategic interaction of implemented environmental regulations after controlling for institutions. We do find that institutional quality does matter. Better institutional quality increases environmental regulation stringency because regulatory enforcement levels rise and dominate the negative effects through technology. Surprisingly, we find spillover effects of good institutional quality where countries choose a more stringent environmental regulation because of the high institutional quality of their neighbor. This may occur as a response to positive institutional spillovers where improvements in institutional quality in one country improves institutional quality in a neighboring country leading it to adopt more stringent environmental regulations.

## 2. Institutional quality and environmental regulation stringency framework

Production in a polluting sector generates a transboundary pollutant. Policymakers legislate a particular environmental regulation level which can be in the form of an environmental standard or tax. The legislated environmental regulation level is not necessarily the same level faced by firms because there may be variability in the enforcement of the policy. Thus, we distinguish between legislated and implemented environmental regulations. Following Lopez et al. (2011), we define the *implemented* environmental tax as some fraction of the legislated tax.[2] We hypothesize that government institutions may impact the implemented tax through two mechanisms: a direct regulatory stringency channel, which captures the direct effect of institutions in their ability to implement a policy, and an indirect technology channel, which shows the

[1] Note that throughout the text, when we mention the term environmental regulation stringency, it will refer to the implemented level unless specifically indicated.

[2] Our empirical proxy for implemented environmental regulations is the shadow price of energy.