CHAPTER 1

INTRODUCTION

This dissertation consists of two different research efforts. In the first one I describe the institutional framework, policy instruments, and the enforcement process that characterize industrial water pollution regulation in Montevideo, Uruguay, aiming to identify and weigh institutional and political economy constraints that may help to explain the present instrument choice of command and control instruments as opposed to more cost-effective economic instruments. The identification of these constraints allows one to evaluate at first glance the possibilities that the country has of moving toward incentive-based instruments for the control of industrial water pollution. The second part of my dissertation is a formal econometric analysis that aims to first empirically examine the determinants of the allocation of inspections of industrial plants by the municipal and national governments in Montevideo and then to empirically testing the effect of these inspections, fines and other intermediate enforcement actions on the reported levels of emissions of Biological Oxygen Demand (BOD_5)[1] and the compliance status of industrial plants with regard to BOD_5 standards.

[1] What I refer to as BOD_5 is more specifically $BOD_{5,20}$. This is the quantity of oxygen demanded by organic matter in their break down process during five (5) days at a water temperature of 20^o Celsius.

1.1. THE INSTITUTIONAL CAPACITY AND POLITICAL ECONOMY BEHIND INDUSTRIAL POLLUTION REGULATION IN MONTEVIDEO, URUGUAY

Environmental economists advocate the use of economic instruments as a cost-effective way to control pollution.[2] Less developed countries should be particularly interested in their implementation in order to save scarce resources and avoid further compromising economic development possibilities. However, the history of environmental policy in Latin America does not validate this presumption. Pollution control regulation in Latin America has been under-developed, poorly enforced, and based on "command and control" instruments (CEPAL, 2000).[3] It is only in recent years that some countries have incorporated economic instruments into their legislation (see CEPAL, 2000 and 2001). This is particularly true for the case of water pollution.

Why have Latin American countries relied almost exclusively on command and control regulations? What distinguishes countries that have already incorporated economic instruments into their legislations (or are considering doing so) from those that still base their pollution regulation on command and control instruments? What are the conditions for a successful implementation of economic instruments?

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[2] I refer to economic instruments as those incentive-based instruments that directly control emissions, such as emission taxes and tradable discharge permits. There exists another category of economic instruments frequently called indirect economic instruments. These do not regulate emissions directly. Examples of the latter are taxes for polluting goods (e.g. gasoline).

[3] Similarly, command and control instruments may be classified as direct and indirect. Among the first ones are emission standards; the second ones include technology standards. For a more comprehensive discussion on instrument classification see Russell and Powell (1996).

Answers to these questions have come from the positive political economy literature of regulatory instrument choice and a more recent literature on the "institutional capacities" of these countries. The first states, for example, that polluting firms will prefer emissions standards to emissions charges simply because under emissions standards firms pay nothing for their emissions up to the standard. Firms therefore may pressure regulators and/or legislators against the imposition of emission charges and the latter may act accordingly, influenced by the overall economic situation of these countries. These same reasons explain why regulators may relax penalties for not complying with emissions standards. On the question of why some countries have not yet considered implementing economic instruments, this literature suggests that it is necessary to analyze the characteristics of the supply side of the "political market", such as the predominance of lawyers in the legislature and their staffs who are unfamiliar with economic instruments.

The second set of answers comes from a fairly recent literature. Russell and Powell (1996) noted that in the more institutionally developed Latin American countries some efforts are being made to implement economic instruments; however, legislation is mainly based on command and control instruments in those countries with less developed institutions. The argument of "lack of institutional capacity" gives a possible explanation for this disparity. Regulators in Latin American countries committed to implementing direct economic instruments may not succeed because the implementation of these instruments requires the capacity to monitor emissions regularly to enforce them. Most Latin American countries may not be able to satisfy this demand.

Unfortunately, there is little empirical analysis of whether the explanations provided by these two sets of theoretical literatures apply or not, and if so, to what extent. Keohane, et al. (1998) state that “most of the academic work in this area [political economy of instrument choice] has been theoretical; very few arguments have been subject to empirical validation.” Furthermore, information on political decisions is rarely available. As a result the only possibility in these cases is “through detailed case studies of the legislative decision-making process.” (Keohane, et al., 1998, p. 367). Similarly, Russell and Powell (1996) state that “no definite answer is available without substantial field investigations” (p. 1).

Moreover, when the issue of instrument choice for pollution regulation in Latin American countries is addressed, the region (or even the broader category of Less Developed Countries) is commonly treated as a homogeneous unit of analysis. (See for example Eskeland and Jimenez, 1992; Russell and Powell, 1996, O'Connor, 1998; Seroa da Motta, et al., 1999; Blackman and Harrington, 2000). But useful answers to the important questions posed above demand empirical research on the institutional and political economy characteristics of each case study as a specific unit of analysis, since the appropriateness of regulatory systems "will vary across countries, across regions within countries and also across pollutants" (Blackman and Harrington, 2000).

I am not aware of any work about the institutional and political economy characteristics behind the implementation of a specific instrument for any Latin American country. This issue motivates the first part of my dissertation, which describes the policy setting of industrial water pollution control in Montevideo, Uruguay, with three objectives. First, identify and weigh institutional and political economy factors that

may help to explain the present instrument choice. Second, explore the possibilities of moving toward incentive-based instruments. And third, contribute to the general lack of evaluations of compliance levels with pollution control regulations, the lack of coordination between the different regulatory offices, and the need to revise the present legislation.[4]

Uruguay is a peculiar case because it has had a relatively high level of economic development among Latin American countries, but its environmental legislation is extremely underdeveloped, even compared with other countries in the region with poorer social indicators. For example, air pollution is not regulated and "economic incentives" have only recently been proposed as valid policy instruments (Ley Nº 17.283, known as "Ley General de Protección del Medio Ambiente" enacted in December 2000). Water pollution legislation is an exception: it has a history of more than 30 years of "command and control" regulation, providing an excellent case to analyze.

The first part of my dissertation is based on a field research done during the years 2000 and 2001. The field research consisted primarily of data collection (originally in paper format and dispersed in different offices), interviews, and document gathering. Those interviewed included inspectors, heads of enforcement offices, policy makers, regulators' legal advisors, former heads of the corresponding environmental offices at the Municipal Government of Montevideo (Intendencia Municipal de Montevideo, IMM) and the National Environmental Office (Dirección Nacional de Medio Ambiente,

[4] Problems identified by the Water Resources Workshop of the Environmental Group of Montevideo, an inter-institutional body created for the development and control of the local Agenda 21 objectives (IMM, 2002).

DINAMA), and engineers in charge of industrial treatment plants. Finally, as part of the field research I also participated in actual inspections with IMM inspectors.

1.2. EFFECTIVENESS OF THE ENFORCEMENT OF INDUSTRIAL EMISSION STANDARDS IN MONTEVIDEO, URUGUAY

The second part of my dissertation is motivated by the present lack of formal econometric studies evaluating regulators' effectiveness in enforcing pollution regulations in Latin America, and the determinants of the allocation of enforcement actions among the regulated plants.

Effectively, the empirical literature that deals with these two issues unfortunately refers only to BOD_5 and TSS (total suspended solids) emissions of the US and Quebec pulp and paper industry and air pollution from the US steel industry [(Magat and Viscusi (1990), Deily and Gray (1991), Laplante and Rilston (1996), Gray and Deily (1996), Nadeau (1997), Helland (1998), Dion, et al. (1998), Gray and Shadbegian (2002), Shimshack and Ward (2002)]. In fact, Dasgupta, et al. (2001) and Wang et al. (2002) are the only examples of empirical studies of effects of inspections and fines on pollution levels and the determinants of the monitoring and enforcement activities of regulators, respectively, for a less developed country (China).[5] There does not exist any example of

[5] There are a few other examples of empirical analyses of informal and formal pollution regulation in LDCs (Pargal and Wheeler, 1996; Pargal, Mani and Huq, 1997; and Gupta and Saksena, 2002). But these studies, among other differences, have significant differences in the quality of their data as compared to the above-mentioned papers. (See Chapter 5).

this type of empirical work for Latin America.[6] This is a very important shortcoming because Latin America has a long tradition in water pollution control laws based on uniform emissions standards, but both public opinion and papers that have analyzed environmental policy in the region have regarded them as poorly enforced [(Russell and Powell, 1996; Eskeland and Jimenez, 1992; O'Connor, 1998; Tietenberg; 1996)]. At the same time, new regulations for other media (like air) and new incentive based instruments are being developed and implemented in some parts of the region, but no effort has been made to empirically test the capacity to enforce these new regulations.

In this respect, previous empirical analyses in the US, Canada and China are of little guidance for a Latin American country given the obvious differences in institutional capacities and even political systems. The second part of my dissertation aims to start filling this gap by first empirically examining the determinants of the allocation of inspections by the municipal and the national government among industrial plants in Montevideo, Uruguay, and then by empirically testing the effect of (a) plant-level economic characteristics, and (b) monitoring and enforcement actions of both the municipal and state governments on industrial plants' emissions of BOD_5 in Montevideo, and their probabilities of being in violation. More specifically, in the second part of my dissertation, apart from the question about the determinants of the regulators´ allocation of inspections, I address the following questions: (1) How effective have inspections and the different enforcement actions of both municipal and state governments been in terms

[6] Existing works (Blackman and Bannister, 1998; Dasgupta, et al., 2000; Coronado, 2001; Cruz and Uribe, 2002, Escuela Superior Técnica del Litoral, 2002 and Ferraz, et al. 2003) are not comparable to the present one. First, some of them do not have information on emissions or formal regulatory measures or both. Second, they are all cross-section studies. See Chapter 5 for a detailed description of these works and their data limitations and differences.

of reducing BOD_5 emissions? (2) How effective have inspections and the different enforcement actions of both municipal and state governments been in terms of the compliance status of firms? (3) Could enforcement be improved by substitutions between monitoring and enforcement actions? The latter question is relevant since inspections and orders are almost the only actions used by regulators; fines are rarely levied. If this is the expression of a strategy such as the one suggested by Garvie and Keeler (1994) in the presence of institutional and political "constraints", then a study like the one proposed here could estimate the effectiveness of such a strategy. Finally, since emissions are self-reported, I also perform some simple tests to explore the presence of under-reporting.