

THE USE OF ECONOMIC INSTRUMENTS FOR POLLUTION CONTROL IN LATIN
AMERICA: LESSONS FOR FUTURE POLICY DESIGN¹

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Abstract

I review the few programs implemented in Latin America to control pollution with direct economic instruments, and draw general lessons for the future implementation of these instruments in the region. The available evidence suggests that a combination of low capacities and political economy issues negatively affected the implementation of these programs. As a result, the capacity of the economic instruments to induce emission reductions cost-effectively and their future political viability in these countries in the short or medium run may have been compromised. This present state of affairs provides more evidence in favor of the policy recommendation that Latin American countries should build local capacities before implementing direct economic instruments, than in favor of the alternative that these countries should adapt direct economic instruments to their institutional and political characteristics.

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1. INTRODUCTION

For more than thirty years, environmental economists have been advocating emission taxes and “cap and trade” schemes as more flexible and cost-effective instruments for pollution control than the more traditional emission standards.² Nevertheless, fairly recent contributions to the literature point out that, in addition to the difficulties arising from the political economy of instrument choice (see Keohane *et al.* 1998), the lack of institutional capacity (Eskeland and Jimenez, 1992; Russell and Powell, 1996; O’Connor 1998), as well as the local culture, traditions and habits (Bell, 2003; Bell and Russell, 2002; Bell, 2002 and 2005; Russell and Vaughan, 2004) are important obstacles for the successful implementation of direct economic instruments in less developed countries. Leaving aside the cultural factors, the institutional capacity literature suggests that countries should build local capacities before implementing direct economic instruments. The choice of policy instruments must be compatible with a country’s institutional capacity, implying “...an evolution from those instruments more easily defined and enforced, and the least closely connected to ambient quality goals, toward those involving more difficult definition tasks and closer connections to desired ambient results, aiming at tradable permits in the long run” (Russell and Powel, *op.cit.*, p. 20).

The experience of Latin American countries with direct economic instruments in pollution control boils down to the following three programs: Santiago de Chile’s Total Suspended Particles’ Emissions Compensation Program (ECP) of 1992 and its extensions to industry emissions of Nitrogen Oxides and Particulate Matter in 2004, Colombia’s 1997 Discharge Fee for Water Effluents’ contents of Biochemical Oxygen Demand and Total Suspended Solids, and Costa Rica’s 2009 Environmental Fee for Water Discharges of Chemical Oxygen Demand and Total Suspended Solids.³ These programs challenge the policy recommendation based on the institutional compatibility in the sense that environmental

² The analysis of “indirect” instruments to control pollution (i.e.: those not regulating the end-of-pipe level of emissions directly, but other indirect determinant of the level of pollution, such as the abatement or production technology) is beyond the objective of this paper.

³ Other attempts to implement direct economic instruments in some of these countries as well as other countries in the region did not succeed.

authorities in these countries did not wait for economic development to bring the necessary capacities to implement direct economic instruments. Instead, these programs represent attempts to adapt direct economic instruments to the country's economic, social and cultural characteristics (Huber *et al.*, 1998, Serôa da Motta *et al.*, 1999). It is therefore very important to know how these programs performed and more important, if possible, to draw general lessons from these experiences that may be useful for the future implementation of direct economic instruments in Latin America.

The last general lessons from the implementation of economic instruments in Latin America were drawn by Huber *et al.* (1998), Serôa da Motta *et al.* (1999), CEPAL (2000) and Acquatella (2001 and 2005). These studies effectively identified and warned about institutional capacity and political economy issues that were preventing a successful implementation of economic instruments during the 1990's.⁴ According to these studies, the economic instruments gained political acceptability with the market oriented policies that were being implemented in the region in those years. However, this political acceptability did not translate into an increase in the budgetary allocation to environmental agencies. Quite the contrary, the fiscal austerity that characterized the macroeconomic reforms during the 1990's prevailed. Without these funds needed to overcome monitoring technology and staffing deficiencies, the economic instruments were not properly enforced and started to lose credibility in the regulated community. CEPAL (2000) and Aquatella (2001) added that this lack of provision of the necessary capacities during the nineties was coupled with an institutional – judiciary framework that prevented horizontal and vertical coordination between and within the different layers of national and regional agencies and norms. As a result of this lack of institutional capacity and political will, the effective implementation of economic instruments during the 1990's remained limited to a role of timid revenue-raising mechanisms for the environmental agencies, instead of instruments to control pollution cost-effectively.

What were the main lessons derived from these findings? In Huber *et al.* (1998) first and Serôa da Motta, *et al.* (1999) later, these authors recommended the implementation of economic

⁴ These works covered a broad set of economic instruments: not only direct but also indirect economic instruments, and not only those implemented to control pollution, but also those pricing the extraction or use of natural resources.

instruments to be modest (or compatible with institutions), gradual (starting from pilot projects or experimental programs before going regional or national) and flexible (allowing low cost revisions of the legislation). They also recommended the implementation of economic instruments to assure the participation of stakeholders, and to generate revenue through cost-recovery approaches over correct pricing approaches, as a way to build political consensus and guarantee financing.

These are the last general lessons drawn from the implementation of economic instruments for pollution control in Latin America, to my knowledge. Nevertheless, the above mentioned works do not cover the experience with Santiago de Chile's ECP and Colombia's Discharge Fees programs beyond both program's first design (and first year of implementation in the case of the ECP), not to mention the performance of Costa Rica's environmental fee program about which little is known. In other words, there is no work in the literature today that examines the experience with these the only three programs based on direct economic instruments implemented thus far in Latin America, and analyzes whether the lessons drawn above were taken into account or not, whether they were useful or not to overcome the initially identified problems and whether there are new lessons to draw. The objective of this paper is to contribute to filling this gap based on a number of studies that have been published during the last years analyzing Santiago's ECP on the one hand and Colombia's discharge fees on the other, as well as other sources of information, including interviews with regulators and policy makers.

Beyond the specific lessons drawn that may be useful for the future design of economic instruments, the most important conclusion that emerges from the analysis is that these three policy experiments provide more evidence in favor of the policy recommendation that countries should build a necessary set of local capacities before implementing direct economic instruments, than in favor of the alternative that countries should adapt direct economic instruments to their institutional and political characteristics. This conclusion is based on the consequences that the changes that are necessary to introduce in the design of these instruments to adapt them to the local conditions may have on the instruments' incentives to reduce pollution cost-effectively, and on the negative effect that the underperformance of these instruments may have on the political support for this type of instruments.

The paper is organized as follows. In the next section I describe the background, the final design, the implementation and the performance of the programs. I draw the lessons in section 3. Finally, I conclude in Section 4.

2. THE LATIN AMERICAN EXPERIENCE WITH ECONOMIC INSTRUMENTS

The experience of Latin American countries with direct economic instruments for controlling pollution boils down to a few programs. I review these programs below, in chronological order.

2.1. Santiago de Chile's Total Suspended Particles' Emissions Compensation Program (ECP)

2.1.1. Background

One month after it took office in March 1990 the first democratic government of Patricio Aylwin undertook a major environmental policy reform in Chile. As part of this reform it created a Special Commission for the Decontamination of the Metropolitan Region (CEDRM) of Santiago. The commission acted under the politically influential Ministry General Secretariat (O'Ryan, 2002). This commission elaborated a Master Plan to tackle the pollution problem in Santiago. The Plan was transformed into a decree (Decree #4) by the Ministry of Health. This Decree included the implementation of an emission standard of 122 mg/m³ of TSP for existing boilers and industries, and the ECP.

O'Ryan (2002) asserts that there are two reasons why a tradable emission permits system for Santiago gained political support at that time. The first reason was that the exporting sector was receiving signals of concern from their clients abroad with respect to Chile's environmental record. Both this sector and the government were aware of the need to take actions in the environmental arena in order to improve Chile's image in the world market. Bauer (2004) provides a similar explanation: international trade agreements required Chile to have environmental legislation. The second reason was that the exporting sector wanted regulations to be flexible and with minimum government intervention, and so did the government. This was a new democratically elected government that understood that pressuring the private sector with "interventionist" environmental regulation was not the way to go through a delicate transition to democracy. As a result, the negotiations between the government and the private sector conducting to Decree #4 "lasted only a few weeks. ... The receptivity of tradeable permits was

so good among all actors that they were incorporated as a key instrument into the Environmental Framework Law passed in 1994. A law for marketable permits had to be passed ... by the end of 1996” (O’Ryan, 2002, p. 3).

Supreme Decree #4 was passed in March 1992, transforming Chile in the first Latin American country, and so far the only one, to implement a tradable permits program to control air pollution.⁵

2.1.2. *The design of the Emissions Compensation Program*

Initially, the ECP was designed to control TSP emissions from industrial, domestic and other boilers, as well as industrial processes with a maximum flowing capacity greater than 1,000 m³/hour. Nevertheless, industrial processes were later excluded from the program given the difficulty in estimating their maximum capacity of emissions (Palacios and Chávez, 2002). Although the resulting coverage of emissions was estimated to be just 4% of the estimated total emissions of TSP in the metropolitan area of Santiago (Palacios and Chávez, 2005), most of the emissions covered are PM₁₀, which cause the worst health problems (Montero, *et al.*, 2002).

The emission permits in Santiago’s ECP are not actually emission permits in the classic sense, but emission capacity permits. The reason for this is that “it was recognized that monitoring and enforcement capacities were weak and underfunded, and that any system to be established had to keep monitoring and enforcement costs low for both sources and the regulatory agency” (O’Ryan, 2002, p. 3). To require the sources of the ECP to install a continuous monitoring device was considered to be economically unfeasible (Montero, *et al.*, 2002). The maximum daily emission capacity of a source was estimated by the authorities multiplying the maximum hourly flow of the source (m³/hr) by an estimated concentration of kg of TSP/m³. The estimated concentration was not source-specific but an estimated average of 56 mg/m³ for all sources. This estimated concentration was adjusted to 50 mg/m³ in 2000, and again to 32 mg/m³ in 2005 (Coria and Sterner, 2008). The permits granted to the original sources covered by the program were called Initial Daily Emissions (IDE). Each IDE grants the owner a

⁵ It is worth noting that Chilean program is contemporaneous to the U.S. 1990 amendments to the Clean Air Act that established the Sulfur Dioxide (SO₂) Allowance Trading Program, whose Phase I started in 1995, and to the Regional Clean Air Incentives program (RECLAIM), which started in 1994.

permission to have the capacity to emit one kilogram of TSP per day in perpetuity. New sources entering the program have to “compensate” for their emission capacity buying IDEs to one or more of the existing sources. The compensation began gradually. According to the SD#4, in 1993 new sources had to compensate 25% of their emissions capacity, 50% the next year, and so on, until 1996 when they had to compensate 100%. Nevertheless, this was changed in the following years. From June 1998 new sources have to compensate 120% of their emissions capacity, and 150% from April 2001 (O’Ryan, 2002).

All compensations have to be approved by the regulator. If this is done, the regulator grants an equivalent number of permits to the new source. (The new sources’ permits are called Permitted Daily Emissions (PDE), but are equivalent in all sense to the IDEs of the original sources).

The enforcement of the program is based on an annual self-report of the daily emission capacity of the source, which has to be below the number of permits it holds. The sources do not actually measure their emission capacity themselves but instead they hire an accredited laboratory to do this job and present the report to the authorities. The regulator conducts inspections on both the sources and the laboratories to check for the accuracy of the emissions capacity reports and the laboratory equipment characteristics (Palacios and Chávez, 2002).

As said, the regulated plants in Santiago’s ECP are at the same time subject to an emission standard of 122 mg/m³, also established by the SD #4. Emitting above this concentration level is illegal, regardless of the number of permits held.

2.1.3. Implementation

The market created by the SD # 4 in 1992 officially started in 1993, without any major political opposition. Nevertheless, the program had to overcome several institutional constraints. In the first place, there was no environmental regulatory body to administer the program. This body was created that same year under the name of Fixed Sources’ Emissions Control Program (PROCEFF), as an administrative unit inside the Metropolitan Health Service of the Environment (SESMA), a regional office of the Ministry of Health. Interestingly, the idea of the private sector and the CEDRM officials with PROCEFF was to create a “non discretionary monitoring and enforcement body”, aiming “more at working with the sources than to sanctioning non-compliance” (O’Ryan, 2002, pg.3).

Another important problem that the implementation of the ECP had to overcome was the construction of an emissions capacity inventory in order to allocate the permits. Having created a market for pollution permits before a regulatory office for air pollution existed; Chilean authorities had neither an inventory of emissions on which to base the allocation of permits, nor the resources to construct it in a timely fashion. Nevertheless, the task was facilitated by the incentive to declare the emissions capacity that the grandfathering of the permits created (Montero, *et al.*, 2001 and 2002). On the other hand, the grandfathering of permits without comprehensive information on historic emissions capacity of sources also created incentives for these sources to over report their emissions capacity (Montero, *et al.*, 2001 and 2002). The process of building and correcting the emissions inventory took PROCEFF several years. For example, it took PROCEFF seven years to assign the status of “existing” or “new” source as of march 1992 to all the identified sources affected to the ECP (Montero *et al.*, 2001; Palacios and Chávez, 2002). During these first years, PROCEFF “did not pay much attention to the trading activity and, consequently, to the reconciliation of permits and emissions capacity” (Montero, *et al.*, 2002), in spite of the fact that compliance became mandatory in 1994. As a result, the program suffered from noncompliance in its first years of implementation. Palacios and Chávez (2002) report that 42.6% of the sources were violating their emissions capacity permits in 1995. Consequently, the aggregate daily declared emissions, corrected by the offset requirements of the new sources, exceeded the aggregate permits by 41% in the same year (Montero, *et al.*, 2002).

2.1.4. Overall performance and evaluation

Based on the available evidence, the overall conclusion with this policy experiment is that although the environmental objectives were accomplished, the market for emission capacity permits did not fully develop.

The environmental objectives of the SD#4 were accomplished after 1997 by a combination of reasons. First, the implicit emissions capacity cap was too generous (Montero, *et al.*, 2002). Environmental regulators over-estimated the emissions capacity of the sources, mostly due to poor information records (Coria and Sterner, 2008). Second, the sources switched to natural gas in 1997, when it became available from Argentina. This switch was mostly due to the relatively low price of the fuel, and not because of the ECP (Coria, 2009). As a result, between 1997 and 2006 all the affected sources in the ECP complied with the emission standard of 112 mg/m³. In 2007, last information available, as a result of the shortage in the natural gas

that had started in 2004, this standard was violated by some sources for the first time in 10 years (Coria and Sterner, 2008).

As said, the ECP market did not fully develop. There have been a relatively small number of transactions (240 between 1997 and 2007), 76% of which were intra-firm (Coria and Sterner, 2008). Several reasons have been cited in the literature to explain such an unexpected performance. One of these reasons is regulatory uncertainty, produced during the first years of the program by the delay in the completion of the emissions inventory, and continued over the years as a result of the changes in the offsets requirement for new sources (commented above), that were put in practice when the regulators realized that their initial allocation of permits was too generous (Montero, *et al.*, 2002). Possibly for the same reason, the regulators also decreased the concentration used to estimate the emissions capacity, as also commented above. Finally, the lack of clarity in terms of the responsibilities in case of non-compliance was also a source of regulatory uncertainty (O’Ryan, 2002). There was no established criterion to relate the magnitude of the violation to the amount of the fine. The final amount of the fine was determined by a “case by case” procedure (Palacios and Chávez, 2002).

Another reason identified in the literature to explain the low trading activity is the level of transaction costs (Montero, *et al.*, 2002; O’Ryan, 2002). These are due mainly to the length of the approval period. The historic average period for a transaction to be approved is about 20 months. Nevertheless, it has decreased over time. For example, the program began in 1993 but the first transaction was approved in 1998. It took regulators 39 months to approve transactions initiated before 1998 (Coria and Sterner, 2008). In addition, transactions costs are due to the lack of public information on the opportunities to trade and market prices. There is no systematic record of transactions by the regulators, who are not obliged to report prices publicly either. In fact, as most of the transactions have been intra-firm, it is not clear whether there was an actual price in these cases (Coria and Sterner, 2008). The lack of information on partners, prices and also technology options is identified by sources affected to the ECP as the main pitfall behind the design of the ECP (Coria, *et al.*, 2009).

Another issue that has characterized the ECP over the years is non compliance. Aggregate violation had disappeared and the percentage of noncompliant plants had decreased to 25% in 1997. Nevertheless, the shortage of natural gas that started in 2004 caused the boilers to

return to dirtier fuels, and as a result the percentage of sources in violation, which had reached a minimum of 21% in 2005, increased to 24% in 2007 (Coria and Sterner, 2008).

Noncompliance has been the consequence of some of the above mentioned reasons behind the thin market, but also the consequence of an ill enforcement strategy (Palacios and Chávez, 2002). With respect to the first, non compliance is produced by the delay in the approval of transactions by regulators, for example. Regulators do not approve trades in a timely fashion and this situation provides a justification for months of unpunished noncompliance (Coria, *et al.*, 2009). On the side of the enforcement strategy design, fines are not related to the size of the violation, they are instead a fixed amount within a certain range. As a consequence, the maximum violations observed in the ECP are always profitable, even under perfect, continuous monitoring (Palacios and Chávez, 2002).

A final reason behind the unexpectedly poor performance of the permits market that has been identified in the literature is related to the institutional arrangement under which the ECP operated (Coria, *et al.*, 2009; O’Ryan, 2002). In 1994 the Chilean congress approved a framework law for the environment (Ley de Bases del Medio Ambiente). This law created the National Commission of the Environment (CONAMA), and its regional offices. The regional office of CONAMA for the metropolitan region substituted the CEDRM. But the national CONAMA was assigned a lower rank than a Minister, therefore environmental matters never had enough weight inside the government (Pizarro, 2007). In addition, the administration of the ECP remained in charge of a sub-department of the regional branch of the Ministry of Health.⁶ The Ministry of Health, more oriented toward “prescriptive regulation” (Ellerman, 2007), was always more interested in attaining the desired environmental quality and acquiring information on sources than in the ECP market itself. It therefore paid little attention to the reconciliation of permits, its enforcement and the implementation of the market in general (Montero, *et.al*, 2002; O’Ryan, 2002). This is understandable; although it is in charge of the implementation of the

⁶ In 2000, PROCEFF was formerly renamed Sub-Department of Air Quality, inside the regional branch of the Ministry of Health, SESMA. Later in 2005, SESMA was absorbed by a new metropolitan branch of the Ministry of Health, SEREMI (Palacios and Chávez, 2002, Coria, *et al.*, 2009, O’Ryan, 2002, <http://www.asrm.cl/menu/institution.aspx>)

ECP, the performance of the Ministry of Health is evaluated by health indicators, not market indicators (Coria, *et al.*, 2009).

Finally, the problems suffered by the ECP eroded the support for tradable permits inside CONAMA (O’Ryan, 2002). Furthermore, 58% of the interviewed sources in a recent survey declared that they would prefer emission standards or technology regulations over tradable permits (Coria, *et al.*, 2009). This mood is reflected also in legislators: although it should have been approved by 1996, a framework law regulating credit-based markets for pollution permits has been awaiting discussion in congress since 1995.

2.2. Colombia’s Discharge Fee for Water Effluents

*2.2.1. Background*⁷

In August 1991, less than a year after taking office, the newly elected president Gaviria, an economist, endorsed a policy document entitled “An Environmental Policy for Colombia”. This document proposed a major institutional and regulatory reform in Colombian environmental policy. Among other things, it proposed the creation of a Ministry of the Environment and the development of economic instruments. The Ministry of the Environment would concentrate the enforcement of the existing environmental norms, at that time in the hands of several ministries and Regional Autonomous Corporations (Corporaciones Autónomas Regionales, hereafter CARs).

The 1991 policy document gave birth to a legal proposal. Before presenting it to Congress, the government performed a “wide public consultation process across the country with the participation of a wide range of different stakeholders” (Uribe, 2004, pg. 4) that resulted in the incorporation of some modifications to the initial proposal. These modifications included a

⁷ This section is based on Uribe (2004). Uribe was a key actor during the process that ended in Law 99. He was Head of the Environmental Policy and Regional Autonomous Corporations Division of the Department of National Planning between 1990 and 1994; he was in charge of coordinating working groups that advised the members of the Constitutional Assembly on environmental matters. He is also co-writer of the Law 99 of 1993, and one of the two delegates representing the national government throughout the consultation process and discussions in Congress.

less centralized institutional framework, the creation of five institutes of research to scientifically support policy decisions and more social participatory and control mechanisms. In particular, the legal proposal left the design of the national environmental policy to the Ministry of the Environment but its implementation to the CARs or the Urban Environmental Authorities (*Autoridades Ambientales de los Grandes Centros Urbanos*, hereafter AAUs), in the case of the cities with more than a million inhabitants.

After the incorporations of the modifications that emerged in the public consultation, the proposed law was presented to the Congress. The debate in Congress centered in the jurisdictional limits of the CARs. The government wanted that these were defined by ecological criteria, but some members of Congress wanted them to coincide with the jurisdictional limits of the Departments, so as not to jeopardize the Governors' local political power. The national government finally conceded to this and to the creation of more CARs as part of the political negotiation in Congress. As a result, the Colombian Congress approved the legal proposal, which became Law 99 of 1993.

This law meant a significant change in Colombian environmental institutional framework and policy. Apart from creating a new Ministry of the Environment, in its first article the Law 99 establishes the incorporation of the environmental costs and the use of economic instruments as a general principle in the design of the national environmental policy. Following this principle, it gave the new Ministry of the Environment the function of conducting economic valuation studies and establishing the technical methodologies for the economic valuation of the costs and benefits of conserving the environment (Art. 5). More important for this work, Article 42 of Law 99 established that the pollution of the atmosphere, water or soil is subject to discharge fees. The bases for the calculation of the fees are to be set by the Ministry of the Environment, specifically including the economic valuation of the social and environmental damages caused by emissions, and the restoration costs of the affected resource, giving the discharge fees a Pigouvian feature.

What explains this new confidence of the Colombian policy makers in environmental economics? Discharge fees for water pollution were not entirely new in the Colombian legislation. The Water Code of 1974 included such fees, aiming at taxing emissions of "lucrative" firms only. Nevertheless, the fees were not regulated until 1984. Moreover, the implementation of the old fees was very limited mainly because a lack of political will, without which the fees could not be more than a timid financing mechanism for some CARs (CEPAL,

2000). According to Uribe (written communication, 2010), who coordinated the writing of the legal proposal that became Law 99, he convinced himself from the beginning of the process that in order to be politically viable any environmental legislation should be accompanied by an economic justification; i.e.: a quantitative benefit – cost analysis. According to him, the discharge fees included in the Water Code of 1974 never came into effect because the Code lacked this requirement. Not being an economist, and without any environmental economist to help him at that time in Colombia, Uribe had to train himself reading environmental economics textbooks. He explicitly acknowledges having based the inclusion of the discharge fees in the Law 99 on Baumol and Oates' classic text "The Theory of Environmental Policy" (Uribe, 2004, pg. 29 and Uribe, written communication, 2010).

2.2.2. *The design of the pollution charges*

Interestingly, the structure of the new Ministry of the Environment outlined by the Law 99 included an Office of Economic Analysis directly depending from the Vice Minister (Article 10). This Office of Economic Analysis was in charge of designing and implementing the discharge fees foreseen by Law 99. These responsibilities fell on its first Director, Thomas Black Arbelaez.⁸

When Black joined the Ministry, the discussion was centered on how to implement the demanding task of estimating the damages of pollution in order to set the proper taxes, as established by Law 99 (Thomas Black, written communication, 2010). Raising concerns about the cost of such a task, Thomas Black and his team changed the course of the discussion. Based on a mechanism proposed by Baumol and Oates in the same textbook cited above, and after several "conversations" with Wallace Oates, Black decided to follow a "cap and charge" approach (Black, written communication, 2010). According to this approach, the total amount of pollution in every basin (the cap) is determined through a negotiation between all the relevant

⁸ Before heading the Office of Economic Analysis of the Colombian Ministry of the Environment, Black had worked for seven years at the Economic Analysis Group of the Environmental Division of the General Accounting Office of the United States' Congress. In particular, Black spent his last three years there estimating the cost savings that could be attained by the US Acid Rain Program and working on a proposal for a pollution tax on lead emissions.

stakeholders based on the available information at hand. After the cap is set, the regulator charges an initial tax that, if proven too low, is increased periodically until the cap is reached.

The scheme was put into regulation by the Decree 901 of 1997. This decree established that the fees would charge the load of Biochemical Oxygen Demand (BOD₅) and Total Suspended Solids (TSS) in water effluents of point sources. According to the decree, a minimum national fee is defined annually by the Ministry of the Environment. (The initial values of the fees were US\$ 17/ton for BOD₅ and US\$7/ton for TSS emissions, respectively). This minimum value of the fee can be adjusted by a “regional factor”. This regional factor is set every five years by the CARs and AAUs and adjusted upward every six months if the pollution reduction is below the targeted pollution reduction for the river, watershed, region or city. The pollution reduction target is set by the CARs and AAUs through a participatory process with the different stakeholders. The information on pollution reduction used to calculate and adjust the fees is based on self-reports by the sources. Municipal sewage companies could report emissions based on presumptive levels.

The fees did not substitute the existing emission standards, but applied only to the legally permitted levels of emissions. Concentrations of the regulated pollutants above these standards are not subject to the tax, but to a fine. Both the CARs and the AAUs are in charge of the collection of the fees.

2.2.3. Implementation

The implementation of the institutional reforms approved by Law 99 of 1993 took several years. The government created the Ministry of the Environment in 1994, and sixteen new Corporations between 1994 and 1998. At the same time, urban environmental authorities were established in Bogotá, Cali, Medellín and Barranquilla. This capacity building process was largely funded by the World Bank and the Inter American Development Bank (Uribe, 2004).

One of the most important problems facing the national implementation of the fees since the beginning of the program was the disparity between the institutional capacities of the different regional corporations. Only one regional corporation started collecting fees in 1997, the year the program started. To solve this problem, the team of economists at the Office of Economic Analysis, led by Thomas Black, met with the regulated sector and community members in the different regions, conducted studies to assess the degree of pollution and its effects in the different regions, and provided technical support to the regional authorities. This

technical support was provided through workshops and technical documents compiled in an implementation manual (Ministerio de Ambiente, Vivienda y Desarrollo Territorial, República de Colombia, 1998). The team counted upon the advice of David Wheeler, Lead Economist of the World Bank's Development Research Group at that time, who endorsed the program in seminars to local regulators. The technical documents included in the manual presented the basic theory behind the discharge fees, the basic legal framework through which the implementation of the fees should be defended by the local lawyers, and a detailed account of the steps to follow to successfully implement the discharge fees, including accompanying software to help members of the less developed CARs and AAUs to calculate the fees. The members of the leading CARs and AAUs were considered a central part of the implementation plan and also took part in it.

The manual sought to build local support for the fees on the basis of two ideas: first, they were a source of revenue for local regulators, and second, “command and control” instruments were costly means of achieving the environmental targets, as demonstrated by the fact that compliance with the existing emissions standards had been historically poor. The discharge fees, on the other hand, would minimize the compliance costs of the regulated parties.

Other arguments managed by the Minister were that the fees would generate local employments and access to new markets. The former was to be accomplished by the construction of hundreds of treatment plants, mostly by municipal facilities, financed by the Inter American Development Bank.

What the regulators of the Ministry of the Environment learnt in the field was that local regulators and local public and private sources of pollution were more concerned with the allocation of the revenues generated by the fees than with their cost effectiveness. Local managers of private firms and public works wanted the revenues to be re-invested in the regional community. In the words of World Bank (2000): “They viewed the charges as a financial sacrifice they would bear only if the revenues were used to fund local investments in cleaner manufacturing and wastewater treatment. Without support from industrialists and public works managers, the charge program stood no chance of implementation. ... Finally, representatives from the Environment Ministry team, regional agencies, industrialists, public works managers, and community organizations hammered out a mutually agreeable solution. The new charge program would support "regional decontamination funds" used for local environmental projects, after some portion was diverted to fund agency budgets....” (pg.135).

2.2.4. Overall performance and evaluation

Besides the remarkable effort of the team at the Ministry of the Environment, the program continued to suffer from many implementation problems. The degree of implementation of the program between CARs varied greatly. Some CARs collected 95% of the fees invoiced while others just 1%. Some CARs invoiced 100% of the potential sources, others just 1%. Overall, the implementation was more successful in CARs that were richer and older (Blackman, 2009).

Probably the most important implementation problem suffered by the Colombian discharge fees program was (and still is) the broad noncompliance by the main discharges: the municipal sewerage companies. Because the emissions of these sources did not decrease, the environmental quality targets were not met, and the fees never stopped increasing. This triggered the lobby from the rest of the sources, complaining that they were paying for the noncompliance of the municipal sewerage companies, who also lobbied against the fees themselves. As a result of this lobby, the government of President Alvaro Uribe repealed the Decree 901 in 2003 with a new Decree 3100 (later modified by Decree 3440 of 2004). Essentially, the new decree introduced the following changes:

(a) It mandated the CARs and AAUs to establish (i) individual targets of pollution reduction for municipal sewage companies and sources whose loads are more than a fifth of the total loads received by the water body, and (ii) group targets for the rest of the sources, according to the group's type (industrial branch, etc.);

(b) It mandated the CARs and AAUs to ask the municipal sewage companies to present a Plan for Pollution Management in accordance with the pollution reduction target;

(c) It changed the method by which the fee is adjusted. First, the adjustment is now annual, instead of every six months. Accordingly, sources have to report once a year, instead of two, as before. Second, the calculation of the pollution load relative to the target in the regulated river or watershed leaves aside the pollution load of municipal sewage companies. Third, the adjustment of the fee calculated as above will be applied only to those individual sources or group sources that did not comply with the corresponding individual pollution reduction target; and

(d) It set a cap of 5.5 times the minimum national fee to regional fees.

Finally, the new decree also institutionalized the earmarking of local revenues.⁹

According to Black Arbeláez (written communication, 2010) the reformed discharge fees are insufficient to act as an incentive to reduce emissions and/or invest in treatment technology. In any case, it is obvious that the changes sought to leave the municipal sewage companies and large polluters outside the fees' program, changing a monetary incentive to invest in pollution abatement by a prescriptive-type pollution abatement plan. But above all, the changes introduced by the new decree illustrate the drop suffered by the fees' political support.

2.3. Costa Rica's Environmental Fee for Discharges

2.3.1. Background

In the year 2000, the council of Central American ministries of the environment, board of the Central American Commission of the Environment and Development (Comisión Centroamericana de Ambiente y Desarrollo, CCAD) approved the Central American Program for the Modernization of the Environmental Policy (Programa Centroamericano de Modernización de la Gestión Ambiental, PROSIGA), funded by the Embassy of the Netherlands in Costa Rica (SICA, 2000). One of the objectives of this program was to “complement the direct environmental regulation with economic policy instruments, with a view to the environmental benefits and costs generated by the economic activities” (SICA, 2000, pg. 2). PROSIGA's objective was to produce legal proposals for the implementation of economic instruments in several Central American countries, but only succeeded in Costa Rica, possibly because this country had more advanced environmental policy institutions and because the policy proponents had more political influences in Costa Rica than elsewhere (Hubert Méndez, regional coordinator of PROSIGA, personal communication, 2009). PROSIGA hired Thomas Black, former head of the Office of Economic Analysis of the Colombian Ministry of the Environment. Black advised the economists Hubert Mendez and Raúl López, the person in charge of developing the economic instruments in PROSIGA, on the economic and judicial framework supporting the

⁹ In 2003, as part of a strategy to reduce its operational costs, the government closed the Ministry of Development (Uribe, 2004). The formulation of policies related to land use, drinking water, sanitation and low income housing was transferred to the Ministry of the Environment (Decree 216 of 2003). The ministry was renamed accordingly as the Ministry of the Environment, Housing and Territorial Development.

Colombian program. Méndez and López visited Colombia, and with the assistance of Thomas Black designed Costa Rica's environmental fees for discharges. (Black, written communication, 2010).

2.3.2. *The design of the environmental fees*

The influence of the Colombian experience on Costa Rica's environmental fees for discharges is explicitly acknowledged in the technical documents produced to support the legal initiative (see for example, López and Méndez, 2004), and translates in the chosen conceptual framework (a Pigouvian tax on pollution) and its design (regulation by basin, a target for pollution reduction that has to be the result of a negotiation between the different stakeholders in every region, basin, or city, etc.).

In its final version (Executive Decree #34431 of 2008), Costa Rica's Environmental Fee for Discharges puts a price on each kilogram of COD (Chemical Oxygen Demand) and TSS (Total Suspended Solids) discharged. The fee, charged quarterly, does not substitute the previous emission standards, but it complements them. It is actually a three-part fee, with segments defined by the concentration level C_j of the pollutant j in the source's effluents relatively to the ambient concentration of the pollutant in the water body at the point of discharge (Ca_j) and the maximum allowable level of discharge (Cp_j , the standard). The source pays no fee for the emitted kilograms of COD and TSS if $C_j < Ca_j$. If the concentration level of the pollutant is above that of the receiving water body at the point of discharge but below the standard, $Ca_j < C_j < Cp_j$, the source pays a fee of US\$0.22 \times 0.75 and US\$0.19 \times 0.75, respectively, per kilogram of COD and TSS emitted in that range. Finally, if $C_j > Cp_j$, the total fee paid by the source is the sum of a fee of US\$0.22 and US\$0.19, respectively, per kilogram of COD and TSS emitted corresponding to the concentration levels in the interval $(Cp_j - Ca_j)$, plus US\$0.22 \times 3.5 and US\$0.19 \times 3.5, respectively, per kilogram of COD and TSS emitted corresponding to the concentration level in excess of the standard $(C_j - Cp_j)$.

The fee is applicable only to point-sources of pollution. The targets for pollution reduction are to be proposed by the Ministry of the Environment and discussed with the relevant stakeholders of the regulated zone. If an agreement is not reached in three months the ministry of the Environment sets the target for each zone. In order to calculate the amount of discharges and the fee invoice, the Ministry of the Environment asks each source to report emissions once a year. If the source does not report emissions, the government can estimate the source's

presumptive emission levels using past reports, number of employees, level of production, inputs used, the source's branch, or bibliographical references.

Finally, the revenues obtained through the collection of the fee are to be spent in the zone where they were generated and on specific issues by fixed proportions. For example, 60% of the revenues are earmarked to finance municipal water treatment plants, 15% to promote cleaner production in the sources and 10% to finance monitoring costs of the regulators.

2.3.3. *Implementation*

Costa Rica's environmental fee for discharges came into effect in October 2008. The first fee was collected in January 2009, almost six years after the initial regulation was issued (J. M. Zeledón, Director, Waters Bureau, Costa Rican Ministry of Environment, Energy and Telecommunications, written communication, 2009; M. Peña, Ecolegis Environmental Law Services, written communication, 2009). But although the implementation in Costa Rica took several years, the reasons for the delay were different from those that affected Colombia.

Building on the Colombian experiment, Costa Rica regulated the environmental fee comparatively faster. PROSIGA was approved in 2000 and the first version of Costa Rica's environmental fees for discharges came out as Executive Decree #31176 of 2003. The fee was modified in 2004 by a new decree (# 31858), through which the government excluded the agriculture and the aquaculture from the list of sectors affected by the fees. It also established that the implementation of the fee would be gradual; starting at 10% of its value in the first year and ending at 100% in the sixth year. The Ministry of the Environment could revise the environmental target or the level of the fee every six years.

The new decree also established January 1st, 2005, as starting date for the implementation of the fee. Nevertheless, the fee was not implemented in January 2005. In fact, it was contested in court by the sugarcane industrial-agricultural union (Liga Agrícola Industrial de la Caña de Azúcar). The principal argument against the fee by this union was that it was a tax, something that could only be promulgated by the congress (Peña, 2008). In 2006 the Supreme Court ruled against the contest, declaring the constitutionality of the fee, giving it a legal and political crucial endorsement (Zeledón, personal communication, 2010).¹⁰

¹⁰ The Supreme Court did rule against the trust fund created by the decree 31176.

Nevertheless, the lobby efforts from the sources did not end with the Supreme Court ruling. They continued, and had their results. In response to a “request” from several economic sectors, according to which the fee needed to be compatible with the emissions standards and needed to recognize the efforts made by compliant sources and punishing violators (Zeledon, 2009), the Ministry of the Environment approved a new decree (# 34431) in 2008. The new decree included a substantial change in the level and the structure of the fee, which was transformed in the three part fee explained above. Originally, it was a plain fee of US\$ 0.22 per kilogram of COD emitted and US\$ 0.19 per kilogram of TSS emitted.

The implementation problems have also been important in the administrative arena. The Department of Waters of the Ministry of the Environment had to hire personnel, build a database on emissions and payments, and acquire the necessary materials to monitor emissions and administer the revenues for investments. The charge collection is more developed in the Tarcoles basin, where 60% of the industry and 65% of the population of Costa Rica are located. Nevertheless, the collection is estimated to be 80% of the total potential. In the rest of the regions, regulators are starting to collect the necessary information to collect the fee, but this has not started yet (Zeledón, personal communication, 2010).

The problem that a deficient collection of fees causes is that the revenues generated are not enough to finance the investments in treatment plants and monitoring costs, so the program cannot develop. A solution to this problem would be to concentrate investments in some basins, not necessarily the one where the revenues are generated. But this would be illegal. As a result, it is possible that the implementation of the program continues to be slow.

Somewhat paradoxically, Costa Rican regulators have found that the most difficult sources of pollution to negotiate with are public utilities providing water services such as sanitation, drinking water and irrigation. In fact the Costa Rican Institute of Aqueducts and Sewerage, a national public utility, is not paying the fee. On the other hand, private firms see the fee as an opportunity to gain access to foreign markets (Zeledón, personal communication, 2010).

It is too early to conclude what the future of the environmental fee would be, but given the similarity of the implementation problems in Costa Rica with those of the Colombia’s discharge fees, particularly the opposition of large public utilities, the hypothesis that the program will suffer a decrease in political support cannot be rejected.

2.4. Other programs

2.4.1. In Chile

Apart from the well known ECP, Chile has recently implemented an emission compensation program for big industrial sources of NO_x emissions in the Metropolitan Santiago. This program assigned a cap of emissions of NO_x for the year 2007 that is 66% of the aggregate estimated emissions of 1997. This cap was designed to be reduced by 50% in 2010 to comply with the Metropolitan Area Decontamination Plan. The authorities of the Metropolitan Area of Santiago implemented in 1998 another program -not exactly a tradable permits program- by which new major investment projects not complying with certain emission limits are obliged to compensate their emissions of PM and gases with that of existing sources in order to pass the Environmental Impact Assessment (Calfucura, *et al.* 2008)

2.4.2. In the rest of Latin America

There are other experiences in Latin America with direct economic instruments. Nevertheless, for several reasons, they look very different from a classic text-book like economic instrument. An example is the State of Sao Paulo's industrial effluents charge in Brazil. Implemented in 1981 by a law passed in 1977, the charge was designed only as price for the treatment of industrial effluents' service by the state's water and sanitation company (de Gusmao, 2000). The amount of the charge depends on a theoretical, industrial sector – based, presumptive level of pollution.

Another example is the water charge implemented in the Brazilian Paraiba do Sul river basin since March 2003 (Braga, *et al.*, 2005). This charge depends on a theoretical fraction of treated effluent in relation to the total volume of effluent produced and on a theoretical efficiency in the treatment process. Actual effluents loads are not regularly monitored nor reported by firms. In fact, a recent survey found that 157 out of 488 industrial plants could not determine the volume of effluents produced by them and only 15% of the 488 plants surveyed declared that they monitor their effluents (Féres, *et al.*, 2005). Lastly, the level of the charge is significantly below the lowest marginal abatement cost estimated by these authors, suggesting that the charge may not be a sufficient incentive to induce a reduction in pollution loads.

2.4.3. Unsuccessful attempts to implement economic instruments

Chile, Colombia and Costa Rica are the only countries in Latin America that implemented direct economic instruments for pollution control. But they are not the only ones

were these instruments were considered for implementation. For example, an attempt to institute water discharge rights in Mexico had significant implementation problems (see Escalante and Aroche, 2000; and Huber, *et al.* 1998).

Uruguay is another example. In 1995 the municipal government of Montevideo approved the creation of emissions charges for those industries with effluent concentration levels larger than the emissions standards. The charge would be calculated as a function of the number of pollutants with concentration levels above the standards, and the extent of these violations. This charge was never implemented because the Chamber of Representatives repealed it in the following year as unconstitutional. Similar to Costa Rica, municipal governments in Uruguay can only create charges (“*tasas*”) if these are directly related to a service provided by the municipality. According to the members of congress, because the charge was based on cubic meters of tap water consumed and not on cubic meters of effluents discharged to the sewage system the charge was not really a “charge” but a tax, which had to be approved by congress. The issue was exacerbated by the charge imposed on industrial plants emitting directly to watercourses because in these cases there was no sewage service involved.

3. LESSONS

Although very limited, the experience of Latin American countries with direct economic instruments for the control of pollution allows us to draw some general policy lessons. Some of these lessons are not new. Environmental economists have learnt from actual experiences in developed countries that the successful implementation of economic instruments depends on issues of design and implementation somewhat overlooked in the past, such as the flexibility in the timing of trading, the administrative burden, political economy considerations, and monitoring and enforcement issues (see Stavins, 2007, Harrington, *et al.*, 2004, and Hahn, 2009). These lessons are also valid for Latin America. Effectively, the cases analyzed show that issues related to the design of the enforcement strategy have been overlooked (Palacios and Chávez, 2002). They also show that details in the design of the market for permits, such as the rules governing trade and the definition of permits can have important consequences on its performance (Montero, *et al.*, 2002).

But although these lessons are essential to the successful design of a pollution control program based on tradable permits or emission taxes, what I emphasize below are those lessons

that are more specific to less developed country contexts, and are useful in terms of the future design, justification and implementation of economics instruments in these contexts.

Toward this end, on the one hand, the analysis of the experience of Colombia, Chile and Costa Rica with direct economic instruments confirms some lessons already drawn by the literature cited in the introduction. First, it confirms that a successful implementation of economic instruments in Latin America is threatened, still, by a lack of capacities and political will. Second, it confirms two more practical lessons:

3.1. A negotiation of the pollution reduction target and other aspects of the regulation with the relevant stakeholders may be essential to gain their initial support: This lesson is mentioned in Acquatella (2001) and Huber *et al.* (1998) for example, and it is a clear lesson that emerges from the analysis of the Colombian experience done in Section 2. In the case of Costa Rica, the negotiation of the pollution targets with relevant stakeholders also proved to be essential to gain an initial support from the regulated community (Zeledón, personal communication, 2010).¹¹

3.2. Earmarking the revenues generated by an emissions fee may be an essential element of its design to facilitate its acceptance by the regulated sources: Again, this is a lesson mentioned before in the literature that also emerges from the analysis of the Colombian discharge fees. In the case of Costa Rica, the earmarking of revenues for local investments in sewerage treatment plants and for cleaner production was established formally in the decree from the beginning. I have no evidence though whether this was the result of a political negotiation or a recommendation by the Colombian advisors that helped to design the Costa Rican program.

On the other hand, in addition to confirming these lessons, the analysis of the experience of Colombia, Chile and Costa Rica with direct economic instruments allows us to draw new important lessons. These are pointed out below.

¹¹ In Chile, the negotiation with the regulated sources lasted only two weeks. The fact that Chile authorities created an asset with potential market value and distributed it for free instead of a tax may explain this difference, among other factors.

3.3. The legal figure of the discharge fee is vital for its political success

If taxes are to be approved by the Congress, they cannot be the result of a presidential or municipal decree. Therefore it may be necessary to approve a law before implementing the fees, as Colombia did. If this is not possible, an alternative road could be the one taken by Costa Rica. Based on an old water law of 1942 they concluded that the best figure would be a *canon*. This is basically a price for the right of use of a public good. The decision proved to be correct: the Supreme Court backed it up when the sugarcane industrial-agricultural union contested it in court (Zeledón, personal communication, 2010). The issue is important: before writing the decree policy makers in Costa Rica studied which the correct legal figure for the instrument was and today the country has a an environmental fee for discharges. Uruguayan regulators in 1995 were not as careful and the initiative did not succeed.

3.4. The implementation of emission fees has been initially more successful in the more economically developed jurisdictions

The Colombian experience shows that the fees were implemented more successfully in the more developed jurisdictions. The Costa Rican experience so far shows that implementing the fees nationwide is becoming a formidable task, given the low administrative capacity of several regional and local offices. To the contrary, the collection of the fee in the Tarcoles basin, the more economically developed region in Costa Rica, is around 80% of the potential collection according to official estimates (Zeledón, personal communication, 2010).

3.5. Direct economic instruments need to be modified in fundamental ways as compared to the classic textbook instruments that inspired them in order to be compatible with the institutional capacity and/or to gain the political support needed to be implemented

For example, due to a lack of capacity of regulators and sources, emission permits in Santiago are defined in terms of emissions capacity, not in terms of actual emissions. For the same reason, the sources are required to self report its emissions on an annual basis in the three cases analyzed. Moreover, when sources do not report, the regulators can estimate a presumptive level of emissions in order to calculate the fee. In Costa Rica, the initial effluent fee was changed to a three part tariff as a response to a request from several economic sectors. As part of the change, sources emitting at concentration levels below that of the receiving body at the point of discharge pay zero fee. In Colombia, municipal sewerage companies and other big private polluters are allowed to negotiate individual pollution reduction targets with regulators. The

targets for the rest of the sources are allowed to vary according to the type of polluters (industrial branch, etc.). Finally, none of the three economic instruments reviewed substituted previous emission standards. Sources have to comply with the emission standard and the economic instrument.

Serôa da Motta *et al.* (1999) concluded that the implementation of economic instruments needed to be compatible with the available institutions, flexible and to assure the participation of stakeholders. O'Connor (1998) previously concluded that the political acceptability had conditioned both the design and phasing of implementation of economic instruments, referring to issues such as grandfathering of permits and initial low levels of emission charges. Nevertheless, the review of the three Latin American programs suggests that the changes introduced to make the instruments compatible with the available institutions and politically acceptable may be more fundamental than these. Furthermore, these changes may affect one of the most important advantages of economic instruments over prescriptive regulations, as stated in the following lesson.

3.6. Some of the above mentioned modifications may affect the instruments capacity to achieve the desired cost – effective allocation of abatement responsibilities

The above examples illustrate how markedly the instruments actually implemented differ from the textbook classic tradable permits or emission taxes. Some of these differences may have positive effects. For example, Montero (2005) has shown that a hybrid policy of standards and permits may be welfare improving when emissions are not perfectly observable and are instead estimated as in Santiago's program. But this is not necessarily the case of other differences. For example, as currently designed, the Costa Rican and the Colombian programs do not necessarily equalize the ratio of the abatement costs of any two sources to the ratio of the impact coefficients of their emissions on the environmental quality, as required to minimize total abatement costs when the location of the sources matter (see Hanley *et al.*, 1997, for example). According to these programs, what a specific source pays depends on how much it pollutes and the environmental quality of the receiving body. But not in a way that resembles this condition, or any other known condition. For example, in Costa Rica a source immediately downstream would benefit from an increase in emissions from an upstream source because this reduces the environmental quality of the river and by this way reduces the fee that the downstream source has to pay. This effect has a direct consequence on the realized aggregate abatement cost of

reaching a given environmental quality. A similar argument can be made for Colombia, where two sources next to each other may pay different fees according to the economic sector to which they belong, or according to how much they pollute, or if they are municipal sewerage companies or not. Finally, in Santiago, the definition of the permits in perpetuity as a measure to reduce the administrative costs of the program, for example, has contributed to preventing the market to develop.

The change in the nature of the economic instruments as a result of political concessions and a lack of institutional capacity may also have important consequences in terms of the sources' incentives to invest in pollution-reducing technology: the altered instruments obviously reduce the incentives to abate pollution because this is the very reason why they become politically viable. If this is true, the changes in the economic instruments would affect their environmental effectiveness in addition to their cost effectiveness.

3.7. The overall costs of implementing an economic instrument in the absence of a system to keep track of emissions exist may be high enough to compromise its performance

Implementing an economic instrument, even when this is fundamentally adapted to local conditions, requires the regulators to build a system to keep track of emissions or emissions capacity through time, plus a system to keep track of permit trades or the collection of fees. Economic instruments may also require the sources to learn to change its organizational and production or abatement processes cost-effectively. As shown by the cases reviewed above, this may take time. In the meantime the emissions control program may under perform. This lesson may be particularly valid when, as it was the case of Santiago and Colombia, there are no previous environmental regulatory institutions.

3.8. Public utilities without the necessary treatment technology installed may be major obstacles for the effective implementation of the program

The available evidence suggests that if large, politically powerful, public sewerage companies lack adequate treatment infrastructure, they will respond to an effluent fee by lobbying against it, and not by investing in this infrastructure. So, if there is no political will to make these utilities comply with the fees, these are not going to pay them and will instead continue to pollute heavily. The fact that this may trigger the complaint of the rest of the sources, who after an initial support may start to lobby against the fees and not comply with them, as it

happened in Colombia, may complicate matters even more. This problem is important because public sewerage companies without a suitable wastewater treatment infrastructure are common in many places of Latin American countries.

3.9. The initially achieved political support to implement economic instruments may be eroded by the implementation problems and under performance of the program

It is a known lesson that in order to be implemented successfully, as it is the case with any policy instrument, economic instruments must have strong political support (Kathuria, 2006). But this political support must not only be gained at the beginning of the process, but maintained through the process. If the program performs poorly relatively to what was expected by regulators and other relevant stakeholders, the evidence shows that this may trigger a decrease in the political support for economic instruments inside the government, the parliament and among the regulated sources, as documented by O’Ryan (2002) and Coria *et al.* (2009) for Chile, and Uribe (2004) for Colombia.

Sadly, a close look at the policy making process leaves the observer with the impression that the expectations about these programs were set unrealistically high. One of the reasons that may explain this is that the design of these programs was based on pioneering seminal environmental economics literature, which naturally overlooked important real-world issues. The environmental economics literature should be a much safer guide for implementing economic instruments nowadays than it was in the past, particularly for policy makers that are not necessarily trained in environmental economics. But expectations were also inflated by politicians and policy makers in their eagerness to convince the stakeholders about the virtues of economic instruments as opposed to prescriptive instruments. Deliberately or not, for example, politicians and regulators in charge of implementing the fees in Colombia and Costa Rica sometimes exaggerated the relative advantages of economic instruments over emission standards. For example, in some policy documents that backed up the economic instruments, it is possible to find the argument that these are a less costly means of complying with environmental regulations than are prescriptive instruments. In this assertion it is not clear whether they refer to aggregate or individual costs. In the second case, the assertion is not always true.

4. CONCLUDING REMARKS

So far, Latin America has witnessed the implementation of a very small number of programs based on direct economic instruments to control pollution: Santiago de Chile’s ECP in

1992 and its extensions to industrial emissions of NO_x in 2004, Colombia's 1997 Discharge Fee for Water Effluents, and Costa Rica's 2009 Environmental Fee for Water Discharges.

We have seen that a combination of flaws in the design plus other problems related to the available capacities in Santiago, and a combination of low capacities plus political economy issues in Colombia negatively affected the implementation of these programs in both cases. As a result, the capacity of the economic instruments to induce emission reductions cost-effectively and their future political viability in these countries in the short or medium run may have been compromised. Regretfully, this happened irrespective of the fact that economic instruments may have saved money with respect to the alternative of implementing only prescriptive instruments anyway.

In the case of Santiago's ECP, even though it was designed to take into account some institutional restrictions, such as the monitoring capacity of regulators and firms, the market for permits did not fully develop as a consequence of ill designed rules of trade that imposed significant transaction costs, changing regulatory rules that added uncertainty to the decision to trade, an ill designed enforcement strategy, and a generous initial allocation of permits that was the result in part of a poor record of emissions prior to the ECP. These problems not only affected the functioning of the permit market but may also have decreased the sources' support for tradable permits, in favor of emission standards and technology regulations. In addition, it may also have affected the politicians' will to insist with incentive based environmental regulations: a framework law for the implementation of credit-based markets for pollution permits has been awaiting discussion in congress since 1995.

In the case of Colombia, a general lack of capacity in most of the regional offices caused the implementation of the fees to be geographically heterogeneous and time consuming. With the passage of time, the political will to support the fees' program decreased and proved more permeable to the lobby of private and public sources of pollution that emerged as a result of the extensive non compliance of the municipal sewerage companies. The fees were modified, losing fundamental features of a cost-effective pollution tax; and possibly also its power to induce pollution abatement in recalcitrant sources.

In the case of Costa Rica, it is still too soon to fully evaluate the effectiveness of the program, but its implementation problems are similar to those suffered by Colombia. In particular, the rampant opposition from the main discharges: national and municipal public

utilities. What is yet to be seen is whether the choice for economic instruments to control water pollution is a policy option sufficiently institutionalized to survive changes in governmental administrations and congress compositions, or not.

The present state of affairs provides more evidence in favor of the policy recommendation that countries should build local capacities before implementing direct economic instruments, than in favor of the alternative that countries should adapt direct economic instruments to their institutional and political characteristics. This conclusion is based on the consequences that the changes that are necessary to introduce in the design of these instruments to adapt them to the local conditions may have on the instruments' incentives to reduce pollution cost-effectively. It is also based on the negative effect that the underperformance of the programs may have on the political support for economic instruments.

What the evidence shows so far is that if regulators want to successfully implement economic instruments to control pollution in terms of emission reductions, market performance, fee compliance and cost effectiveness they need a program that is (a) correctly designed, (b) supported by basic capacities in terms of monitoring of emissions, tracking of trades or fee collection, and environmental regulatory institutions, and (c) that has enduring political support. In order to be well designed it is necessary that the public sector has the needed capacity in terms of skilled personnel. Moreover, the set of required capacities may be a necessary condition for achieving an enduring political support for economic instruments. For example, at any given stage, policy makers who are well trained in environmental economics may design better programs and may handle more reliable and cautious arguments to defend them in the political arena, before and during the program implementation, so that they do not backfire. After all, one of the reasons the US moved towards economic instruments was precisely an increase in the understanding of how economic instruments work among legislators, policy makers and regulatory staff (Hahn and Stavins, 1991 and Cole and Grossman, 1999). This was achieved through the inclusion of economics training in law schools and the proliferation of public policy programs in universities. Environmental economists played an obvious prominent role in this training. The implementation of economic instruments in Latin America was not the product of such an evolution of the environmental institutional framework.

The observation that having the set of needed capacities may be a necessary condition for achieving an enduring political support for economic instruments acquires significant value for

one simple reason: it is difficult to attain the political will to implement these instruments. This is because cost effectiveness-is not an argument as politically appealing as economists think it should be, and because at the same time it is difficult to estimate the actual cost saving that could be obtained by implementing economic instruments as compared to the counterfactual of implementing prescriptive instruments.

A corollary of this lesson is that, if at some point the political will to implement an economic instrument is achieved, it may be better, if legally possible, to do it first only in those jurisdictions that have in place the relevant set of necessary capacities. These jurisdictions will possibly be the more developed ones; particularly those with a history of pollution regulation and therefore a good inventory of emissions.

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