Governance by green taxes: implementing clean water policies in Europe 1970–1990*

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Abstract. This article analyzes the use of economic instruments for environmental policy in four European countries. The study employs data from national and international sources for an *ex post* evaluation of the effects of economic policy instruments in the clean water programs of Denmark, France, Germany, and The Netherlands from 1970 to 1990. It is shown that among the four countries The Netherlands were the most successful in environmental terms, regarding social costs and with respect to technological innovation. On the one hand the study confirms that economic instruments can work as rather powerful stimuli for the implementation of public policies; on the other hand it provides some unexpected findings regarding the significance of the institutional context for the design and operation of market-based instruments. It is argued that institutionalized practices of public policy making influenced the specific design of the four water pollution control programs, including the design and role of economic instruments, and that the regulatory design in turn affected the degree to which the incentives provided by the economic instruments were able to influence the behavior of the polluters. The study hence points to the significance of taking into account the institutional setting of the design and operation of market-based instruments, an observation with both theoretical and practical implications.

Key words: Economic instruments, Environmental policy, Implementation, Water charges, Comparative

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1 Introduction

The use of economic instruments for environmental policy is based on the principles of environmental economics (Baumol and Oates 1975, 1988; Pearce and Turner 1990). This discipline is rooted in neoclassical economics, with its rather strict assumptions regarding the criteria for pareto-optimal solutions. From the political scientist's view, the economic theory treats the use of economic instruments for environmental policy in an ideal, but in practice somewhat partial, analysis in which such instruments are regarded as complete substitutes for command-and-control regulations, despite the development of a complex body of environmental regulations since Pigou's days.

According to Baumol and Oates (1988, p. 22), the authors of what has now become the standard work on environmental economics,

The formal analysis confirms that in a competitive setting the solution to our problem requires only a *single* policy measure: a Pigouvian tax (or effluent fee) on emitters equal to marginal social damage. More precisely, the environmental authority should levy a fee per unit of smoke emissions equal to the marginal damages (residents and other firms) [*my italics*].

Although the strict assumptions of environmental economics are ideal for the science of economics and have helped achieve substantial insights into the application of economic instruments, many questions remain unanswered for those who wish to understand how economic instruments work as a stimulus in a somewhat more complex setting of regulations and institutions. In particular, problems arise when we move from the theoretical *ex ante* analysis of the properties of economic instruments to the more complex *ex post* evaluation. As one might expect, there is a rather grave discrepancy between the ideal requirements for the design of economic instruments—as the single policy measure to address environmental problems—and the designs that are applied in practice (OECD 1989). It remains, for instance, the exception that environmental taxes are based on a valuation procedure, as such instruments are normally designed under more pragmatic circumstances and employed in a mix with other measures. The discrepancy between theory and practice is somewhat paradoxical, as environmental economics generally counts as applied economics and, according to Baumol and Oates “is not meant to be theory for theory's sake. [The] prime concern is policy” (Baumol and Oates, 1988, p. ix).

There have been attempts (e.g., among political scientists) to generate theories on a broader array of policy instruments. Since Kirschen's classical article, the focus has been on the development of taxonomies and the classification of policy instruments and on generating hypotheses about the use and properties of certain groups of instruments (Kirschen et al. 1964). An authoritative taxonomy has not yet evolved; and without going into details citing the literature, it is fair to say that the taxonomy proposals, to a considerable extent, vary with the national backgrounds of researchers (Howlett 1991). The “instrument perspective” in which the analysis is extended simply by including more policy instruments does not seem to be a promising approach.

2 Role of institutions

Freeman et al. (1973) depicted the attainment of environmental quality as both an economic *and* a political resource allocation problem that requires an understanding of economic, political, and legal institutions. A similar starting point for a broader analysis of environmental regulation was suggested more recently by the authors of an Organisation for Economic Cooperation and Development (OECD) report on economic instruments (OECD 1994, p. 33); they recommended increased incorporation of the policy and implementation context into the analysis of environmental policy instruments. In the political science literature on regulation, public administration, and implementation one finds a broad array of possible approaches to the analysis of environmental policy (Weale 1992). Although several of these approaches can lead to interesting analyses of the way economic instruments are designed and interact with other policy instruments, they are not easily reconciled with the more "normative" approach (Cropper and Oates 1992) of environmental economics. Political science can explain why economic instruments, for reasons that have to do with deficiencies of public policy-making, do not conform to textbook recommendations, but political science cannot provide scientific prescriptions for the correct blend of policy instruments and institutions.

The present research on the impact of economic instruments takes its starting point in insights gained from the literature on public policy implementation (Pressman and Wildawsky 1973; Berman 1980; Mitnick 1980). The implementation literature allows us to understand why it is rather exceptional to experience that public policies are fully implemented in accordance with the intentions of the lawmakers. In particular, policies that rely on a complex set of administrative arrangements are likely to encounter implementation difficulties owing to the many actors and veto points at stake in the implementation process. Economic instruments are believed to be more "self-enforcing" and have often been recommended by implementation researchers, but these instruments may also encounter difficulties. Choices made during the decision-making process can be crucial for the subsequent implementation, as ambiguities are most likely to spill over into this phase. This applies to both more conflict-ridden aspects of the policy process (interest groups may try to influence the policy design) and the less explicit choices that are made. It is particularly the latter ambiguities (those caused by the ignorance of institutions and institutional practices) that may provide unexpected side effects to the application of economic instruments.

David Vogel has pointed out how environmental regulation often follows more general national patterns of regulation of corporate conduct. Vogel's hypothesis that "each nation regulates the environment in much the same way as it regulates a wide variety of other areas of corporate conduct" has led many policy analysts to focus on the impact that *national policy styles* may have on the design of environmental regulations (Richardson and Watts 1985; Vogel 1986; Van Waarden 1995). Established styles, understood as standard operating procedures

for how to regulate, can lead policy-makers to make choices based more on historical traditions than on a proper reflection of the needs and logic of the problem they want to address. More specifically, this means that if a framework for water policy has been brought about in the past policymakers will most likely avoid questioning the architecture of these institutions when introducing a new policy instrument, such as a water levy.

Institutional analysis has a long record within political science, but primarily in the vein of "historical institutionalism" (Hall and Taylor 1996). It is only recently that institutional approaches have become more common within economics, and such approaches have hardly made their way into subdisciplines such as environmental economics. Still, the new institutional economics, and in particular the work of Douglas North (1990), offers an opportunity for expanding the theoretical horizon of environmental economics without challenging its rational choice assumptions too much.

North based his work on the basic insight provided by Coase that markets can hardly exist or operate without institutions—broadly understood as "rules" (Coase 1988). Whereas in the law-and-economics tradition the focus is on rules for property rights and liability, which define the ownership and responsibility of the market actors on the basis of which transactions take place, North and others within the tradition of new institutional economics have a broader understanding of what institutions are about. North differentiated between formal and informal institutions: The formal institutions are administrative and political institutions, which in turn settle the economic institutions. The informal institutions are the history, culture, and norms established over time. The importance of formal and informal institutions is that they reduce transaction costs, not only in the economic system but also in the political system. Transaction costs, in the market and in the legislature, are reduced thanks to the adherence to established procedures and conventions. By following more or less routine or standard operating practices, actors avoid undertaking a complete evaluation of the costs and benefits of every decision. In the political system bargains and compromises are institutionalized in specific structures of administration and management, as well as in terms of certain resource allocations. Hence, although institutions can reduce transaction costs, they are subject only to incremental change. Political actors face very high transaction costs if they try to reach agreement not only on specific policies but also on changes of the broader institutional setup. For example, it might be possible to strike a bargain on the introduction of a carbon-energy tax in the parliament; but if the energy tax coalition also raises the more fundamental issue of structures and institutions in the energy sector, such as the competence of local versus national authorities in energy utility management, it would most likely increase transaction costs (i.e., provide difficulty keeping the coalition together).

From this more general insight on the role of institutions, we can think of two ways in which institutions might affect the use of economic instruments. First, institutions may influence the design of an economic incentive (choice of tax base, tax rate, and possible exemptions and special arrangements) and the way it

is combined with other policy instruments and administrative arrangements. Standard operating procedures for policymaking may lead policymakers to prefer certain designs of environmental policy that are in accordance with previous choices—the national policy styles. Second, institutions may affect the operation of economic instruments (i.e., by providing a grid that limits the options available to the target groups). The desired incentives to be provided by economic instruments can be obscured by institutional impediments that filter or disturb the desired price signal. The fundamental patterns of regulation are quite different within different sectors (e.g., agriculture, energy, waste) and are often not reflected in the process wherein economic instruments are designed. The transaction costs of redesigning existing administrative arrangements, changing or removing well-established subsidies, or reconsidering possible impacts of legislation in other sectors to introduce an economic incentive, is often perceived as exceeding the expected benefits, and such changes are often ignored. Economic instruments are therefore often applied, as it were, at the margin of existing regulatory arrangements. When in operation, the expected incentive from the economic instrument and the accruing internalization of externalities in transactions therefore must work within the grid provided by the more or less unaltered institutional arrangements. There are also possible institutional restrictions at the micro level (i.e., among firms).

In this study the focus has been on the interplay between economic and other policy instruments during the implementation of water pollution control policy. The main purpose of the study has been to investigate whether the use of economic instruments makes a difference to policy outcome. During the course of the project it was soon discovered that it was difficult to evaluate the functioning of economic instruments without paying attention to the broader regulatory context. The research also soon led to the observation that the functioning and success of economic instruments, which had been adopted in three of four countries, to a large extent depended on the interplay with the institutional context. Whether the instruments operated under favorable institutional conditions or under more restrictive circumstances was essential to the outcome of policies and to a large extent a result of the institutional legacy in the national systems of water management.

3 Water pollution control policy in four countries

All four countries in this study had substantial water pollution problems during the late 1960s, and the control of water pollution was of prime concern when the first modern environmental programs were introduced around 1970. In Denmark, water pollution became regulated by the Environmental Protection Act passed in 1973. In France, *Loi sur l'Eau* (the Water Act) had been passed in 1964, but the decrees necessary to secure implementation of the law were not issued until 1968–1969. In Germany, Willy Brandt's ambitious environmental program of 1971 included a call for amendments to the Water Household Act, which was passed in 1976 after consultations with the *Länder* governments,

Table 1. Policy instruments for water pollution control

Policy instruments	Denmark	France	Germany	The Netherlands
Permit procedure	++	++	++	++
Mandatory guidelines			++	
Optional guidelines	+	+		+
Planning	++	+	+	+
Covenants		++		
Appeal procedure	+			
Effluent charge		+	+	++
User charge	+	+	+	
State subsidies	+	+	+	(+)
Local subsidies	++	+	++	
Local authorities	+	+	+	
Regional authorities	+	+	+	+
Special-purpose-agencies		++	(+)	++
Private tenders		+		
Water quality principle	+	+		
Emission principle			+	+

together with a new Waste Water Levy Act. In The Netherlands, the Surface Waters' Pollution Act was passed in 1969 and became effective in 1970. Thus, within a relatively short time span around 1970, these four countries ventured on new and more active water pollution control policies (see also Johnson and Brown 1976).

At the formal level, the use of policy instruments appeared to be similar in all four countries (Table 1); a permit procedure was instituted for dischargers, certain planning procedures were followed, user fees were imposed on dischargers, and substantial competence was delegated to local authorities.¹ From a narrow "instrument" point of view, the programs looked surprisingly alike, except that Denmark did not choose to apply economic instruments (levies), as did the three other countries.²

The programs and instruments were implemented in very different national settings. Despite the narrow legal similarities, in practice there were substantial discrepancies in the importance attributed to the different instruments with regard to basic pollution control principles and concerning the role and significance of local authorities in the different political systems. Economic instruments were far from single-policy instruments, as in the formal analysis; and in the context of the programs there were differences that can be understood only when

¹ There are several reports and articles describing these systems, including those of Bower et al. 1981; Schneider and Sprenger 1984; Johnson and Brown 1984; and Bongaerts and Kraemer 1989.

² Clarification of the term "economic instrument" is necessary. A distinction is made between normal user fees and levies (effluent charges). *User fees* are charged only for waste discharged to a collective sewerage facility and cover the costs of a service. In contrast, a *levy* is a financial obligation that must be born by any entity discharging waste, treated or untreated, into a surface water.

considering the constitutional and historical paths of development with regard to public administration in the four countries. These points are explained in more detail in the sections on the four national programs (see below).

A few words on the macro background variables are necessary before introducing the individual country experiences. Not only did the four countries considered here launch their modern programs for water pollution control almost at the same time, around 1970, but the countries are similar in many respects. Denmark, France, Germany, and The Netherlands are, apart from Luxembourg, the four richest member states in the European Union and have experienced a parallel development in their gross domestic product (GDP) per capita from 1970 to 1989. The economic preconditions for pursuing an environmental policy have thus been reasonably comparable. Also in terms of popular support for environmental policies the preconditions have been reasonably similar if we can believe the figures from Eurobarometer.

Data on water quality is available in OECD statistics but cannot be regarded as a good indicator of the outcome of water pollution control programs. Differences in basic environmental conditions make it difficult to infer from policy to actual water quality. Furthermore, there are different sources of pollution, and mainly point sources of industry and cities were the concern of the early environmental laws; plural sources of agricultural nutrients did not become subject to regulation until in the mid-1980s. What we are interested in, really, is the ability of various programs, and in particular of economic instruments, to rectify pollution at the source; emission data therefore offer a more reliable account of the efforts of pollution control. These data have been identified in national statistical publications; and because they are based on the conventional units of organic pollution [biochemical oxygen demand (BOD) or chemical oxygen demand (COD)], it is possible to compare the development in these figures.

The systems for the regulation of water pollution control are explained in the following sections; but because these systems should be understood in the context of the formal and informal institutions of policy styles, some fundamental patterns of public administration in each of the countries are outlined. The regulatory design is then contrasted and linked with the outcome (emissions controls) achieved in each of the four countries. The format of an article allows only an overview; readers interested in the intricacies of water management are referred to a more detailed account elsewhere (Andersen 1994).

4 Denmark: regulation based on decentralization and water quality planning

Denmark has a highly decentralized system of public administration. The 277 municipalities and 14 counties are responsible for many public services; and local income taxes, collected directly by these authorities, make up 30% of total income taxation. An important reason policy traditions incline toward decentralization is found in the influential farmers' cooperative movement that emerged during the nineteenth century and was strongly opposed to "rule by decree" from Copenhagen (Mørch 1982). The libertarian preference was reinforced by the

1968 administrative reform that gave the municipalities and counties a more important role in all policy sectors, not least in environmental policy.

Consequently, local authorities became the crucial element in a comprehensive planning-and-permit scheme designed to help control the pollution of surface waters. There were no binding national emission standards; instead, a water quality approach was adopted. The counties were to classify local surface waters and set targets for their improvement. Dischargers in need of a permit would receive one on the basis of local targets for the improvement of water quality (von Eyben 1989).

The use of economic instruments for pollution control was considered during the early 1970s but not introduced. In the words of the then Minister of the Environment, the use of such instruments would imply "that those who can afford it will be allowed to pollute, and those who cannot afford it will not be allowed, and we don't want to bring class policy into environmental policy" (Folketingets 1973). A welfare ideology penetrated public policymaking, and egalitarianism was pronounced.

A corporatist political system had developed, and consensus had to be accomplished with the most important peak interest organizations before legislation was passed. During the implementation further room was made for negotiations on everything from guidelines to local permits, especially with the influential Federation of Danish Industries. This was in accordance with the evolved tradition for broad framework laws that followed in the wake of corporatism. According to this tradition, administrative boards or tribunals with representatives of affected interest groups were commonly used to settle conflicts. To check the powers of the Ministry of the Environment, an independent Environmental Appeal Board was set up to handle complaints on environmental permits. The Appeal Board consists of experts appointed by various interest organizations and the Ministry (Andersen 1989).

The design of pollution control regulation was, to a great extent, a continuation of prevailing policy traditions. There was a considerable belief in public planning and in the capacity of local authorities. Although there was a certain rhetoric on the polluter-pays principle, levies were not introduced. Manufacturing industries were encouraged to discharge to public (municipal) sewage plants, and the Environmental Protection Act instructed the municipalities to offer subsidies to pay for their construction, causing user fees not to reflect actual costs. In some cities, such as the capital Copenhagen, user fees were not imposed until 1977; instead, sewage plants were financed out of the general revenue. The subsidy clause had been copied from the Water Course Act of 1949 and the Sewer Act of 1907 with few considerations; and except for the argument of "the general interest" advanced in the original Sewer Act proposal of 1901, no analysis to justify this reversal of the polluter-pays principle has been presented.

Even where policymakers intended to depart from standard operating procedures, they fell back on a traditional procedure, which was to "look at Sweden." Swedish policies were in many ways seen as exemplary in Denmark; and under this influence a relatively independent Environmental Protection Agency (EPA)

was established. The Swedes were also fond of subsidies, so it did not lead Danish policymakers to question their approach; in fact, the Danish EPA had to resist pressure from industry and labor that required state subsidies for sewage plants. Many public sewage plants were constructed in Denmark during the 1970s, and it was never questioned whether end-of-pipe solutions would be more expensive than control at the source.

The implementation of the Danish water pollution control policy was effective on its own terms but highly ineffective in a broader perspective. The municipalities expanded their local sewage plants, although not quite to the treatment level preferred by the national authorities. Therefore, at the end of the 1970s there was fairly good coverage of the population. The regulation of industrial discharges proceeded rather slowly, however. The regulatory scheme implied that before requirements could be set for manufacturing industries local authorities had to undertake careful water quality planning. This planning was vested in new county authorities, who lacked both the skill and data to carry out the task. In the meantime, local authorities were reluctant to tighten discharge requirements or even to monitor compliance so as not to deter industries and risk jobs and tax revenue. When the counties released the first draft water quality plans, conflicts with municipalities arose on the targets. Consequently, it took more than 10 years before water quality plans were elaborated.

In the meantime, there were few incentives for firms to reduce pollution on their own. As a consequence, gross industrial discharges were approximately at the same level during the late 1980s as at the outset when measured in terms of oxygen-binding substances (BOD/COD) (Fig. 1). About 50% of industrial

Fig. 1. Denmark. Gross industrial discharge and net production index, 1972–1989. Source: Miljøstyrelsen and Danmarks Statistik, Copenhagen.

discharge was treated at public sewage plants, causing reduced pollution; but this method was problem-displacing and an expensive solution (see below).

5 France: economic incentives and river basin management

The French policy style corresponds to its more centralized system of public administration and has, also in water pollution control, a somewhat technocratic flavor. The French administrative structure is complicated, with three levels of local government: regions, departments and communes (municipalities), of which both regions and departments have a dual character, being led by both a state-appointed prefect and an elected council (Wright 1989).

The department is the most important entity, and the traditional ministries of industry and agriculture have branch administrations at the department level. A Ministry of the Environment was established in 1971, but it has remained small and insignificant, without its own branch administrations at the department level. Whereas the "old" ministries recruit their officials from each of the traditional engineer corps, the Ministry of the Environment does not refer to such a single administrative corps and therefore lacks the internal and external spirit that envelops these corps and "their" ministries (Larrue 1992).

Loi sur l'Eau was passed in 1964, and it was in many respects exemplary, according to the view of water engineers (Nicolazo 1989). Integrated water management was introduced, and a new system of river basin agencies financed by income from water levies was established to lead water pollution control. Each of the six river basin agencies were supposed to take the responsibility for the management of ground and surface water in hydrological basins along the large French rivers.

Still, the new system was built on "top" of the original water act of 1917, which had vested the departments with the authority to grant discharge permits. However, because of the influential Association of Mayors, the river basin agencies were not allowed to manage pollution control, as envisaged in the draft act. The construction of sewage plants was to remain with the French communes.

Local authorities in France have not been reorganized since the days of Napoleon, and France has more than 36 000 communes, which is more than one finds in the rest of the entire EU (Ministère 1991). The numerous and weak local authorities are a complement to the powerful state authorities. Ninety percent of the French communes have fewer than 2000 inhabitants, and they have to cope with restricted sources of revenue. Consequently, not only water supply but also sewage plants are to a large extent managed by private contractors from the French water industry, a paradox in a country otherwise known for its many nationalized industries (Lorrain 1991). The communes depend on a complicated system of subsidies from the state.

A system of levies was introduced with Loi sur l'Eau. The levies apply to all polluters discharging to surface waters and are based on specific pollutants. The agencies have not been free to set these levies but have been subject to control from the Ministry of Finance. Because of restrictions on public spending (most

pronounced during Mitterrand's presidential terms) the levies have been too small in themselves to induce any control of pollution. The revenue has been controlled by the river basin agencies, and they have used the funds to support industries and communes willing to take measures to control pollution. During the 1970s the Ministry of the Environment created a system of branch contracts, where selected industrial branches agreed to reduce pollution if they received subsidies from the river basin agencies (Harrison and Derrick Sewell 1980). Later, similar river contracts were introduced, but they were aimed at both industries and local authorities along a certain river section. It is generally acknowledged among French water experts that without the levies and the contracts little could have been achieved with regard to water pollution control, as the permit procedures of the departments were not effective.

With regard to industrial pollution, focused efforts in specific industrial branches ensured considerable reductions in the discharges. From 1975 to 1987 discharges were reduced by 37%, and reductions were especially significant in the pulp and paper industry and the chemical industry (Fig. 2).

With regard to local sewage plants there has been some statistical confusion about the situation. Figures published by the French Ministry of the Environment indicated that only about 52% of the population was served by sewage plants in 1990. A recounting of sewage treatment plants initiated by independent water experts have recently led the Insititut Francais de l'Environnement (IFEN), the environmental statistical office, to publish a figure of about 68% coverage for 1990 (IFEN 1996). The moderate coverage leads one to suspect that the local authorities, which depend on most of their income from the state, have not had sufficient leeway to respond to the incentive from the water levies, as sufficient

Fig. 2. France. Gross industrial discharge and net production index, 1975–1987. Source: INSEE, Paris

investment funds have been lacking for sewage treatment. These difficulties seem to have been solved as coverage increased rapidly during the early 1990s.

6 Germany: command and control with a supplementary levy

Germany's federal character penetrates the policymaking process and has created a national style of regulation that is different from both the Danish and the French styles (von Beyme and Schmidt 1990). For water pollution control the Constitution vests competence at the regional level with the *Länder*, a disposition that also applied to other pollution control areas until 1972. When the first Water Household Act was passed in 1957, it was a broad framework act based on the lowest common denominator. There had been local water pollution legislation since the late nineteenth century, with more than 70 regulations applying to the Rhine River (Wey 1982). Only after the severe pollution of the 1960s did the federal government succeed in overcoming the resistance of the *Länder*, with the introduction of a stringent "command-and-control" system of industrial sector guidelines and a wastewater levy.

The cornerstone of the new regulatory system introduced in 1976 was the sector guideline system, and the wastewater levy was seen as a supplement to this system (Friege 1984). The sector guidelines, now detailed for more than 100 industrial sectors, prescribe specific technological standards to be achieved in each industrial branch; firms that cannot meet these requirements have a wastewater levy imposed on them. Because of opposition to the levy from Bavaria (a land especially keen on *Länder* competence in this matter) it was first introduced in 1981 and in some *Länder* even later. The significance attributed to the wastewater levy is thus substantially smaller than recommended by the independent Council of Experts on the Environment (Rat von Sachverständigen 1974).

Because of the constitutionally prescribed *Länder* competence in water pollution control matters, the revenue of the levy is controlled by the *Länder* even though the rate is uniform for all of Germany. In contrast to France and The Netherlands, the *Länder* do not offer subsidies for industrial pollution control. The revenue of the German wastewater levy is used to subsidize the construction of public sewage plants by local authorities.

Local governments in Germany have had a long and changeable history since they achieved basic autonomy during the nineteenth century (Gunlicks 1986). In terms of pollution control, the municipalities are responsible for the construction of sewage plants, and German local authorities were active as early as the turn of the century.³ Sewage plants have been subsidized to some extent by municipal

³ In the Ruhr district a system of specialized water boards, resembling the Dutch model, was established at the beginning of the century and remains in operation. It constitutes an exception to the general German system, according to which municipalities have responsibility for sewage treatment, and is hence not analyzed separately here. For an analysis of German water boards, see Holm (1988).

revenue but more importantly by land and federal sources. These subsidies, although violating the polluter-pays principle, follow from the fiscal equalization principle (*finanzausgleich prinzip*) of the German constitution, which intends to secure citizens in all of Germany approximately the same level of public services. As a consequence of local, land, and federal subsidies, it is estimated that German user fees for wastewater treatment cover only 65% to 75% of the true costs of pollution control, relieving industries that discharge to public plants of these costs.

Only industries that discharge directly to surface waters are subject to the wastewater levy, but industries can escape the levy if they are in compliance with the sector guidelines based on the best available technology (*mindestanforderung*). Also public sewage plants have to pay the levy if they do not comply with the emission guidelines.

The sector guidelines are negotiated in a special committee of Länder and federal environmental authorities. Because of the constitutional delegation of authority to the Länder, guidelines then have to be approved in the Bundesrat. Thus, Germany is probably the only country where politicians approve technical standards, something left to bureaucrats in other countries.

It is difficult to draw a balance on the effects of the levies in Germany despite the detailed wastewater statistics available. Emissions began to decline in 1981, the same year the levy was introduced and 5 years after the act was passed (Fig. 3). The levy is supplementary to the system of branch guidelines; but because of the lengthy negotiation procedures the first of these guidelines was only agreed on in 1980–1981. As one would expect some time to elapse from the passing of

Fig. 3. Germany (West). Gross industrial discharge and net production index, 1977–1987. Source: Statistisches Bundesamt, Wiesbaden

such guidelines to their enforcement, there are no strong indications that it was command-and-control that curbed the German emissions. On the other hand it makes little sense to separate the effects of the levy and of the guidelines, as in practice they are combined.

7 The Netherlands: the legacy of water management

The Netherlands is a unitary state, with a sense of centralism said to have originated in Napoleon's occupation. Unlike the Danish and German municipalities, Dutch municipalities have little financial autonomy and are more dependent on the state for their income. With regard to water pollution control, an exceptional infrastructure for water management, the Dutch water boards, has come to play a significant role. Since medieval times the Dutch water boards have been responsible for dikes and canals; and water pollution control developed incrementally during the 1950s under the auspices of local water boards.

In 1969 The Netherlands' first law on water pollution control, the Surface Waters' Pollution Act (SWPA), was passed. It instituted a coherent system of economic instruments and assigned the water boards an important function in pollution control (Environmental Resources 1982). Rather than making the municipalities responsible, the water boards were reorganized on hydrological principles and their tradition for user fees transferred to pollution control. Formally, however, the water boards operate on the delegation of the provinces (de Goede et al. 1982).

Water pollution issues are managed not by the Ministry of the Environment in The Netherlands but by the Ministry of Transport and Public Works. Its operational wing, the Rijkswaterstaat (originally set up to reclaim the Zuidersee), is almost a state within a state in The Netherlands; it is responsible for water quantity and water quality management. The Rijkswaterstaat's scientific center for water pollution control, RIZA (located in the city of Lelystad in what used to be the Zuidersee), has played a significant role in the national supervision of industrial pollution.

The water boards are also called the Boer republics of The Netherlands because of farmer domination. A council is elected for each board, headed by a dike count. Water quantity and water quality interests can elect or appoint members of the council. Their activities are financed by user fees. During the decision-making process on the SWPA, the Union of Water Boards requested that the government subsidize sewage plants, but the request was refused. The water boards had already demonstrated how sewage plants could be financed by means of user fees; moreover, the government argued in 1965 that the use of fees and charges would provide an incentive to reduce pollution (Rijkswaterstaat 1990). The water boards became responsible for the local waters, and the Rijkswaterstaat were responsible for the so-called state waters, mainly the Rhine and the North Sea, where the bulk of Dutch industry is located.

All entities discharging waste into surface waters are obliged to pay a levy to either the local water board or the state. The funds from the state water levy are used to provide subsidies for companies interested in reducing pollution. Because the levies have been of a certain significance, industries have been interested in reducing pollution and seeking advice and subsidies from RIZA. The levy has also had an important function in generating funds for environmental investments. About 71% of industrial investments for water pollution control in The Netherlands from 1970 to 1989 have been supplied by means of the state water levy.

Water boards that discharge into state waters also must pay the state water levy. Furthermore, the SWPA contains a disputed "insufficiency" clause, which the Rijkswaterstaat can use against disobedient water boards. The bill to local industries depends on the sewage treatment investments made by the local water board, and one could expect such local water boards to be as reluctant as other local authorities. This would result in insufficient pollution control, and pollution would then reach the waters of other water boards. The Rijkswaterstaat may, however, claim that a water board acts "insufficiently" and assess a levy for *all* the waters leaving the territory of the disobedient jurisdiction. This clause has been used only once, in negotiations; and in general the water boards have been keen to undertake water pollution control.

It is notable that the system of economic instruments in The Netherlands is different from those of the other three countries because of the strict use of the polluter-pays principle. There were no subsidies for public sewage facilities; and the levies applied to all dischargers, regardless of their location. The state water levies have, however, differentiated between fresh and salt water, and it has generally been more moderate than the levies imposed by local water boards.

The Dutch system of water pollution control is exceptional, and so is its success. Two important works by Dutch scholars have demonstrated how the levies gave incentives for industries to reduce water pollution (Bressers 1988; Schuurman 1988). From 1970 to 1987 pollution with oxygen-binding substances was reduced by 80% despite increased economic activity (Fig. 4). Reductions were especially significant for companies discharging to state waters, a fact that can be explained only by the earmarking of revenue for pollution control and the activities of the RIZA.

Furthermore, the Dutch system was effective because it caused industry to control more pollution at the source and so restricted the need for costly end-of-pipe treatment. Thus, the capacity of sewage plants in The Netherlands is substantially lower, measured per capita, than in Denmark, although in both countries more than 90% of the population is connected to sewage plants. Figures also show that the gross discharge of Dutch industry has become substantially lower than that of Danish industry. The impact of levies in The Netherlands has been so forceful that some water boards have experienced problems of overcapacity owing to the quick reduction of discharges from industry. As we shall see below, the Dutch problem of overcapacity has been significantly smaller than what Denmark is experiencing now.

Fig. 4. The Netherlands. Gross industrial discharge and net production index, 1965–1987. Source CBS, The Hague

8 Comparing outcome: an assessment of cost-effectiveness

Thanks to the comprehensive use of national environmental data and the assistance of national census bureaus, it has been possible to establish synchronous time series for emission data on industrial discharges from 1977 to 1987 (Fig. 5). Even though this figure excludes the early 1970s, when the Dutch program was most effective, it is evident that The Netherlands has been the most successful among the four countries in reducing the load of oxygen-binding substances from industry on surface waters. France is a surprising number two, and Germany began to decrease discharges during the 1980s. Gross industrial discharges in Denmark are still at the same level as around 1970.

Pollution of various water-intensive sectors at the source can be calculated based on emission data (Fig. 6). (Comparable data at the branch level are not available for Germany.) When measured this way (e.g., excluding the impact of public sewage treatment), it can be seen that Denmark has the most polluting industry. The reason lies with the Danish philosophy of accepting public responsibility for pollution control and treating industrial pollution at public sewage plants. For this reason, the capacity of sewage treatment is also substantially higher in Denmark, when measured per capita, than in The Netherlands (Fig. 7).

One might expect that Danish industry, not burdened by environmental taxes and levies, was relieved of costs compared to industries in the other three countries and so had an advantage in terms of improved competitiveness. Figure 8 shows the share of industrial investments for water pollution control in relation to total industrial investments. Unfortunately, figures are not available for the

Fig. 5. Gross industrial discharge, 1977–1987. Source: national census bureaus etc.

Fig. 6. Estimate of discharge by manufacturing industries per capita in 1987. Source: National sources

whole period, as the Danish census bureau ceased to count industrial investments for pollution control after 1982. Until 1977, however, Danish industry invested slightly more than French and Dutch industry, whereas from 1977 to 1983 Dutch industry invested slightly more than the other three. The relatively high Danish investments are explained by the fact that Danish industries had to support the

Fig. 7. Capacity of sewage plants (inhabitant equivalents per capita), late 1980s. Source: national and European Community statistics

Fig. 8. Share of investments for water pollution control in industry in relation to total industrial investments. Source: national census bureaus

financing of public sewage plants in terms of connection fees; and because of the large number constructed these connection fees were substantial. In the other countries, especially The Netherlands and France, relatively more pollution was rectified at the source, keeping costs for such plants at a lower level. The lenient treatment of Danish industries did not, therefore, relieve them of substantial costs, as one would have expected.

Fig. 9. Public investments per capita for sewage plants in US dollars at 1985 prices and exchange rates. Source: national census bureaus and OECD

The social costs for end-of-pipe treatments were substantial in Denmark. Deflated investments for the construction of public sewage plants are shown in Fig. 9 (excluding sewer networks) in three countries at 1985 prices and exchange rates. (With regard to Germany, investment figures are available only for plants plus sewerage networks and are not included here.) Investments are moderate in France, probably reflecting the more limited extent of public sewage plants.

The Danish investments are considerable, particularly when one considers the extension of services that took place during this period. From 1976 to 1987 the share of the population connected to sewage plants increased from 75% to 95%, and in The Netherlands it increased from 35% to nearly 90%. During this period Denmark invested US\$114/capita and the Dutch US\$71/capita in public sewage plants. As sewer networks are excluded, the Dutch population density does not explain the difference. As a matter of fact, mainly plants of more than 10000 inhabitant equivalents,⁴ the level of large-scale benefits, were constructed during this period in both countries. To put it simply, Denmark invested almost twice as much as The Netherlands but increased its relative capacity by less than half. Methods and levels of treatment were similar, biological treatment being the preferred technology.

It would require a detailed study of technologies and costs to explain the differences between Denmark and The Netherlands appropriately. Although the

⁴ An inhabitant equivalent is the technical expression for the amount of organic pollution, measured in BOD or COD, generated by one person.

Danish capacity is nearly 50% higher per capita than that of the Dutch (Fig. 9), the difference in capacity cannot account for all of the difference in construction costs. The sewage plant market was overheated in Denmark during the 1970s, and profits were high. Furthermore, the Dutch water boards may have been more professional in tendering out the construction of sewage plants than the smaller, technically often insufficiently staffed Danish municipalities.

To sum up, it is clear that Denmark's approach to water pollution control was less successful than that of the countries that used levies, in terms of environmental achievements and social costs. As a result, Denmark now has a substantial overcapacity of public sewage plants. Since a revision of the Environmental Protection Act became effective from 1993, user fees that rule out subsidies and better reflect the full costs of treatment have been introduced; and a program for cleaner technology, reducing pollution at the source, has also been launched. As a result, Danish industries now reduce their discharges, causing increasing problems of surplus capacity. However, if Danish companies control pollution at the source to the same extent as Dutch industry, the resulting surplus capacity may become as high as 30% to 35% (Andersen 1991). To avoid overcapacity local authorities in some cases been reported to have offered more or less legal discounts to keep industrial pollution at the previous level.

9 Reflecting the role of economic instruments

The three countries that introduced levies were not equally successful. Three factors seem to explain why the Dutch policy was relatively more successful than the German and French policies. These factors relate to the institutional context in which the economic incentive was introduced and in which it operated.

First, the Dutch, prior to 1969, had institutionalized a system of water management based on contributions and fees from the water users. It was logical to expand this system to include water pollution control. There was also, unlike in the other three countries, little previous legislation on water pollution control, and so few institutionalized practices had to be respected. The Dutch levy system was not built on top of existing user fees for sewage plants, such as became the case in France and Germany where earlier legislation was not reconsidered. In The Netherlands all discharges were covered by the Surface Waters' Pollution Act, and levies were imposed on the basis of actual emissions, causing indirect and direct discharges to be subject of levies.

Second, the Dutch levies were simply higher than the French and German levies. Figure 10 shows the level of levies in the three countries. In The Netherlands the economic incentive to control pollution was considerably stronger—when firms considered their marginal abatement costs versus the rate of the levy—than in the other two countries.

It is a paradox that French industry reduced pollution to the level achieved, when one considers the small French levies. In fact, most French observers claim that the French levies are too low, and that it is more profitable for firms to ignore the levy and continue to pollute. It is a similar paradox that Dutch industries

Fig. 10. Levy per inhabitant equivalent in US dollars at 1985 prices and exchange rates. Source: national sources/OECD deflator

discharging to state waters, and thus subject to the smaller state water levy, have reduced pollution more, than have Dutch industries discharging at a higher rate into water board waters.

This observation leads us to the third factor behind the Dutch success. The earmarking of revenue and the extended cooperation among polluters and specialized expertise in water institutions such as RIZA and the river basin agencies seem to have decreased transaction costs when responding to the economic incentives. The availability of information and advice, and the opportunities for financial assistance on the basis of the proceeds of the levies, smoothed the transition. Without the supervision of the RIZA and the earmarking of the revenue, pollution would hardly have been restricted to the extent achieved in The Netherlands.

The effect of earmarking is evident in the case of France. One of the branches that first became the target of a branch contract was the pulp and paper industry, and here the pollution level was reduced significantly (Fig. 6). However, among the food-processing industries only sugar factories were subject to contracts. In general, pollution has not decreased among food-processing industries, which shows that the levy has been too small to provide incentives for change. However, as an instrument to raise funds to be channeled into effective co-operation between firms and water pollution experts, the system seems to have been effective.

This interpretation is supported by the German case. In Germany the revenue was not earmarked, and there was no program for cooperation between public authorities with know-how and private companies. Funds from the levy have been disposed of by the Länder, who used them for other water pollution control

purposes. Although it is generally difficult to assess the impact of the German levy, and despite differences in the computation of discharges, reductions have not been as significant as in the other two countries. The interplay between more traditional command-and-control regulation and the wastewater levy has been less successful than the interplay between the Dutch/French water authorities and the use of levies.⁵

Germany and Denmark share a common tradition with regard to the role of the municipalities. Municipal authorities seem to be more inclined to support local industries by subsidizing their discharges or by accepting higher pollution levels than specialized water authorities. Although one would expect local government to offer a balanced consideration of environmental protection versus employment, and specialized water authorities to more rigidly "go by the book," it is surprising that the economic burden on industry has been no smaller in Germany and Denmark than in France and The Netherlands.

Local governments, keen to protect local employment (and tax revenue), have apparently been less effective in their management of pollution control than the specialized water pollution control authorities. The reason for this difference is not difficult to understand, once the transboundary character of pollution is considered. A local authority may choose to ignore the social costs of its policies that it creates downstream, whereas a water authority operating on hydrological principles must consider the total impact of its choice. The precarious question to be raised on the basis of these findings is to what extent local authorities are entities suitable for promoting sustainable development, or whether environmental management calls for a stronger state, with special-purpose bodies of public management. Much may depend on the specific environmental issue at stake.

10 Theoretical and practical implications

The study of water pollution control policies shows that the choice and implementation of specific policy instruments depend to a considerable degree on the institutional context, or what we have broadly classified as the national policy style. The fact that this study concerns water management, with its often century-old systems of regulation, may help explain why institutional influence stands out as particularly strong in regards to the design and operation of economic instruments. One should not expect to find instances of "single instrument" designs in other environmental sectors, however, although the institutional intricacies may be less obvious.

Strategies for pollution control come to reflect well-established traditions for government intervention and, in particular, for the relationship between government and industry. The four case studies of water pollution control show

⁵ This conclusion might not apply equally to those districts in Germany where specialized water boards operate (see footnote 3).

how policies were decisively influenced by formal and informal institutions during the process of policy-making. The role of the Dutch water boards is perhaps the best example of how the heritage of yesterday's regulations affects today's decision-making. In turn, these institutions affected the operation of the economic instruments in that the policy designs chosen provided different space for responses to the economic incentives.

It is interesting that neither of the two Dutch scientists who investigated the use of economic instruments for water pollution control policy in The Netherlands accorded much interest to the special role of the Dutch water boards. In their analysis, the existence of this administrative infrastructure was seen as *ex ante*, a factor exogenous to the functioning of economic instruments.

How, one may ask, can environmental economics benefit from the insights of such implementation studies? Is there not a paradigmatic difference between the formal analysis and techniques provided in economics and the policy-oriented analysis employed by political scientists? Although it is truly difficult to integrate the different approaches, there seem to be a few observations in the study that deserve to be treated in the more theoretical terms of environmental economics. Earmarked taxes have hardly been explored in the theoretical literature, although there are few reasons why economics should not investigate the theoretical aspects of earmarking. Also the issue of agent chosen could deserve more theoretical treatment, particularly the difference between defective and nondefective agent behavior. From a political science point of view there is an obvious research agenda in exploring more systematically the influence of national policy styles on the operation of various policy instruments. Are certain policy instruments more or less compatible with particular policy styles? Can we improve and refine the concept of policy style into something less heuristic?

From a more practical point of view, it is mainly a question of being more alert to the opportunities and limitations that follow from established institutions and to be more attentive to the basic properties and oddities of the state's system of public administration. Although institutions are already in place, such institutions may be modified or altered on an incremental basis to support the use of economic instruments. Unfortunately, economic instruments are often introduced on a marginal basis, without an appropriate understanding of the incentives at work at the implementation level. Incentives that derive from programs under the auspices of other ministries or sectors are neglected or inappropriately considered; and among officials accustomed to traditional legal instruments there is often a defective perception even of the economic incentives accruing from the regulations of their own resort. Policymakers should also consider how existing institutions could be used to better facilitate the implementation of a program.

The main lesson at the practical level seems to be the possibility for "smoothing" the institutional rigidities by information and earmarking of revenue-lowering transaction costs. Economic instruments provide incentives; but frequently the regulated—whether individuals or firms—lack the information, skills, and know-how required to respond in a rational way. Firms frequently

miss information on how water and energy use is distributed among the various parts of the production process, paying attention mainly to the bottom line. To reduce pollution costs it is necessary to spend resources on investigating alternative solutions, and the mere perception of such transaction costs may impede the incentives accruing from economic instruments. By facilitating an institutional network of actors who can assist in lowering transaction costs, the success of economic instruments can be ensured at a lower rate (and thus at reduced social costs) than economic instruments that have to be sufficiently high to offset transaction costs.

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