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Firms' Choice of Regulatory Instruments to Reduce Pollution: A Transaction Cost Approach*

Magali Delmas and Alfred Marcus

Abstract

This paper compares the economic efficiency of firm-agency governance structures for pollution reduction using transaction costs economics. Two governance structures are analyzed with the transaction costs approach: command and control regulation (CCR) and negotiated agreements (NAs). We propose that the choice of governance structure depends on the strategies firms pursue given the attributes of their transactions and their market opportunities. The application of transaction cost economics analysis leads to different choices of regulatory instruments. Firms in more mature, stable industries are likely to choose command and control, while firms in new, dynamic sectors are more likely to opt for negotiated agreements. Frequency of transactions is a key factor in firm choice.

KEYWORDS: transaction cost economics, environmental pollution, environmental regulation, governance structure, command and control regulation, negotiated agreements, environmental voluntary agreements

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1 Introduction

Firms are subject to different types of regulatory instruments to reduce pollution, not simply command and control regulation (CCR) (Schultze, 1977). In some instances, governments have provided them with the right to choose these instruments. In other instances, firms can choose jurisdictions where they locate facilities based on the instruments that governments offer. A prominent example of the right to choose a regulatory instrument was the choice the U.S. government offered firms to use negotiated agreements (NAs) under Project XL (eXcellence and Leadership). Under XL, firms had the right to determine the means to meet standards in exchange for site-specific performance more stringent than that called for in current requirements (Delmas and Mazurek, 2004; Marcus, Geffen and Sexton, 2002). A jurisdiction where firms can locate that offers NAs is the Netherlands. NAs became a central feature in Dutch policy under the country's 1989 National Environmental Policy Plan (NEPP) (OECD, 1995). By 1997, more than 100 NAs were in place in the Netherlands (EEA, 1997).

The selection of CCR or NAs has implications for firm cost minimizing strategy, but has not been studied or analyzed as such. The purpose of this paper, therefore, is to trace out the parameters of this choice within a transaction cost economics (TCE) perspective. To examine this choice, we extend the TCE framework to analyze transactions between firms and regulatory agencies. Under what circumstances should a firm favor CCR or NAs to reduce pollution? As Williamson has sketched the parameters of the make or buy decision for inter-firms transactions (Williamson, 1985; 1991), we sketch the parameters of firm choice with respect to these instruments. For the firm, the primary purpose of interactions with regulatory agencies is to acquire permission to operate. Additional purposes are to limit damage to humans and the environment, avoid future liabilities, not incur reputational loss, and maintain good will. Based on these concerns, which regulatory instrument should a firm seek?

Starting with Coase (1960), TCE not only analyzed transaction costs as they exist within and between firms, but also explored the question of the most efficient means for resolving pollution disputes. Public bureaucracies have been analyzed through the lens of transaction costs economics and there has been extensive discussion of the make or buy decision with regard to government services (Williamson, 1999). But investigating the efficiency of different environmental policy instruments from the point of view of the firm has not occupied a prominent place in the literature. Our investigation extends the transaction cost perspective to the firm's choice of a regulatory instrument.

Since the transaction cost implications of policy alternatives from the perspective of the firm with regard to environmental protection have not been considered, investigating these choices from the firm's perspective has promise.

The costs of compliance with environmental regulation are high (Jaffe, Peterson, Portney and Stavins, 1995; Rutledge and Vogan, 1994) and they include search and information costs, bargaining and decision costs, and monitoring and enforcement costs (Stavins, 1995). Delays associated with transacting with regulatory agencies may translate into high opportunity costs for companies operating in rapidly changing market conditions. Thus, minimizing these costs can have an important effect on a firm's performance. Given a firm's aim to minimize transaction costs, what should it do? Which policy instrument -- CCR or NAs -- should it favor? Answering this question can help managers and policy makers.

We maintain that negotiated agreements provide more flexibility to adapt to changing circumstances. However, the negotiation and implementation costs of these policy instruments are also higher. We propose that the comparative efficiency of these governance structures varies with the attributes of firm transactions and market opportunities. When dealing with frequent and complex regulatory transactions, we suggest that firms may choose governance structures with high transaction costs that will allow them to minimize opportunity costs.

This paper is organized as follows. The first part analyzes the attributes of governance structures -- CCR and NAs -- that are available to firms in acquiring the right to operate (a permit) from regulatory agencies. Part two analyzes the transaction costs of these governance structures according to the transaction's attributes. Part three develops the implications for firms' cost minimizing strategy.

2 Governance structure choices

In this paper, we analyze transactions between firms and government regulatory agencies. To acquire the right to operate (a permit) from a regulatory agency, a firm must comply with certain conditions with respect to releases into the environment. The regulatory agency, by virtue of the fact that it is a representative of the public, owns "property rights," which it can transfer to the firm through several main mechanisms including command and control regulation and negotiated agreements. Under these arrangements, the transaction is in the form of a quid pro quo wherein the firm agrees to meet conditions set by the regulatory agency in exchange for the right to operate. These arrangements differ on their adaptability and the use of incentive and control instruments.

Command and Control Regulation (CCR)

Under CCR, the conditions specified by the regulatory agency in exchange for the right to operate may be of two types. First, the firm agrees to meet environmental performance goals such as healthy air or fishable and swimmable

waters. To meet the specified target, it limits its amount of pollution by media (i.e. water, waste, air) and type of pollutant (NO_x, SO_x etc...). Second, it may be required to install a particular pollution abatement technology or use a specified industrial process to achieve the environmental performance goal. The regulatory agency sets targets or establishes technologies the firm has to use based on scientific and technical knowledge. Typically, the agency consults with industry and other affected parties. For example, under the Clean Water Act, the Environmental Protection Agency (EPA) established separate technology based standards for each industry. Each industry (corn wet millers, etc.) had to install best practicable and best available technology by a certain date (Marcus, 1980). In introducing significant new pollution sources under the Clean Air Act, firms also have to use best available technologies to reduce their air pollution (Marcus, Geffen, and Sexton, 2002). The distinction between performance based and technology based command and control regulations is often blurred as the regulator usually bases the performance standard on its determination of best available control technologies. The assumption is that the firm will adopt these technologies to achieve the performance standard.

Monitoring of compliance, then, is accomplished at the process level; if the technology is in place, the firm complies. Alternatively the monitoring can be done as a function of pollution releases. However, this type of monitoring, if not based on estimated inputs and outputs and calculations, can be costly because it requires the installation of expensive monitoring equipment to capture the actual discharge levels. Under command and control, regulatory agencies typically prefer and are most satisfied with technological solutions, since these eliminate the need for costly monitoring.

Under CCR, a fairly standardized and uniform contract-like agreement emerges that is applied to all companies using similar production methods. This form of regulation maximizes government control over production decisions as the regulatory agency decides how much pollution may be emitted and dictates the technology that may be used. The firm either agrees to the terms of the contract set by the government and puts itself on a compliance path or otherwise does not obtain a permit.

Under CCR, if the firm changes its production processes it may have to apply for a new permit. For example, New Source Review under the U.S. Clean Air Act requires that companies that expand or modify their facilities have to obtain a clean air permit that demonstrates that they have installed the best available pollution control technology (BACT). The new permit in turn does not grant much flexibility to adapt to changing circumstances.

Negotiated Agreements (NAs)

Under NAs, a firm can acquire the right to operate at a facility for a specified period based on its overall performance rather than the performance of specific sources.¹ NAs are not generic in nature like CCR, but specific, made-to-order, and customized. They have the potential to realize site-specific benefits for low cost pollution prevention, if the opportunities can be identified and used instead of one-size-fits-all requirements.

Unlike CCR, negotiation of the target to be attained is carried out at the facility level. It would not be standard for all facilities of a certain type (Delmas and Terlaak, 2002). The environmental target can be negotiated for the facility as a whole instead of by media (air, water, waste) or type of pollutant. Government agrees to an overall and comprehensive facility wide environmental performance goal instead of specific air, water or waste attainments for each different type of pollutant. Then, it is up to the firm to decide how to make trade-offs among media and pollutants to meet this overall goal.

Once agreed to, a long-term comprehensive performance-based NA should provide the flexibility to make changes at a site without recourse to further interference by pollution control officials. The firm can settle its environmental pollution issues for a specific period (let us say 10 years), reduce the behavioral uncertainty of the regulatory agency during that period, and put itself in a position where it can take advantage of market opportunities that come along.

In the U.S., under Project XL developed by the U.S. EPA, firms were able to trade superior environmental performance (SEP) for the flexibility of long-term NAs. A Dutch example is the chemical industry's declaration on implementation of an environmental policy. Every four years, participating firms provide plans to meet targets for the industry (EEA 1997). Firms producing acceptable plans are granted flexibility in permitting procedures (Börkey and Lévêque, 1998).

NAs are similar to neoclassical contract law and excuse doctrine as defined by Williamson. TCE views contracts as devices for structuring ex-post adjustments. Contracting parties can choose between a secure contract that specifies how the quasi-rent generated by their relationship will be shared ex-post and a flexible contract that allows them to benefit from future non-anticipated opportunities. NAs are a type of hybrid arrangement wherein the parties to the transaction maintain autonomy but are bilaterally dependent in their post-contract decision-making. When circumstances change, the parties need not go to court

¹ The term covenants is the term used in the Netherlands for negotiated agreements. The OECD recently provided a typology of voluntary agreements including the term negotiated agreements (Börkey and Lévêque, 1998). Because this typology has been widely adopted in the literature we use the term of negotiated agreements in this paper.

but can rely on informal arbitration to resolve their differences. This governance approach provides flexibility if there is a need to change production processes.

A Comparison of CCR and NAs

The two policy instruments can be classified in terms of the degree to which the regulatory agency exercises control over production decisions or the degree to which firms can adapt to changing circumstance independently from the regulatory agency.² Command and control represents the case that maximizes government control. It does not provide much flexibility to the firm in the case of change of production process. Changes in production processes are subject to review and the regulatory agency dictates the new abatement technology to be adopted. Under negotiated agreements, the regulatory agency monitors only abatement activity or pollution output. The duration of the contract is set beforehand. During this time period the burden of proof is on the government as to why changes in the contract should be made.

From this discussion it would seem that firms would prefer instruments that provide them with more flexibility to adapt to changing circumstances and would therefore favor negotiated agreements to command and control. However, as we shall show, the flexibility that they win comes at a cost. The negotiation and implementation costs of these policy instruments also are higher, which is likely to make firms wary of pursuing them. We shall argue that only certain types of firms are likely to benefit. Therefore, a comprehensive understanding of the transaction costs of these instruments is necessary.

3 Transaction costs and governance structures

There are several components of transaction costs. The ex-post transaction costs, we maintain, consist of two elements, the costs of renegotiating an agreement, once one is in place, and the opportunity costs a firm can experience if the renegotiation does not take place in a timely manner. Thus, in our framework, we not only stress the ex-ante negotiation and compliance costs associated with environmental regulation, but we also emphasize the ex-post transaction and opportunity costs. In what follows, we elaborate more on these costs and their importance according to the type of governance structure in place.

² In our analysis we do not consider pure hierarchy, which would be government ownership as opposed to regulation. We do not consider this alternative, as there are few Soviet-style command economies anymore and the results from a social welfare perspective of the Soviet-style system for the environment were disastrous. While researchers have explored the intricacies of these policy instruments separately, they have not compared them with respect to their transaction costs at the level of the firm (Fiorino, 1995; Portney and Stavins, 2000).

But in order to do this we must first describe our behavioral assumptions about firms and governments.

Our assumptions start with the idea that in the granting of environmental permits, government-business relations have been strained. They have been strained because of the differing nature of these institutions. Their legal and institutional foundations differ (Marcus, 1984). These differences make discussions of transaction costs in government-business relations more complicated than discussions of transaction costs in business-to-business relations. Specifically, business executives must operate according to quantifiable and discrete financial targets with their performance evaluated using indicators such as market share, profits, and return on investment. Regulatory officials have goals that are more vague and indefinite and not as easily measured (e.g., improving environmental quality), and their performance is judged according to more subjective criteria, such as the status of public health and the general state of the environment. As a rule, business managers value efficiency, while government executives value equity, accountability, and responsiveness as well as efficiency (Marcus, Geffen, and Sexton, 2002; Wilson, 1989). Business managers have increasingly adopted organizational structures designed to allow them to respond quickly to rapid changes in the marketplace, while government executives—reflecting the checks and balances in the U.S. Constitution— have complicated, bureaucratic, and overlapping structures, which operate at a more measured pace.

Government executives must cope with distributional conflicts that arise among diverse interests operating in a democracy, and institutional rewards typically go to those who can forge compromises in this setting. Business managers, on the other hand, must cope with the needs of customers and the expectations of shareholders, and though they too must forge compromises typically, they are rewarded for taking quick action in the marketplace. Risk taking is more valued by the business world and is more prevalent in business than in regulatory agencies.

Because of these different behavioral assumptions about the institutions, government is perceived as a source of uncertainty for the firm: i.e. it is difficult for firms to predict government behavior. Indeed, government can change the terms of existing regulations or impose delays when firms request permits, taking away firms' ability to respond quickly to market opportunities. From the firm's perspective, government may be perceived as opportunistic, its opportunism being a result of growing social demand for environmental improvements which results in more stringent regulations and more difficult permitting procedures. When regulations change, regulatory agencies incur high coordination costs, which can delay their responses to firms' request for permits and permit changes and impose additional costs on firms.

With a ratcheting up of regulatory requirements, there are rapid changes in the features of these requirements, changes that may be difficult for regulated facilities to handle. There is ample empirical evidence that shows how as societal demand for regulation grows and regulatory agencies deal with this augmentation, regulation becomes increasingly costly for firms (Jaffe et al, 1995). Therefore in our framework, we assume that firms and agencies are boundedly rational and opportunistic (Williamson 1985). The costs of their transacting come from the writing, monitoring, and enforcing incomplete contracts that are meant to harmonize their conflicting interests.

Ex- ante Negotiation Costs

Ex-ante negotiation costs are the costs of negotiating the level of the target that the firm has to reach. Prior to some type of arrangement being in place, negotiating costs exist for choosing the level of emissions a firm must reach. These may include information and search costs on what is acceptable for a firm or an industry. In the case of CCR, the targets to be achieved are decided by regulatory agencies based on information provided by scientific and technical experts and the lobbying of interested parties. Though firms may participate in this process individually, they are more likely to delegate it to their trade associations. They delegate it because the benefits are collectively shared.

Collectively shared benefits set in motion a very interesting dynamic. Command and control requirements tend to be generic. They apply to all firms of a certain class or all firms as a whole. No individual firm can reap all or most of the benefits. No individual firm suffers all or most of the costs. Trade associations therefore face very difficult collective action dilemmas (Olson, 1965; also see Mitnick, 1993). A firm or small group of firms with a disproportionate interest in CCR outcomes must come forward to resolve these dilemmas. This firm or small group of firms must motivate, coordinate, and police group behavior. They must induce contributions to the collective whole. They must cajole other firms to be involved. No matter how much effort they apply, the likelihood is high that there will be shirking by many firms. Many firms will free-ride on the efforts of the firm or firms that take the lead. Knowing full well that there will be such shirking, the firm or firms that take the lead are likely to withhold effort. Why should they sacrifice so much for the collective good? The amount they will spend on assuring a favorable outcome will be less than if they were only involved and if only their interest was at stake.

These collective action problems as they affect policy making in the instance of CCR regulation are well-known. However large the free rider and shirking problems are in the business community they are all the much greater among non-governmental institutions and among so-called public interest groups and thus regulatory capture is almost an inevitable outcome of CCR. It is easier

to form coalitions and resolve collective actions disputes in the business sector where interests are more concentrated and concrete than in the non-profit, public interest sector where interests are more diffuse and harder to define and articulate with precision.

In NAs, individual firms are directly involved in the negotiation of targets for their facilities. No collective action problems have to be overcome. No free riders have to be herded into following the lead of a trade association. No shirking is possible. The firm involved in the NA is fully mobilized for its interests are at the center of the discussion. The costs and the benefits of what is determined will not be generally shared. They will fall directly on the firm that is engaged in the effort to procure a NA.

Thus, for the firm involved in a NA, the burden of providing information is considerably higher in negotiated agreements than in command and control regulation. This burden is manifold. Firms must arrive at a realistic appraisal of their ability and cost to control pollution. They need to know currently what might be feasible and they also need to project market and technological developments to be able to assess their future ability to control emissions (Marcus, Geffen, and Sexton, 2002). Furthermore, in the case of negotiated agreements, legal fees associated with writing the contract between firms and regulatory agencies are higher than in the case of passing a law or issuing a regulation where there is no private contractual arrangement. In addition, these negotiations may include a large number of stakeholders from whom consensus has to be reached. This just adds to the transaction costs, and these costs are not shared as they would be with a trade association in the case of CCR but they fall directly on the firm involved in a NA. For example, in Project XL firms had to negotiate not only with community stakeholders and NGOs but also with state and local government as well as regional and the various offices of the federal EPA. The average costs of negotiating a project XL have been estimated to be \$320,000 with an average negotiation time of 26 months per firm (Delmas and Mazurek, 2004). 3M spent approximately \$1 million and more than a year's time and failed to reach an agreement with the government at its Hutchinson, Minnesota tape facility (Marcus, Geffen, and Sexton, 2002). Formalizing the link between ex-ante negotiation costs and governance we would argue that on average, *the ex-ante negotiation costs for the individual firm will be higher for negotiated agreements than for command and control regulations.*

Compliance Costs

After the arrangement is in place, compliance costs are incurred in finding the technology to comply with the regulation (search and information costs), in monitoring the performance levels and in reporting these levels to the regulatory agency (reporting and monitoring costs). They do not include the actual cost of

the technology. Search and information costs with respect to the technology to adopt to abate pollution are likely to be higher for NAs than for CCR. Because in NAs the firm has the flexibility to implement the technology of its choice as long as it achieves the target environmental performance goal, the search costs are the responsibility of the firm. In technology based CCR, the regulator sets the technology to be used and incurs the search and information costs on the best available technology. Often, the government decides on the technology that a firm will use under this type of command and control regulation.

Reporting and monitoring costs are likely to be higher under NAs than under CCR. Where private parties have significant discretion with respect to how to abate emissions, accurate quantitative assessments of performance are particularly important to the government. That is, the amount of information the government needs to monitor performance is often positively related to the level of discretion the government vests in the private party. Under negotiated agreements there will be complex calculations where the burden of proof is on the regulated party to show to the regulator that it is achieving the goals that it set for itself. There also will be complex trade-offs between different types of pollution. In the case of command and control firm managers just have to provide information about the firm performing below a specified threshold, or about the abatement technology in place. We would argue that *overall, the compliance costs for the firm are higher for negotiated agreements than for command and control mechanisms.*

Ex-post Negotiation Costs

Legal costs may exist if the agreement has to be renegotiated. Ex-post transaction costs include the costs of renegotiating the contract or the legal fees in case of a change in the agreement (in Williamson's terms "breach of the contract"). These changes in the agreement can originate from the firm, which may change its production process or from the regulatory agency which may adopt more stringent regulations.

Under CCR, which is media specific and pollutant specific, every change in an industrial process within a facility is subject to new permit approvals to re-establish the right to operate. If the firm does not comply with the command and control system, it will be a breach of contract resulting in fines and the potential loss of the right to operate. Under command and control, there is the potential for opportunistic behavior of the regulatory agency. The regulator can change a permit. The only ultimate recourse the firm may have is to go to court to challenge the decision.

In contrast, NAs are likely to have a fixed goal of long duration, which provides certainty and predictability during the length of the contract. Firms will negotiate environmental performance goals on a long-term basis. Under

negotiated agreements, as long as a performance goal is met, no new permit is required. Within the negotiated contract, they will try to set up flexible adaptation to many contingencies. So NAs typically provide flexibility in terms of conflict resolution. The firm therefore is less likely to renegotiate the contract. NAs therefore tend to limit the potential opportunistic behavior of the regulatory agency. *In sum, we would argue that the ex-post negotiation costs for the firm are higher for command and control regulations than for negotiated agreements.*

Opportunity Costs

The entire process is costly because firms, by engaging in it, are shut off from other profitable options. Opportunity costs are exacerbated in the case of delay, when there is general or prolonged uncertainty about the terms of an arrangement. For example, it can take 12 to 18 months to get a new production facility approved under the New Source Review requirements of the Clean Air Act (Marcus, Geffen, and Sexton 2002). This time can be critical if the firm is trying to introduce a new product. Demoralization costs (Michelman, 1967) also exist. It is not just the disutility losers have when an opportunity is not pursued but also the value of lost future production caused by demoralization of uncompensated losers, and other observers disturbed by the thought that they themselves may be subjected to similar treatment on some other occasion (Michelman, 1967: 1214). These are the “secondary” costs or adaptive responses taken by those subject to “capricious” redistribution (Williamson 1970: 119), redistribution that originates in bureaucratic processes that the parties feel could have been avoided. These processes cause delays and lead to frustration or a reluctance to take on and carry out similar projects in the future. Transaction costs are a multifaceted concept, whose many aspects must be recognized when considering the efficiency of alternative policy instruments for pollution control.

Command and control has high opportunity costs. They arise out of the need a company has to obtain a new permit when it alters its production processes. Negotiated agreements that are set for a long-term period minimize these costs. Indeed, the firm has the flexibility to pursue the most efficient pollution control and business solution and does not need to wait for the approval of the agency in the event of a change of a production process anticipated in the contract. Therefore we argue that *negotiated agreements are likely to have lower opportunity costs than command and control.*

Table 1 summarizes our argument made above concerning the transaction costs and opportunity costs associated with the governance structures. From our reasoning, it appears that none of the mechanisms has clear superiority over the others in terms of efficiency. The negotiating costs of NAs are greater than CCR

but the opportunity costs are lower.³ CCR has lower negotiation and compliance costs but higher opportunity costs. What our analysis points to is the trade-off between the different types of costs. The firm can decide to increase its negotiation and compliance costs to reduce its opportunity costs or vice-versa.

Table 1. Governance structures and transaction costs

	Command and Control Regulation	Negotiated Agreements
Negotiation costs with regulatory agency	-	+
Compliance costs	-	+
Ex-post renegotiation costs	+	-
Opportunity cost	+	-

+ = high transaction costs - = low transaction costs

4 Firm choice of policy instrument

Thus, understanding the transaction costs of the different governance structures has implications for firm cost minimizing strategy. The choice of instruments depends on the strategies that managers are pursuing given the transactions attributes of their firms. Everything else being equal, do managers want to minimize ex-ante negotiation costs, ex-post compliance costs, or ex-post opportunity costs? This choice has a number of dimensions. In situations where the choice can be made (the U.S. when Project XL applied) managers could select a governance structure that best met their needs. In situations where they had no choice (the U.S. when Project XL could not be used), they could lobby for NAs. If the lobbying failed, they could threaten to locate in a jurisdiction (for example, the Netherlands) that better met their preferences. Depending on firm specific attributes and their need to minimize different kinds of transaction costs, everything else being equal managers had some ability to choose the type of governance structure they wanted.

In transaction costs economics, the exposure of a company to the potential opportunistic behavior of the transacting party (in this instance the regulatory agency) varies with of the attributes of the transaction, namely asset specificity,

³ The opportunity costs may be more important than the transaction costs but since they are realized in the future, they have to be appropriately discounted.

complexity and frequency (Williamson, 1985). These attributes are likely to affect the decisions managers will make, as we shall show.

Asset Specificity

Specific assets are defined as assets that have been invested for the purpose of the transaction and that are non-redeployable to other transactions (Williamson, 1985). Asset specificity can take the form of investment in technology, knowledge, and facilities. A firm with sited physical specific assets at stake will have a more difficult time switching jurisdictions if the terms of a contract are unfavorable. Once the firm has decided to locate in one jurisdiction and to invest in specific assets, it will make the decision to switch to another jurisdiction harder than before the location decision. The firm may therefore be subject to the opportunistic behavior of the regulatory agency, which can change the rules of the game and impose a costly permitting procedure on the firm. The level of asset specificity is high for most transactions related to industrial manufacturing activities. However, it does not mean that the firm will automatically favor more flexible governance structures that allow for adaptation to changing circumstances since these governance structures may be associated with additional transaction costs. We argue that in the case of a high level of asset specificity, the decision to choose a negotiated agreement will depend on transaction frequency and complexity.

Frequency

Frequency of the transaction will vary depending on the type of industry in which the firm operates. Industries that manufacture products with short life cycles will have more frequent transactions with regulatory agencies than industries with long product life cycle. For example, semiconductor manufacturers may be required to obtain from the regulatory agency a new air emissions permit each time a manufacturing change is made, a cost they would like to avoid because of the fast-paced nature of the industry in which they are participating. The problems associated with an increase in regulatory stringency under command and control can be substantially more acute when the frequency of the transactions is high, i.e. when firms have to require permits often. Industries with short product life cycles (e.g., semiconductors) bear higher costs in the form of more stringent abatement methods or production delays because their transactions are more frequent than industries where the rate of technical change and need for new permits is static (e.g., cement).⁴ Furthermore, companies

⁴ For example, an average Intel semiconductor manufacturing facility using the latest process technology would introduce at least two new generations of technology; make 30 to 45 process chemical changes per year; and install five to 15 new equipment types and/or processes (Boyd,

concerned with earning quasi rents from first-mover advantages can be adversely affected by potential permitting delays.

Of particular concern to companies that make frequent modifications to their manufacturing processes is the potential for state and local regulatory agencies to develop permit programs that subject routine process changes to review. Reviews can impose delays of several days or several months, depending on whether regulators require public notice and comment (which themselves can take up to 60 days). While no one knows for sure, some managers posit that production delays can cost a first-mover firm such as Intel Corporation a million dollars in lost revenue each day (Boyd, Krupnick, and Mazurek, 1998).

Negotiated agreements allow the firm to obtain permits for a set period of time which avoid the firm to be subject to permit renewal and changes during that time. For example, Weyerhaeuser, and Merck negotiated agreements under project XL where speed to market played a considerable role in motivating companies to apply for time-consuming and complicated negotiated agreements.⁵ In the case of negotiated agreements, because the firm has signed a contract with the regulatory agency, any change initiated by the agency can lead to a breach of contract that would incur cost to the agency. Consequently, negotiated agreements should be more efficient than command and control mechanisms for firms involved in frequent transactions.

Complexity

Complex transactions, which involve several pollution media and types, may also involve high transaction costs. For example, if a firm pollutes in air, water, and solid waste it will have to deal with three transactions with the regulatory agency. Each transaction is governed by a different set of rules and different parties which increase the complexity of the interactions. Under command and control the firm is unable to make changes within one part of its production process without having to deal with the multiple external parties that have jurisdiction over the pollution levels of the production processes.

Krupnick, and Mazurek 1998). Under federal air pollution law, Intel could be required to obtain from regulators a new permit each time the firm makes a manufacturing change.

⁵ Merck's original August 1995 XL proposal said: "Speed to market for new products, and new claims for existing products, is at the heart of the company's need to have flexible manufacturing facilities that can make a broad range of products in the same equipment, using a wide array of raw materials and solvents. Thus the ability of Merck's manufacturing plants to respond to rapidly changing market conditions and product demands is critical to Merck's ability to stay competitive in a worldwide pharmaceutical industry. To avoid a competitive disadvantage, Merck argued in its proposal that it was necessary for flexible manufacturing facilities to have flexible permits" (Merck, 1995).

In negotiated agreements, the coordination of these different processes and media pollution can also be done internally. For example, under project XL, Jack M. Berry Inc., a mid-sized juice-processing facility in LaBelle, Florida, developed a facility-wide comprehensive operating plan (COP) that consolidated 23 federal, state, and local environmental permits and all operating procedures into a single manual for the facility. The Final Project Agreement was signed on July 8, 1996. The COP was a multi-media permit that is part of a streamlined permitting approach that was expected to better integrate plant operation and compliance procedures, as well as eliminate unnecessary administrative requirements. The streamlined permitting approach was anticipated to result in cost savings that Berry could reinvest in new environmentally beneficial operating procedures. In its proposal for a project XL to ease the permitting process, Berry estimated the savings from the negotiated agreement to several million dollars (Berry, 1995: 4). This type of arrangement facilitates making complex trade-offs among pollution sources and pollution abatement technologies that can increase efficiencies.

In the case of complex transactions, the coordination issues of dealing with several media will increase ex-post negotiation costs and opportunity costs. Negotiated agreements will provide the most efficient governance structures as compared to command and control.

5 Discussion of the framework and conclusion

We argue that the efficiency of various governance structures varies with firms' transaction attributes and market opportunities. The application of TCE analysis may therefore lead to very different legal rules from approaches that ignore TCE consideration. With this framework in their hands, what can managers do? If there is a choice of instruments, our model shows to the firm's manager which instrument is the most efficient according to the particular attributes of the transaction and market opportunities. If there is no choice available, it suggests potential rationales to lobby for specific instruments. Managers can suggest alternative policy instruments and outline the various transaction costs of each alternative. In such case, the firm needs to take into account these lobbying costs in its assessment of the total transaction costs. Firms can also decide to change jurisdictions and locate in jurisdictions where the regulatory instruments are more beneficial to the firm (Anderson and Kagan, 2000). In that case they need to take into account the costs of switching of jurisdiction and other costs linked to these changes that may not be related to environmental regulations.

We would argue that as economies evolve and become more dynamic, negotiated agreements need to be available options. From a public policy perspective, a mixed regime provides firms with choices to match a regulatory

governance structure with their firms' specific attributes (Gunningham, Grabosky, and Sinclair, 1998; Lyon and Maxwell, 2002).

Different Institutional Environments

We treated the institutional environment as a constant. Although this is not the focus of this paper, it is important to recognize that the comparative efficiency of policy instruments will vary with the institutional context in which they are implemented (Delmas and Terlaak, 2002). In particular, the probability of government's opportunistic behavior may vary according to the institutional environment. Previous literature has described how institutional mechanisms can constrain the opportunistic behavior of the government (Delmas and Heiman, 2001; Levy and Spiller, 1994; Weingast, 1995; Williamson, 1984). Most of these studies point out that stable markets and credible regulation develop when governmental discretion is constrained (Henisz, 2000; Levy and Spiller, 1994; Weingast, 1995). They argue that the fewer the constraints, the greater the risk that agreements made between private actors and governments today will be repudiated tomorrow (Levy and Spiller, 1994). One factor constraining governmental behavior is the separation between legislative, executive, and judicial branches of the government (Levy and Spiller, 1994; Vogel, 1993). For example, a strong and independent judiciary can limit administrative discretion by developing laws constraining administrative action through administrative procedures. Likewise, a federal system limits central government authority by increasing the number of veto points of state and local governments (Henisz, 2000). This structure contrasts with a centralized system, in which the authority of local governments is limited. Furthermore, fragmentation of power provides multiple access points for public interests, which can restrain governmental behavior.

However, too many constraints limit a government's ability to adapt regulations to changing circumstance. The elements that may provide credibility to regulation by limiting a government's abilities to change rules arbitrarily are the same elements that could hamper the implementation of flexible regulations such as NAs. To be credible in their commitment to NAs, regulators require discretion. The regulator must have the authority to change existing rules and permit procedures. It must also ensure that the NA does not conflict with local or state regulations. Too many (and potentially conflicting) constraints through congressional controls, judicial review, and third-party access can therefore make difficult the implementation of the agreements and in particular increase the negotiation costs of such agreements (Barth and Dette, 2001; Higley, Convey and L  v  que, 2001: 8). For example, the execution of EPA's Project XL was hampered by uncertainties concerning EPA's authority to relax regulatory standards enacted by Congress (Boyd, Krupnick, and Mazurek, 1998; Delmas and

Mazurek, 2004). In the absence of explicit statutory authority for the EPA to issue regulatory flexibility, firms out of compliance with status quo standards are vulnerable both to regulatory enforcement action and citizen lawsuits. Indeed if the regulatory agency provides firms with some relief or flexibility from letter of the law requirements, the firm to some degree makes itself more vulnerable to legal challenges from competitors, third parties and other regulatory agencies. Similar problems originally plagued the Dutch NAs when a few licensing authorities initially were unwilling to relax permit procedures for firms participating in NAs (Wallace, 1995).

Limitations

Because the comparative efficiency of policy instruments varies according to the institutional environment in which they are implemented, further research could examine the arguments we make in this paper in different jurisdictions.

Our analysis has a number of limitations. We discussed governance structures outside of the historical context of their development and as if they were independent choices. In the real world companies and regulatory agencies are already committed to existing permitting arrangements. There may be switching costs associated with the changes from one governance structure to another. Companies and governments are going to compare these systems not in the abstract but they will also integrate the costs of moving from one system to another. In addition, it is likely that regulators of health and safety will be reluctant to rely on a model where all firms would not be treated similarly because of equity concerns (Marcus, Geffen, and Sexton, 2002).

There is more experience in dealing with command and control mechanisms as compared to negotiated agreements. Therefore, in the real world, there is more uncertainty associated with the use of NAs as compared to CCR. This kind of uncertainty will affect calculations of comparative efficiency.

We did not overly concern ourselves with the transaction costs incurred by regulatory agencies with each of these instruments. Further research could address this question as it may have implications on the feasibility of the implementation of the different governance structures. For example, the transaction costs of negotiating agreements with firms individually may add up to be extremely high as compared to instruments that are more standard and can be applied to a greater number of firms.

Conclusion

In this paper, we have compared the TCE efficiency of CCR and NAs in dealing with pollution. We have focused on the micro economic level i.e. firms' transaction, rather than the social welfare implications of alternative governance

structures. This allows us to build a framework around the micro economic efficiency of CCR and NA, an endeavor that has not been previously undertaken.

We propose that the comparative efficiency of these governance structures varies with the transactions attributes of the firm and its market opportunities. We suggest that firms may prefer governance structures that entail higher ex-ante negotiation costs if they can minimize their opportunity costs when dealing with frequent and complex regulatory transactions. In particular, firms in more mature, stable industries are likely to choose command and control, while firms in new, dynamic sectors are more likely to opt for negotiated agreements, provided that they can negotiate these agreements in a timely way with government. Thus, frequency of transactions is likely to be a key factor in firm choice of these governance structures.

As we discussed, some costs may be positively (complements) or negatively (substitutes) correlated with other types of costs. For example, costs involved with negotiating an agreement involved in encouraging participation of stakeholders at an early stage may decrease monitoring and enforcement costs later. Our contribution to transaction cost theory is that we have described a situation where minimization of ex-ante negotiation costs might lead to higher opportunity costs. In fact, negotiation costs and opportunity costs in our framework are inversely related.

We have extended transaction cost theorizing to the case of business-government relations in the spirit of Coase original contribution. Further research could also compare the transaction costs associated with additional instruments such as market mechanisms. Our framework may also be applied to regulation outside of the environmental arena. It may provide an interesting complement to analyses of production costs. Practitioners in business and government as well as researchers should find it useful.

References

- Anderson, C. L. and R. A. Kagan 2000. Adversarial legalism and transaction costs: The industrial-flight hypothesis revisited. *International Review of Law & Economics* 20(1): 1-19.
- Barth, R., and Dette, B. 2001. The integration of Voluntary Agreements into existing legal systems. In C. J. Higley, and F. Lévêque (Eds.), *Environmental Voluntary Approaches: Research insights for policy-makers*: 14-31. Milan, Italy: Fondazione Eni Enrico Mattei.
- Berry. 1995. XL proposal: <http://www.epa.gov/projectxl/berry/>.
- Börkey, P., and Lévêque, F. 1998. Voluntary approaches for environmental protection in the European Union, *OECD, ENV/EPOC/GEEI(98)29/FINAL*: 1-33. Paris: Organization for Economic Co-operation and Development.
- Boyd, J., Krupnik, A. J., and Mazurek, J. 1998. Intel's XL permit: a framework for evaluation, *Discussion Paper 98-11*. Washington: Resources for the Future.
- Coase, R. 1960. The problem of social cost. *Journal of Law and Economics*, 3(October): 1-44.
- Delmas, M., and Heiman, B. 2001. Government credible commitment in the French and American nuclear industry. *Journal of Policy Analysis and Management*, 20(3): 433-456.
- Delmas, M., and Mazurek, J. 2004. A transaction cost perspective on Negotiated Agreements: The case of the U.S. EPA XL Program. In A. Baranzini, and P. Thalmann (Eds.), *Voluntary approaches to climate protection. An Economic assessment of private-public partnerships*. Northampton, MA: Edward Elgar publishing.
- Delmas, M., and Terlaak, A. 2002. Regulatory commitment to Negotiated Agreements: evidence from the United States, Germany, the Netherlands and France. *Journal of Comparative Policy Analysis*, 4: 5-29.
- EEA. 1997. Environmental Agreements, *Environmental Issues Series*, 3. Copenhagen: European Environmental Agency.
- Fiorino, D. J. 1995. *Making environmental policy*. Berkeley: University of California Press.
- Gunningham, N., Grabosky, P., and Sinclair, D. 1998. *Smart regulation: designing environmental policy*. New York: Oxford University Press.
- Henisz, W. J. 2000. The institutional environment for economic growth. *Economics and Politics*, 12(1): 1-31.
- Higley, C. J., Convery, F., and Lévêque, F. 2001. Voluntary Approaches: an introduction. In C. J. Higley, and F. Lévêque (Eds.), *Environmental*

- Voluntary Approaches: Research Insights for Policy-Makers*: 3-12. Milan, Italy: Fondazione Eni Enrico Mattei.
- Jaffe, A. B., Peterson, S. R., Portney, P. R., and Stavins, R. N. 1995. Environmental regulation and the competitiveness of U.S. manufacturing: What does the evidence tell us? *Journal of Economic Literature*, 33(1): 132-163.
- Levy, B., and Spiller, P. 1994. The institutional foundations of regulatory commitment: a comparative analysis of telecommunications regulation. *Journal of Law Economics and Organization*, 10(2): 201-246.
- Lyon, T. P and Maxwell, J. W. 2002. Self-regulation, taxation and public voluntary agreements. *Journal of Public Economics*.
- Marcus, A. A. 1980. *Promise and performance: choosing and implementing an environmental policy*. Westport, Ct: Greenwood Press.
- Marcus, A. A. 1984. *The adversary economy: business responses to changing government requirements*. Westport, Ct: Quorum Books.
- Marcus, A. A., Geffen, D. A., and Sexton, K. 2002. *Reinventing environmental regulation: lessons from Project XL*. Washington, D.C.: Resources for the Future.
- Merck. 1995. Initial XL proposal: <http://www.epa.gov/projectxl/merck/>.
- Michelman, F. I. 1967. Property utility, and fairness: comments on the ethical foundations of "just compensation" law. *Harvard Law Review*, 80(6): 1165-1258.
- Mitnick, B. (ed.) 1993 *Corporate Political Agency*. (Sage) Newbury Park, Ca.
- OECD. 1995. *Netherlands*. Paris: Organization for Economic Cooperation and Development.
- Olson, M. 1965. *The Logic of Collective Action*. (Harvard and Shocken Press) New York.
- Portney, P. R., and Stavins, R. N. (Eds.). 2000. *Public Policies for Environmental Protection*. (Vol. Resources for the Future). Washington, D.C.
- Rutledge, G. L. and C. R. Vogan 1994. Pollution abatement and control expenditures, 1972-1992. *Survey of Current Business*. May. 74. 36-49.
- Schultze, C. 1977. *The public use of private interest*. Washington D.C.: Brookings.
- Stavins, R. 1995. Transaction costs and tradeable permits. *Journal of Environmental Economics and Management* 29: 133-148.
- Vogel, D. 1993. Representing Diffuse Interests in Environmental Policy Making. In R. K. Weaver, and B. A. Rockman (Eds.), *Do institutions matter? : government capabilities in the United States and abroad*. Washington, D.C.: The Brookings Institution.
- Wallace, D. 1995. *Environmental Policy and Industrial Innovation, Strategies in Europe, the US and Japan*. London: Earthscan Publications Ltd.

- Weingast, B. 1995. The economic role of political institutions: market-preserving federalism and economic development. *Journal of Law, Economics, and Organization*, 11(1): 1-32.
- Williamson, O. E. 1970. Administrative decision-making and pricing: Externality and compensation analysis applied. In J. Margolis (Ed.), *The Analysis of Public Output*: 115-135.
- Williamson, O. E. 1984. Credible commitment: further remarks. *The American Economic Review*, 74: 488-490.
- Williamson, O. E. 1985. *Economic Institutions of Capitalism*. New York: The Free Press.
- Williamson, O. E. 1991. Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly*, 36(2): 269-296.
- Williamson, O. E. 1999. Public and private bureaucracies: a transaction cost economics perspective. *The Journal of Law, Economics, and Organization*, 15(1): 306-342.
- Wilson, J. Q. (1989). *Bureaucracy: what government agencies do and why they do it*. New York, Basic Books.