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Flexible Environmental Regulation

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“Flexible regulation” might sound like an oxymoron but it has become a widely accepted catch phrase for a pragmatic approach to regulation that promises the achievement of important public policy objectives at relatively low cost. Given the growing interest in flexible regulation in recent decades, we consider in this paper what can be learned from the U.S. experience with flexible environmental regulation. We assess four types of flexible regulation: (1) flexible commands, such as performance standards, information disclosure rules, and management-based regulations; (2) flexible targets, such as offsets, bubbles, and trading; (3) flexible consequences, such as voluntary programs and agreements; and (4) flexible regulators, such as systems of self-regulation and self-policing. Researchers have demonstrated that many flexible approaches can sometimes work, to some degree; but just as flexible policies can vary in form, we find that they also vary in results. What remains, we argue, is to determine whether the marginal and at times only potential gains from flexible forms of regulation are enough to justify their increased use.

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“Flexible regulation” might sound like an oxymoron, but it has actually become a widely accepted catch phrase for a pragmatic approach to regulation. The phrase stakes out a middle ground between regulation’s defenders and its critics, promising the achievement of important health, safety, and environmental objectives while also minimizing costs and preserving liberty. For over thirty years, the ideal of “regulatory flexibility” has been embedded in federal law in the United States, with legislation requiring administrative agencies “to solicit and consider flexible regulatory proposals” when contemplating new requirements that would affect small businesses (Regulatory Flexibility Act 1980). In early 2011, President Obama adopted a more general order to agencies to pursue “flexible approaches” whenever “relevant, feasible, and consistent with regulatory objectives, and to the extent permitted by law” (Obama 2011). Agencies are now required to “identify and consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public” (Obama 2011).

In response to demands for greater flexibility, environmental regulators have implemented a “varied basket of more flexible regulatory strategies” (Karkkainen 2006). These strategies – which range from performance and market-based standards to requirements for information disclosure or pollution prevention planning – have also fueled a corresponding effort by scholars in the social and policy sciences to refine the
theoretical expectations for flexible approaches to regulation and to test these expectations empirically. Research has confirmed that flexible approaches can sometimes result in the very kinds of improvements in environmental conditions that traditional forms of regulation seek to obtain. However, not all flexible approaches result in significant improvements and some have been linked, on occasion, with unintended adverse outcomes. This chapter assesses what we know about flexible approaches to environmental regulation. We begin by defining more precisely what we mean by flexible regulation by placing the concept within a general framework of regulation. Adhering to this framework, we proceed in each subsequent part of this chapter to show the role that flexible regulation can play in environmental protection and to assess what we know about flexible regulation’s impacts on business behavior and environmental quality.

1. Framework of Flexible Approaches

Flexibility and regulation exist in tension because flexibility implies choice while regulation limits choice. Two different regulations addressing the same problem and targeting the same individuals or businesses may nevertheless permit different degrees of choice in how to act. The regulation that affords the greater degree of choice can be said to be more flexible. If two regulations achieve equally effective results but differ only in that one provides greater flexibility than the other, the more flexible one would be clearly better to adopt because the choice afforded either is intrinsically valuable or it allows regulated targets to choose less costly ways to comply. Of course, regulatory flexibility
can come at a price if regulated targets use it to choose actions that comply with the regulation but that prove ineffective at solving the social problem that motivated the regulatory intervention.

Different regulatory approaches can yield different degrees of flexibility because they vary in how they are structured. The broad literature on regulation contains numerous taxonomies of regulatory structures (Richards 2000), but all variants of regulation can be distilled down to the four components inherent in any regulatory scheme: (1) the command embedded in the regulation, (2) the target of the regulation, (3) the consequences associated with compliance or non-compliance with the command, and (4) the regulator (Coglianese 2010a, 2010b). The regulator is the entity or entities that creates and enforces the regulation. The target refers to the entity or entities to which the regulation applies. The command refers to what the regulator instructs the target to do or to refrain from doing. The regulatory consequences are what the regulator imposes for complying or failing to comply; they can be positive or negative, large or small, certain or uncertain.

To see how these differences affect flexibility, consider first the regulatory command. The command can affect flexibility by its stringency, its structure, and its specificity. Stringency – or how much pollution reduction is commanded – affects both costs and flexibility, two related but distinct concepts. Flexibility relates to costs because regulated targets that have a greater range of choice – more flexibility – will be able to select lower-cost ways of complying. However, not all differences in cost derive from flexibility. Two regulations addressing the same problem might well each afford a
regulated target only one way to comply, but the single action compelled by the less stringent of the two may simply cost less.

Commands vary by more than just their stringency; they also differ in terms of their structure, or what they direct targets to do or achieve. Some commands direct targets to take or refrain from actions, while others only prescribe or proscribe specified end-states that are caused by actions. The former we call means standards, although they are also sometimes called technology, design, or specification standards. By contrast, commands commonly called performance standards do not mandate any particular action or installation of technology, only the attainment or avoidance of an end state such as a specified level of emissions from a smokestack (Coglianese, Nash, and Olmstead 2003; May 2011).

These two types of standards – means and performance – can be distinguished further based on where they intervene in the causal chain leading up to the problem that the standard is supposed to help solve, something which in turn affects the amount of flexibility for regulated targets. To illustrate, consider a highly stylized causal chain that leads to sickness – say, asthma – from industrial air pollution. As shown in Figure 1, the causal chain begins with (A) business decision making that leads to (B) manufacturing operations or other behaviors that generate (C) emissions of pollutants that ultimately lead to (D) cases of asthma. Regulatory commands can be situated at any one of these steps in the causal chain.

A means standard might fall along the chain at step (B), mandating the installation of emissions control technology to reduce levels of a pollutant. As Figure 1 shows, in such a case the regulatory standard would foreclose other choices, such as changing to a
cleaner input. A performance standard situated at step (C), by contrast, would specify the permissible level of a pollutant but would allow the regulated target the choice of how to reduce emissions of that pollutant, either changing to a cleaner input or installing emissions control technology. A target would have still greater choice if the standard were situated at step (D), which we call a \textit{meta-performance} standard. For example, a regulation that simply imposed a general duty of care to reduce the risk of asthma cases would allow the regulated target to choose to reduce either of the precursor pollutants in Figure 1 as well as to choose, for each of these pollutants, which way to reduce that pollutant.

\textbf{Figure 1: Choice Structure, Regulatory Intervention Points, and Types of Regulatory Commands}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Choice Structure, Regulatory Intervention Points, and Types of Regulatory Commands}
\end{figure}

Source: authors.
Another regulatory approach would be to focus on the first step, (A), such as by requiring targets to engage in information gathering, planning, and other management practices that should enable them to make better decisions about reducing the environmental impacts of their operations (Coglianese and Lazer 2003; Hutter 2001). Management-based regulation and information disclosure laws are examples of this approach, which we generalize here under the label of *meta-means* standards. Meta-means standards are means standards in that they do mandate some action, but the actions they compel lie at a very early stage of a causal chain leading to a problem. In our stylized example, the regulator could require a target to identify pollutants it generated that contribute to asthma levels and then to develop its own plan of action aimed at reducing that risk, an example of a management-based regulation (Bennear 2006). The range of behavioral choices available to the target with such a meta-means standard would be the same as with a meta-performance standard. In our example, the target could choose to focus on either of the precursor pollutants and then on either of the two means of reducing those pollutants. The main difference is that under a meta-means standard the target has no choice but to engage in the required information gathering and plan development.

Of course, not all commands targeting the same link on the causal chain will promise an equal degree of flexibility. Even when addressing the same link, standards can be written with different levels of *specificity*. For example, a means standard that requires the installation of technology might require either the “installation of reasonably available control technology” or the “installation of a dry scrubber.” Both are means
standards intervening at the same step on the causal chain, and hence they both preclude targets from meeting their legal obligation by, say, changing to cleaner inputs; however, the first standard would obviously give more flexibility than the second, assuming that both a dry scrubber and a wet scrubber are “reasonably available.” In a similar way, performance standards can vary in their specificity. A command that requires facilities to reduce emissions of a pollutant to a “reasonable level” will undoubtedly permit greater flexibility than a more specific standard that requires reductions to “0.05 parts per million,” even though both are performance standards.

Just as variation in the specificity, structure, and stringency of commands affects flexibility, so too can variation in regulations’ targets. All other things equal, the broader the target, the greater the flexibility. For example, an automobile emissions standard could target either individual automobiles or a manufacturer’s entire fleet. If the regulation imposes an emissions limit on each and every car (a narrow target), it will give the manufacturer much less flexibility than would a fleetwide average emissions limit (a broad target), even though both are performance standards.

The expected consequences of regulation can also affect flexibility. A highly specific means standard backed up with no consequences for noncompliance would, in reality, afford a target more flexibility than a general meta-performance backed up with strict oversight and significant penalties. Similarly, when positive consequences are offered for compliance, targets may not see themselves as constrained if these rewards are modest or trivial. However, if a positive consequence is substantial, such as the
granting of a license to operate a business, targets will be much more constrained to do what is needed to earn the “reward.”

Finally, the identity of the regulator can affect flexibility as well. Although typically the regulator is a governmental entity, a variety of nongovernmental entities can impose commands that are backed up with consequences, including insurance companies, customers, industry trade organizations, and private standard-setting entities such as the International Organization for Standardization (ISO) or the International Electrotechnical Commission (Gunningham and Rees 1997). A target can even “regulate” itself by imposing commands on its own members or employees. To account for self-regulation, we posit that the closer the connection between the regulator and the target, the greater the flexibility the target will have, all things being equal.

Flexibility in the case of self-regulation, though, does not necessarily mean that the command adopted will actually afford, by its terms, greater choice. A private or self-regulatory entity can adopt just as constraining a means standard as any government regulator can. However, when there is a degree of unity between the regulator and the target, any behavior demanded by a regulatory command will more likely reflect the very choices the targeted entity would have made. In situations of complete self-regulation, the slate of options a target has to require of itself is, at least in principle, wide open.

In the end, the actual level of flexibility afforded by any regulation will be a function of its four elements – regulator, target, command, and consequences – combined with the specific set of choices available to the regulated entity in each particular circumstance in which it finds itself. Flexibility is, after all, also a function of the
underlying behavioral (physical, economic, or technological) choices available to an entity. At the limit, if there is only one way to reduce emissions of a certain pollutant, then in practice it does not matter whether the regulator adopts a means standard or a performance standard.

What can be said, then, as a general matter about flexible approaches to regulation? Answering that question is the purpose of the remainder of this chapter. Having elucidated the range of flexible approaches to regulation, we now focus on the role and impacts of actual flexible approaches. Do flexible approaches yield some positive environmental impact? If so, when? Although we track here the existing research literature in emphasizing the question of whether flexible approaches can yield at least some environmental benefits, we acknowledge that this emphasis offers but a partial evaluation of flexible approaches. We note that any number of alternative policy approaches might also be effective in the sense of yielding at least some environmental benefits. A more complete evaluation of any regulatory approach would consider how well the full effects of that approach – benefits and costs – compares with the full effects of other approaches. Furthermore, any policy approach may be evaluated on a variety of policy criteria, whether economic (e.g., cost-effectiveness, efficiency, and incentives for technological innovation), political (e.g., political feasibility and transparency), or distributional (e.g., equity and justice). Naturally, different criteria are likely to yield different judgments about the desirability of any approach to environmental regulation in different circumstances.
2. Flexible Commands

We focus first on flexible commands: performance standards, information disclosure, and management-based regulation. The flexibility of these commands derives from the ways that they permit a regulated target to choose from among a range of actions in order to reduce the environmental impacts of their behavior.

2.1 Performance Standards

Performance standards command the avoidance or attainment of an end-state, giving individuals and businesses subject to regulation the opportunity to choose their own concrete actions, provided that the end state commanded is satisfied (May 2011). By focusing on an end-state and giving the targets of the regulation choice in how to achieve that end-state, performance standards allow targets to select the least costly means of meeting the commanded level of performance. Performance standards also allow for innovation and technological development in ways that means standards cannot typically accommodate (Jaffe, Newell, and Stavins 2004).

For these reasons, performance standards have been widely lauded by academics and policymakers (Coglianese, Nash, and Olmstead 2003). Since the early 1990s, federal agencies in the United States have operated under a presidential order that admonishes them whenever feasible to “specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt” (Clinton 1993). The White House Office of Management and Budget (OMB) has elaborated that “[p]erformance standards are generally to be preferred to engineering or design standards because performance standards provide the regulated parties the flexibility to achieve the
regulatory objective in a more cost-effective way” (OMB 1996). More recently, President Obama’s 2011 executive order on regulation likewise stated that agencies “must” use performance standards whenever feasible (Obama 2011).

As favorably as performance standards have been viewed, these standards also can pose real challenges. For one thing, regulators and inspectors need a way of measuring performance (OMB 1996, 2003). Yet sometimes measurement can be difficult because of the highly distributed nature of the problem, such as when ensuring compliance with emissions limits requires continuous monitoring of hundreds of thousands of smokestacks and pipes.

In addition, if performance standards are so narrowly defined that they only permit regulated entities one realistic option of what action to take, they provide no advantage over a means standard that compels that same action. As OMB has noted, it is “misleading and inappropriate to characterize a standard as a performance standard if it is set so that there is only one feasible way to meet it” (OMB 1996).

Finally, performance standards may be somewhat more susceptible to the law of unintended consequences. For example, one study of performance-based building standards in New Zealand has suggested that the flexibility they afforded led to a major national “leaky building” crisis, with as many as tens of thousands of homes afflicted with extensive rotting (May 2003). The building standards commanded performance in terms of durability and stability but not weatherproofing, which allowed builders to meet code using cheaper materials that met the performance requirements but did not adequately resist rain.
Another consideration with performance standards is that even though they provide individual regulated targets with flexibility needed to achieve cost savings, they often still treat all targets equally, meaning that every target has to meet the same level of allowable emissions. Since the marginal costs of controlling emissions can vary across different businesses, such uniform performance standards can miss opportunities for greater flexibility and cost savings. When only the marginal abatement costs, and not the marginal benefits of abatement, vary over space, a more cost-effective way to attain the same level of overall pollution control would be to allow the end-state to vary from target to target, keeping the aggregate level of allowable pollution the same. In theory, one way to do this would be to set performance standards on an individualized basis for each regulated entity, so that those businesses with lower costs of control would be asked to reduce more pollution than firms with higher costs of control. As long as the average level of emissions remained the same, such a case-by-case approach would be superior to uniform performance standards because the same ambient environmental quality would be achieved at lower overall costs.

The obvious problem with this approach is the practical infeasibility of setting individualized standards when dealing with pollutants emitted from thousands of dispersed sources. One way to overcome this problem would be through a per-unit pollution tax that sets a price on each unit of pollution emitted by each source (Pigou 1932). Under a pollution tax, which is a type of performance standard because the consequences are triggered by an end-state (i.e., the level of emissions), the command changes from the conventional one that tells targets to keep their emissions below an aggregate level in order to avoid large financial consequences, to one that tells them they
will incur smaller financial consequences for every incremental unit of pollution they emit (Dales 1968). Under the latter approach, targets can choose to abate pollution using any means they see fit -- or to pay the tax. The tax would be the same for each targeted firm, but they would have greater flexibility because each firm would be allowed to respond to the tax according to its own marginal abatement costs (see Olmstead chapter for more details).

2.2 Information Disclosure

Although requirements to disclose information are inflexible with respect to the information they mandate be disclosed, they leave regulated firms with total flexibility about whether and how to address the environmental conditions that must be reported. Two major federal regulations in the United States—the Toxics Releases Inventory (TRI) and the Consumer Confidence Reports (CCR)—require the disclosure of environmental information. EPA’s TRI program, established under the 1986 Emergency Planning and Community Right to Know Act, requires facilities from several industrial sectors to report publicly the amount of toxic chemicals they release into the environment, provided they manufacture or use more than a specified amount of those chemicals (Kraft, Stephan, and Abel 2011). Amendments made in 1996 to the Safe Drinking Water Act led to the CCR rule which requires community water systems to report annually to their customers on the quality of the water supplied (Bennear and Olmstead 2008). Both TRI and CCR had been conceived initially as primarily advancing citizens’ “right to know,” but over the years they have come to be considered flexible approaches for achieving traditional environmental regulatory goals (Kraft, Stephan, and Abel 2011). For example, according to one recent account, the TRI “may be the most unambiguous success story in
all of environmental law” (Thaler and Sunstein 2008 p. 192). Clearly, some analysts believe that mandated information disclosure can serve as a flexible type of pollution regulation (Fung and O'Rourke 2000).

Empirical analysis of information disclosure regulations in the United States has suggested that they can be at least moderately effective in inducing some behavioral change, if not even some improvement in terms of the ultimate outcome of environmental quality (Kraft, Stephan, and Abel 2011). Research has found the CCR lowered violations among community water systems who were required to disclose these violations to the public (Bennear and Olmstead 2008).

Empirical evidence of the effectiveness of information disclosure programs, particularly the TRI, has been tempered by analyses demonstrating that some of the apparent reductions in emissions are likely spurious, resulting from changes in reporting requirements (Poje and Horowitz 1990), changes in categorizations of release data (Natan and Miller 1998; Poje and Horowitz 1990), changes in reporting behavior among firms (Bennear 2008), changes in firm organization (Grant and Jones 2003), and other traditional regulatory approaches (de Marchi and Hamilton 2006). Because of the difficulty in separating the causal impact of information disclosure from other correlated activities, one of the most extensive studies of TRI concluded that “[t]he separate and exact impacts that the provision of information has on toxic emissions are, to date, unknown” (Hamilton 2005, p. 242).

The impact of information programs may be hampered by the lack of public awareness of the data they require be made available (Atlas 2007; Ben-Shahar and Schneider 2011). Nevertheless, researchers have offered four main theoretical
explanations -- market, legal, political and internal -- for why information disclosure might lead to improved environmental performance (Sunstein 1999; Tietenberg 1998).

First, disclosure of information may generate market pressures for environmental improvements if consumers, investors, or employees have preferences about environmental performance. Studies of stock market reactions to TRI data have suggested investors take note (Hamilton 1995; Khanna, Quimio, and Bojilova 1998; Konar and Cohen 1997), with the largest reported reductions in TRI emissions coming at companies with the largest negative stock market reactions (Khanna, Quimio, and Bojilova 1998; Konar and Cohen 1997). Studies of housing market responses have exhibited mixed results (Bui and Mayer 2003; Oberholzer-Gee and Mitsunari 2006).

Second, mandated information disclosure may induce legal pressures for environmental improvements, particularly to avoid tort liability (Tietenberg 1998). Environmental right-to-know data may serve as proxies for liability risks, the management of which may lead to improvements in environmental performance.

Third, disclosed information may generate political pressures that motivate environmental improvements. Revelations about environmental performance may influence future regulatory efforts (Bennear and Olmstead 2008; Helland and Whitford 2003; Karkkainen 2001; Sunstein 1999).

Finally, independent of disclosure’s effects on market, legal, and political factors, the collection and release of information may otherwise affect the internal decision making of an organization. Measuring and reporting data on environmental performance may itself lead to internal changes at the firm that improve environmental performance, perhaps to fulfill the environmental preferences of managers (Karkkainen 2001).
Regardless of the particular mechanism, theory suggests that disclosure mandates will be more effective when the information disclosed becomes more embedded in the decisions of both disclosers and users (Weil et al. 2006). For example, disclosure of drinking water pollutant and violation information under CCR appears associated with reduced regulatory violations -- but only among suppliers who were required to mail their reports directly to consumers, not those who posted the notification in a newspaper or made it available on request (Bennear and Olmstead 2008). If disclosure regulations are more effective when information becomes embedded in decision-making, this may help explain why such disclosure appears to lead to greater environmental protection where education levels are higher (Shapiro 2005; Shimshack, Ward, and Beatty 2007).

2.3 Management-based Regulation

Like information disclosure, management-based regulation does not mandate specific means for achieving regulatory ends, but instead mandates what we have called “meta-means.” Some regulations are considered management-based because they require businesses to conduct planning designed to foster attention to ways of improving their environmental performance. For example, the Massachusetts Toxics Use Reduction Act (TURA) requires businesses that use a large quantity of toxic chemicals develop a pollution prevention plan that identifies ways to reduce their use of toxics. TURA does not require businesses to undertake any pollution control measures nor even to implement their pollution prevention plans; it only requires they develop plans.

The first way management-based regulation may improve environmental quality is through changes in internal decision-making at the regulated entities. In order for management-based regulation to be effective through this channel, it must be the case
that the businesses are not already voluntarily engaging in the level of environmental management proscribed by the regulation and that there is a strong complementarity between management effort and planning and environmental quality (Bennear 2006). The second way management-based regulation may be effective is through information sharing between the regulated entities and the regulator. The information generated through the development of required plans may reveal something important to regulators about the costs and benefits of environmental improvements. Information sharing can also allow for comparison across regulated entities which can, in turn, improve performance through targeted inspections or technical assistance (Bennear 2006; Karkkainen 2001).

Drawing on the concept of transactions costs, Coglianese and Lazer (2003) have argued that management-based regulation is preferable when there is significant heterogeneity among regulated entities and measuring and regulating outputs is difficult. The heterogeneity makes technology standards costly and inefficient while the difficulty in measuring outputs makes performance standards infeasible. Bennear (2006) extended this theoretical argument to include the degree of uncertainty about the nature of the risk being regulated, arguing that if the risk is highly uncertain management-based regulation may be less costly than command-and-control regulations and may provide regulators with information on the cost and benefits of risk reduction that can then inform future regulatory efforts.

The primary empirical analyses of management-based regulation in environmental policy have come from states that have adopted management-based programs like the Massachusetts TURA (Bennear 2006, 2007; Coglianese and Lazer 2003). Studies of
individual state programs – such as those in New Jersey (Natan et al. 1996) and Massachusetts (Keenan, Kanner, and Stoner 1997) – have found that businesses view the required planning as beneficial. In one survey, 81 percent of Massachusetts business respondents reported an intention to implement at least some of the pollution prevention activities identified in their mandated plans, although smaller plants were less likely to view the program as beneficial (Keenan, Kanner, and Stoner 1997). Analysis of panel data covering 31,000 manufacturing plants in 49 U.S. states has indicated that management-based regulation significantly lowered toxic emissions and increased source reduction activities, but had no impact on the number of chemicals reported (Bennear 2007). However, the observed reductions in emissions appeared not to persist at statistically significant levels longer than a half-dozen years past the adoption of the regulation, which may suggest that over time management-based regulation loses its effectiveness after businesses find the required planning at the outset enables them to discover and undertake relatively easy corrective actions.

3. Flexible Targets

Given that abatement costs vary across different sources of pollution, pollution control can be achieved more cost-effectively by varying the desired end-state imposed upon these different sources. This could be done by specifying a different performance standard for each source, but, as noted earlier, this is generally infeasible as a practical matter. However, it is possible to achieve the same effect by varying the target. Target
flexibility occurs when regulations define the target to include (1) multiple sources, (2) one source over time, or (3) both.

Providing regulatory flexibility by broadening the definition of the target dates back at least to the mid-1970s in the United States, with the inclusion of the “offset” policy in the 1977 amendments to the Clean Air Act (U.S. EPA 2001). The offset policy allowed for new polluting facilities to locate in non-attainment areas provided that they, among other things, offset resulting increases in pollution with reductions at other facilities. The offset policy also redefined the regulatory target by allowing for averaging of emissions reductions over time, a process known as banking. A facility that decreased emissions more than required in one period was allowed to bank credits for those emissions reductions to apply in later periods (U.S. EPA 2001).

In subsequent years, EPA extended target flexibility by promulgating “bubble” and “netting” policies. The EPA announced its bubble policy in 1979, allowing emissions averaging among regulated sources within the same plant as long as the aggregate emissions in the imaginary “bubble” around the plant remained constant (U.S. EPA 2001). In 1986, EPA also allowed for additional target flexibility through “netting,” a policy allowing a facility to be expanded or modified without triggering an extensive and expensive New Source Review provided it demonstrated that any increases in emissions from the changes were matched with decreases from other units in the plant (U.S. EPA 2001). The bubble and netting policies were a clear extension of the concept underlying the offset policy, offering target flexibility to even more facilities.

All of these policies—offsets, bubbles, banking and netting—are variants of a so-called market-based approach that relies on emissions credits or allowances that are
allocated across different firms (Tietenberg 1985). Firms must meet an emissions level equal to the credits they possess, but they can free up credits at some sources by doing more than required and then can “spend” those credits by doing less than required at other sources or at a later date. Under emissions trading systems, also known as cap-and-trade, firms with excess credits can also freely sell them to other businesses that face higher costs of pollution control. In this way, emissions trading and credit systems are designed to achieve a fixed level of pollution control – the level determined by total number of credits allocated – but at a lower overall cost.

An extensive body of research on these market-based approaches has generally confirmed that they can achieve more cost-effective outcomes than uniform performance standards (Cropper and Oates 1992; Stavins 2000, 2007) (also see Olmstead’s chapter in this volume). For example, in the United States a credit program was used successfully in phasing out the use of lead as a gasoline additive (Newell and Rogers 2004; Nichols 1997; Nussbaum 1992) and a cap-and-trade program was used in controlling sulfur dioxide pollution from coal-powered power plants (Stavins 1998). One additional advantage of credit and permit programs is that they provide incentives for firms to find innovative ways to reduce their pollution, as they can sell excess permits or credits (Newell, Jaffe, and Stavins 1999).

As with uniform performance standards, however, market-based standards have raised concerns about unintended side effects from the flexibility they give to regulated targets. In particular, tradable permits may lead to so-called hot spots if trading results in pollution permits that are concentrated in one proximate area. Banking of permits can result in earlier achievement of environmental goals, but at the expense of reductions in
environmental standards at a later date. There are also concerns that trading will disproportionately harm small businesses.

Evidence from the SO$_2$ trading program has indicated that hotspots resulting from trading never became a significant issue, but that the banking allowed under that program did result a much faster reduction of SO$_2$ in the early period followed by slower reductions in later periods (Burtraw and Mansur 1999). During the lead phase-out from gasoline, large refiners were typically sellers of credits while small refiners were typically buyers. Some small refiners did go out of business, yet the evidence has suggested that small refiners were still better off than under a uniform performance standard (Newell and Rogers 2003).

4. Flexible Consequences

Environmental regulators can also promote flexibility by relying on modest rewards, rather than the threat of punishment, to try to encourage environmentally responsible behavior. In what have become known as voluntary environmental programs, governments threaten no penalties -- not even a taint of law-breaking -- for failing to meet the eligibility criteria established for membership in these programs. They do, however, offer various forms of rewards and recognition to those firms that meet the criteria and apply for membership.

Researchers sometimes distinguish voluntary programs, through which the government sets general eligibility parameters, from voluntary agreements, through which the government negotiates with individual businesses or other targets to provide
case-specific rewards or incentives. In both cases, the flexibility comes from the voluntary nature of the program or agreement. However, in either case if no negative consequences exist for failing to meet government’s demands, the question arises of why businesses would voluntarily make presumably costly improvements in their environmental performance (Carraro and Siniscalco 1996; Lyon and Maxwell 2003; Maxwell, Lyon, and Hackett 2000; Segerson and Miceli 1998; Wu and Babcock 1999).

Researchers have emphasized two primary motivations. The first is the threat of regulation, suggesting that voluntary participation may at times be less voluntary than it seems. When the option to take voluntary action arises against a background threat of inflexible regulation, firms are more likely to take such action (even if they still do not control as much pollution as would be socially desirable) (Maxwell, Lyon, and Hackett 2000; Segerson and Miceli 1998). The second motivation derives from the rewards offered by government. If these rewards are substantial enough, such as if government can provide distinctive technical support to help companies identify both environmental and economic gains, then voluntary approaches might yield results comparable to those from conventional regulation (Wu and Babcock 1999). However, because subsidies or rewards are costly for government to provide, the “carrot” approach typically will not be expected to lead to a socially optimal level of pollution control. If rewards offered as part of voluntary programs or agreements are modest, they may only entice firms to capture the “low hanging fruit,” at most prompting inexpensive action that firms might have eventually taken anyway.

Empirical analyses of voluntary programs have sought to determine whether these programs yield improvements in environmental performance relative to what would have
happened in the absence of the programs. Most studies have compared performance of participants to non-participants and attempt to control for differences in baseline performance of facilities that choose to participate. For example, the most widely studied voluntary program has been the EPA’s 33/50 program. Launched in 1991 with a goal of reducing releases of 17 high-priority toxic chemicals among participating facilities by 33 percent by 1992 and 50 percent by 1995, the 33/50 program required participating businesses to commit to reducing emissions of one of the targeted chemicals. In exchange, EPA would send participants a certificate and provide positive publicity for them.

Early studies of the 33/50 program found that participants in the program decreased releases of the targeted chemicals to all media relative to non-participants when controlling for differences in the types of firms who participated and that participants decreased releases on non-targeted toxic chemical more than non-participants, implying a potential spillover effect from the program (Khanna and Damon 1999). Although the positive impact of 33/50 has been reported in other research (e.g., Sam, Khanna, and Innes 2009), other subsequent analysis has indicated that the 33/50 program did not cause meaningful reductions in toxic releases (e.g., Gamper-Rabindran 2006; Vidovic and Khanna 2007). For example, decreases in participant releases may have been due to the fact that participating facilities increased off-site transfers of targeted chemicals, which lowered total releases but may not have reflected significant improvements in waste management or environmental performance (Gamper-Rabindran 2006).

Government has created many other voluntary initiatives beyond the 33/50 program, particularly in an effort to reduce greenhouse gas emissions. For example, the
Department of Energy’s Climate Challenge program, a voluntary agreement between DOE and the electric utility industry, sought to reduce, avoid, or sequester greenhouse gas emissions. Welch, Mazur, and Bretschneider (2000) found participants did decrease their emissions of greenhouse gases -- but that non-participants actually decreased emissions by even more. Delmas and Montes-Sancho (2010) found that early participants decreased GHG emissions by more than non-participants, but that these early successes were more than offset by the poor performance of late joiners. They argued, consistent with Lyon and Kim (2006), that this may be evidence that late joiners are engaging in “greenwashing” and attempting to free-ride off the success of early joiners.

By contrast, the EPA’s ClimateWise program, launched by EPA in 1993, appears to have had at least some modest effects (Pizer, Morgenstern, and Shih 2010). ClimateWise asked participants to develop a baseline inventory of greenhouse gas emissions and pledge to reduce these emissions. In exchange, participants were offered technical assistance and public recognition of their efforts. Using propensity score matching to control for differences between participants and non-participants, Pizer, Morgenstern, and Shih (2010) found that participation in ClimateWise had small effects on fuel and electricity expenditures -- generally less than 10 percent -- but no effect on fuel cost.

At best, it appears that voluntary programs sometimes lead to improvements in energy use and perhaps environmental quality, above and beyond what businesses might have achieved anyway; however, even when they do, the effects are still generally modest (Borck and Coglianese 2009; Koehler 2007; Morgenstern and Pizer 2007).
5. Flexible Regulators

Finally, we turn to the “regulator” as a final source of flexibility. As noted in Part 1, the regulator need not always be a governmental entity or official. Sometimes industry can set its own rules, and government at times may even encourage such self-regulation in lieu of governmental action. In addition, government can seek to encourage businesses to do their own inspections, even providing limited forms of immunity for legal violations that are discovered through such self-auditing practices.

5.1 Industry as Regulator

Self-regulation seeks to accomplish flexibility by allowing regulated entities to choose the least-costly means of reducing environmental damages. By having industry groups, even business firms themselves, set their own rules for environmental performance, presumably they will adopt rules that call for the very practices that they would choose under a flexible command or a flexible consequence. Sometimes nongovernmental organizations, such as the International Organization for Standardization (ISO), can also provide standards, to which businesses can opt voluntarily to comply (Prakash and Potoski 2006).

As with flexible consequences, it might initially appear unclear why industry groups would voluntarily establish or comply with standards that may be costly for their members. One reason may be that for certain industries poor environmental performance at one firm or facility creates negative spillover effects on other firms or facilities in the industry (Barnett and King 2008; King, Lenox, and Barnett 2002).
A problem that can theoretically arise with self-regulatory initiatives is that the firms that have the most to gain from self-regulatory “protection” may be the firms with the worst environmental performance—a concept known as adverse selection (Lenox and Nash 2003). Adverse selection is likely to be a larger problem when the self-regulatory initiative has low standards for membership and weak monitoring of members’ compliance (Lenox and Nash 2003; Prakash and Potoski 2006).

The most frequently studied industry self-regulatory environmental program is the Responsible Care program developed by the American Chemistry Council (ACC) (formerly the Chemical Manufacturers Association). Under Responsible Care, chemical companies make commitments to a series of practice codes governing manufacturing, distribution and community relations (Nash and Ehrenfeld 1997). The practice codes are generally quite broad and offer participating firms significant discretion in establishing their own performance standards and determining how best to meet these standards (Nash and Ehrenfeld 1997). Initially, the ACC did not require third-party certification of member’s activities, did not disclose members’ compliance (or non-compliance), and did not remove members who were non-compliant; however, over time it has added stronger membership requirements (Coglianese 2010a; Nash 2002). Perhaps because of its initially rather lax standards, Responsible Care has yielded at best only mixed results. Member firms’ compliance has been shown to vary widely (Howard, Nash, and Ehrenfeld 1999), and some research has indicated that members decreased their toxic releases at a slower rate than non-members (King and Lenox 2000).

Another leading example of a self-regulatory program is the ISO 14000 series of environmental management standards. Unlike Responsible Care, ISO 14000 standards
originate outside of both government and industry, emanating from the non-governmental
International Organization for Standardization. Hundreds of thousands of facilities
worldwide have developed environmental management systems that meet ISO standards.
These management systems are similar to the pollution prevention plans required under
management-based regulation, but the ISO standards are adopted on a non-binding basis
by a transnational, non-governmental organization. Perhaps due to their widespread
adoption, the ISO standards’ impact on environmental performance has been extensively
analyzed. The most systematic empirical research to date has found that ISO-certified
businesses did report lower emissions and better regulatory compliance than non-certified
businesses, but even these effects were substantively quite modest even though
statistically significant (Prakash and Potoski 2006).

5.2 Industry as Inspector

In addition to the flexibility afforded by having industry set its own standards,
industry can be encouraged to police itself, introducing a degree of flexibility through the
discretion inherent in any street-level inspector. Given the vast number of regulated
entities in a developed economy, government may find it more budget-friendly if these
entities can be induced to audit themselves, correcting and reporting any violations they
discover (Friesen 2006; Innes 2001). Reducing fines when these entities identify and
disclose their own violations may help create the proper incentives for firms to self-audit
(Pfaff and Sanchirico 2000). For example, the U.S. EPA Audit Policy, adopted in 1995,
removes the punitive component of fines if the firm discovers a violation through an
environmental self-audit, promptly discloses the violation, corrects the violation, and
prevents recurrence.
As with other flexible approaches, the evidence on the effectiveness of self-auditing incentives is mixed. Interestingly, about 90 percent of violations reported voluntarily under the EPA’s Audit Policy are reporting or recordkeeping violations (as opposed to substantive environmental violations), whereas only about 15 percent of violations uncovered during routine governmental audits are reporting or recordkeeping violations (Pfaff and Sanchirico 2004). Nevertheless, businesses are apparently more likely to self-report violations if they are inspected frequently or subject to a targeted compliance initiative by EPA, suggesting some complementarity between government enforcement and self-enforcement actions (Short and Toffel 2008).

The key question, of course, is whether disclosure of violations under the Audit Policy results in improved compliance performance. At least one study found that facilities that self-disclose were twice as likely to have a clean inspection in the future and have a 20 percent reduction in the number of abnormal releases of toxics (Toffel and Short 2011)

Conclusion

The great appeal of a flexible approach to environmental protection stems from a worthy desire to achieve regulatory goals while still preserving much cherished freedom of choice. We have shown how this desire manifests itself in flexible approaches that come in many varieties, varying in what they command and target, what consequences they impose, and who creates and enforces them. Some flexible approaches can and do achieve demonstrable, positive environmental outcomes. But results vary. Some flexible
approaches, like performance and market-based standards, can result in significant environmental gains and cost-savings, while others, like voluntary programs and self-regulation, present mixed records of achievement.

Notwithstanding the great interest in flexible approaches by environmental policy makers, the existing research has only scratched the surface in what needs to be known in order to use these approaches in appropriate circumstances with intended results. In particular, more research is needed to measure a broader range of effects from these approaches and then to compare the results with similar full accountings across the range of all regulatory approaches. We know of no systematic analysis, for example, of flexible approaches that has fully assessed both their benefits as well as their costs, nor that has compared these benefits and costs to those of other policy approaches. Admittedly, such comparisons are more difficult for researchers to make, and there have been sensible reasons for researchers to focus first on whether flexible approaches can yield any positive environmental impacts at all. Especially for those approaches that mandate no specific environmental improvement, it is hard to fathom why businesses might otherwise invest in making such improvements when not required to do so. Furthermore, it has been reasonable to assume, even implicitly, that a focus on costs is less important given that flexibility will undoubtedly be exploited by regulated entities to achieve cost savings. But now that the first wave of research has shown that many flexible approaches can sometimes work – even if at times only rather tepidly – the next frontier will be to discern whether the marginal gains from flexible approaches are enough to justify whatever costs they impose, especially for approaches like information disclosure and management-based standards that can impose extensive paperwork burdens.
References


