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Abstract:

The use of voluntary approaches to achieve environmental improvements has grown dramatically in the United States since they were first introduced thirteen years ago. As of 2004, there are over 50 voluntary programs in the U.S. at the federal level alone. These programs take a variety of forms, from large, cross-industry efforts to reduce global climate impacts to smaller, "boutique" efforts aimed at specific industrial sectors. Other voluntary approaches used in the U.S. include negotiated agreements, industry-initiated unilateral commitments, and state and regional voluntary initiatives, but these tend to be used less regularly.

Despite the diversity of voluntary approaches in the U.S., they often pursue common, and sometimes overlapping environmental objectives and use similar methodologies to achieve such goals. While most voluntary initiatives in the U.S. state an explicit environmental goal, they may also have less direct policy objectives such as enhancing innovation or increasing awareness of environmental issues. In addition, information about firm participation or environmentally responsible products and products is sometimes shared with consumers.

Many argue in favor of the increased use of voluntary approaches in environmental policymaking on the basis of environmental effectiveness, economic efficiency, reductions in government administrative, monitoring and enforcement costs, increases in environmental awareness, and encouragement of innovation. Few programs have been evaluated properly on the basis of these objectives, however. The empirical literature sheds little light on the value of voluntary approaches in achieving goals set by U.S. environmental policy. The difficulty in evaluating voluntary approaches lies in sorting through the myriad of programs, identifying a discernible environmental goal, gathering adequate data for analysis, and measuring achievement of the environmental goal relative to a reasonable baseline scenario.

Key Words: voluntary programs, pollution control options, market incentives.
Subject Area Classification: Pollution Control Options and Economic Incentives; Environmental Policy.

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1. Introduction

The number of voluntary approaches used to address environmental issues in the U.S. has grown dramatically since the introduction of the Environmental Protection Agency's 33/50 program in 1991. In 1999, the OECD identified 42 voluntary initiatives in the U.S. with an estimated 13,000 participants. The U.S. EPA, the primary environmental regulatory agency in the U.S., administered 33 of these initiatives (OECD, 1999). Currently, the U.S. EPA's Partners for the Environment website lists 40 voluntary initiatives (U.S. EPA, 2004a). At the federal level alone, we identify over 50 voluntary initiatives in the U.S.

The majority of U.S. voluntary efforts are what the OECD (2003) describes as public voluntary programs. That is, the federal, state, or regional regulatory authority designs the programs, and individual firms are invited to participate. The 33/50, Energy Star™, and WasteWise programs are all examples of public voluntary programs in the U.S. This type of approach is in contrast to negotiated agreements between government and industry that are more commonly found in Europe, but are relatively rare in the U.S. (Croci, 2003). A third type of voluntary effort sometimes found in the U.S. is a unilateral commitment, also know as an industry-led initiative. These tend to be proposals generated by industry or trade associations with little or no involvement from government regulators. Examples of this type of voluntary initiative include the chemical industry's Responsible Care® program, and an industry-led carbon emissions trading system called the Chicago Climate Exchange.[1]

[1] We do not include as voluntary initiatives pure information provision programs (such as the Green Vehicle Guide) or individual firm efforts to capture cost savings by improving efficiency and reducing waste (such as 3M's Pollution Always Pays (3Ps) program or Dow Chemical's Waste Reduction Always Pays (WRAP) program). The reason that we exclude these activities from the discussion of voluntary initiatives is that they do

Voluntary initiatives in the U.S. are typically designed to enhance the efficacy and scope of existing regulations. Benefits of participation in these programs generally include technical assistance, information subsidies, and public recognition, but firms usually do not garner regulatory exemption. While participating firms generally sign an agreement to adhere to a specified environmental goal and sometimes provide self-reported information on pollution levels or achievement of goals, voluntary initiatives are typically non-binding and do not penalize firms for non-attainment beyond possible revocation of membership (Darnall and Carmin, 2004). This is largely due to the institutional framework in which environmental policymaking occurs. In the U.S., regulatory agencies are held at arms length from the policy process by Congress and therefore lack sufficient credibility to issue threats of new regulation (Delmas and Terlaak, 2002a). In some cases, voluntary approaches are used to reduce emissions in sectors or for pollutants for which political will to pass formal regulation is lacking (e.g., in the area of climate change). In general, voluntary programs are not a central component of the U.S. EPA's regulatory activities (Mazurek, 1999). In contrast to the experience in some European countries, U.S. agencies continue to rely on more traditional forms of environmental regulation and in particular on standard-based regulation.

That said, voluntary approaches are not necessarily unimportant or ineffective. The U.S. EPA's 33/50, Green Lights, and Energy Star™ programs have achieved moderate levels of success in furthering environmental improvements (Decanio, 1994; Khanna and Damon, 1999; Horowitz, 2001; Nadeau, Cantin, and Wells, 2003). Some researchers, however,

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not typically involve any specific agreement proscribing actions firms must take or goals firms must achieve as a basis of participation.

question the ability of voluntary approaches to produce environmental benefits beyond what would occur if the initiatives were not in existence, particularly given the potential for firms with a predisposition towards environmentally-responsible behavior to join these programs (Hartman, 1988; Ozog and Waldman, 1994), the temptation for some firms to free ride (King and Lennox, 2000; Welch, Mazur, and Bretschneider, 2000), and other constraints (Maitland, 1985). Given the growing number of voluntary approaches being implemented in the U.S., measuring the success of voluntary programs has become increasingly important. The largest difficulty in conducting an evaluation is gathering adequate data for the analysis. Available research on voluntary programs generally evaluates older programs that have been in existence long enough to produce potentially measurable results. Current voluntary programs may have learned from past mistakes but are still too new to be evaluated. Evaluation is further complicated by the task of sorting through the myriad of voluntary programs, identifying a discernible environmental goal, and measuring achievement of the environmental goal relative to a reasonable baseline scenario.

This paper examines U.S. voluntary initiatives, their key similarities and differences, evidence on their effectiveness, and some of the difficulties in evaluating them. While pollution prevention and other environmental activities are worthwhile for firms to undertake--firms clearly recognize that there are benefits from engaging in such activities--our key interest is in determining whether third-party or government voluntary initiatives induce firms to reduce emissions or incorporate pollution prevention activities into production beyond what they would have undertaken without such a program in place.

Section II describes some of the common methods used in the design of U.S. public voluntary programs at the federal level; Section III discusses the types of voluntary approaches typically found in the U.S.; and Section IV discusses the arguments and evidence for how well U.S. voluntary initiatives meet five possible policy objectives. Section V describes the main difficulties faced by researchers and policymakers alike when attempting to evaluate U.S. voluntary programs. Section VI compares these programs with European and other international voluntary approaches. Section VII concludes.

2. The Methodology of Designing Public Voluntary Programs

Broadly speaking, there are three basic methods commonly used by U.S. public voluntary programs at the federal level to achieve environmental improvements: (1) require firms to set specific environmental goals; (2) promote firm environmental awareness and encourage process changes; and (3) supply the public with information on firm participation or environmentally-responsible products. No one approach is used to the exclusion of others; most U.S. voluntary programs use a combination of several methods.

By far, the most common method used in the design of U.S. voluntary environmental programs is goal setting. These may be implementation-based goals, where participants meet specific targets set by the U.S. EPA, or they may be target-based goals, where the U.S. EPA specifies a qualitative or process-oriented goal and firms individually set and then meet a specific target (OECD, 1999). Implementation-based goals provide consistency in objectives across firms, while target-based goals allow firms increased flexibility.

Since U.S. programs tend to augment existing regulation, implementation-based goals make it easier to design approaches that go beyond standards specified in formal regulation. They also make it simpler to monitor and measure whether participants in the program are meeting the goal. The 33/50 program is an example of a voluntary program that sets an implementation-based goal. Firms were challenged to reduce their emissions of 17 priority toxic chemicals by 33% by 1992 and by 50% by 1995. While firms were allowed to decide how to accomplish these goals, the U.S. EPA dictated the percentage reductions.

With target-based goals, participants choose (and sometimes publicly announce) their own targets. This allows firms the flexibility to set a goal that meets the qualitative objective specified by the voluntary approach and allows for heterogeneity in costs across firms. The U.S. EPA's WasteWise program is an example of this type of program. Partners are required to implement three waste prevention activities, improve the collection of recyclable material, and increase the purchase of recycled material. However, individual firms are allowed to determine the degree to which these broad goals are achieved and how they should be implemented. Another example is the Climate Challenge program where firms set their own goals on emissions reductions.

Voluntary initiatives with target-based goals require the regulator to know much less about the ability of individual firms to respond to a particular goal, since the firm selects a goal it feels is appropriate given its particular cost structure. The problem with this approach is that it is harder to measure achievement of the goal because of the host of possible goals a firm could set and the need for firm-specific information to evaluate success or failure. This

goal-setting approach has also been criticized because firms are unlikely to set goals that are a challenge for them to meet. This is one of the criticisms of the Responsible Care® program (Howard, Nash, and Ehrenfeld, 2000; King and Lennox, 2000). Firms may simply set goals that require actions they would have taken anyway. In other words, firms pre-disposed to undertake environmentally beneficial actions self-select into the program to earn an added benefit such as public recognition.

A second method used in the design of U.S. public voluntary programs is to promote environmental awareness of participating firms and/or to encourage environmentally beneficial process changes. The Green Lights program encouraged firms to adopt energy efficient changes that translate into savings in firm electricity costs. The SF6 Emissions Reduction Partnership program attempts to raise environmental awareness by providing information on the contribution of sulfur hexafluoride to greenhouse gases and to encourage the industry to adopt new production processes that significantly reduced the use of SF6. The Design for the Environment and Green Chemistry programs work with industry to research environmentally friendly processes and technologies and then encourage firms to adopt them. The difficulty with this design method is that it requires detailed knowledge of a firm's ongoing operations for evaluation. Also, firms may not be comfortable with the government in the role of directing technology investment decisions toward particular technologies and away from others based on the information they provide. Critics argue that the market is better at choosing environmentally friendly process changes than is government. Advocates of this approach counter that the market may not be better at guiding technology decisions if

there is a lack of information about the technologies available (Office of Technology Assessment, 1991), especially if the technologies are in an area unrelated to the firm's primary revenue activity. Even profitable process changes may not be known if the firm is not able to justify the cost of researching it. A government agency, on the other hand, may have economies of scale advantages in researching and disseminating information.

A third method used in the design of U.S. voluntary programs is to publicize the environmental responsibility of program participants or products. The idea is to supply this information so that green consumers and investors can alter consumption and investment patterns in favor of cleaner firms or products (Arora and Gangopadhyay, 1995; Cohen and Konar, 1997, 2001). This is the intent behind programs such as Energy Star™, Green Power Partnership, and It All Adds Up to Cleaner Air. Two common methods of conveying information on participants or products are (1) to simply publicize the membership in the program, and (2) to establish a set of criteria that when met earn the firm or product a label. The easiest type of information to publicize is general in nature. Energy Star™ publicizes participant names, highlights companies that excel at energy efficiency and provides results for particular energy-efficient buildings or products that have earned the label. The National Environmental Performance Track and Climate Leaders programs also highlight outstanding performers.

The effectiveness of this information remains an open question (Bui, 2003). If the provision of these data truly provides a business advantage, then one wonders why firms do not self-report this information to the public directly. One answer may have to do with

credibility. The U.S. EPA serves as a third party, offering neutrality and potentially some control as verifier and presenter of the information. Firms may use their goal achievements as a way to potentially differentiate their product from their competitors' products (Arora and Cason, 1995; Videras and Alberini, 2000). Even if the publicity does not attract environmentally-minded consumers, it may still prove useful to the firm to be recognized by the U.S. EPA because it adds to a company or product's overall name recognition in the marketplace.

3. Description of U.S. Voluntary Approaches

Since the start of the 33/50 and Green Lights programs in 1991, over 50 other voluntary approaches have been initiated. Maxwell and Lyon (1999) argue from a political economy perspective that four forces in the late 1980s set the stage for the growth of voluntary initiatives in the U.S.: mounting and increasingly complex legislation, technological innovation and scientific discoveries, regulatory budget cuts, and the increasing use and effectiveness of "citizen lawsuits." Another reason voluntary initiatives have become increasingly popular methods for environmental regulation is that they allow policy-makers to address environmental issues that may lie outside the existing regulatory framework or issues for which regulation may be difficult to pass due to political considerations. For instance, due to limited authority under the Clean Air Act to control greenhouse gas emissions and lack of political will to impose strict standards, the U.S. government has increasingly turned to voluntary initiatives as a mechanism to address climate change

concerns: Over one third of U.S. voluntary initiatives are designed to address global warming issues (see Table 1).

Most voluntary environmental initiatives in the U.S. are conceived and designed by the U.S. EPA. Other U.S. federal agencies that have designed voluntary environmental initiatives, either on their own or in conjunction with the EPA, include the Department of Energy, Department of the Interior, Department of Agriculture, Department of Transportation, and Occupational Safety and Health Administration. As noted in section 1, most voluntary initiatives in the U.S. are public voluntary programs. We separate this category of voluntary initiatives into multi-sector federal voluntary programs, single-sector federal voluntary programs, and state and local voluntary programs. Negotiated agreements and unilateral commitments also are discussed as separate categories in this section. Table 1 lists the U.S. EPA's main environmental voluntary initiatives at the federal level and a select group of voluntary initiatives at the state and regional level in the U.S., organized by major category, and also describes the targeted industries or sectors and the main environmental goal of the program.[2]

[2] We include in the list both programs that are currently in operation and programs that are not currently active. Programs known to be no longer in existence are marked with a *. Programs that have undergone name changes are marked with a †. In particular, programs that we identify that have undergone a name change are as follows: the Sectors Strategies Program was the Industry Sector Performance Program, Best Workplaces for Commuters was the Commuter Choice Leadership Initiative, the Water Efficient Product Enhancements Program was the Water Alliances for Voluntary Efficiencies, and the Environmental Stewardship Program was Today's Environmental Partnership.

3.1. Multi-Sector Federal Voluntary Programs

Multi-sector federal voluntary programs include many of the most well known voluntary initiatives in the U.S., such as Green Lights, Energy Star™, National Environmental Performance Track, Sector Strategies, and WasteWise. Public authorities typically design these programs with possible consultation but no direct negotiation with affected industries and then invite firms to participate in the voluntary program.[3] Most of these public voluntary programs are designed to meet the goals of President Clinton's 1993 Climate Change Action Plan, which seeks to reduce greenhouse gas emissions, or to meet voluntary goals set out in the Pollution Prevention Act of 1990 (Mazurek, 1998). Nearly one third of multi-sector federal voluntary programs focus on energy efficiency and climate change issues. Another one third of these programs have pollution prevention as an environmental target (see Table 1).

A key characteristic of multi-sector federal voluntary programs is that they tend to target a wide variety of firms from different industries. Energy Star™ has more than 8,000 firms listed as partners and has awarded labels to items in over 40 different product categories (U.S. EPA, 2004b), while the WasteWise program has over 1,300 participating firms from 54 industry sectors (U.S. EPA, 2004c). To attract participants from different industrial sectors, multi-sector federal voluntary initiatives also tend to have general

[3] Within this category, the degree of potential involvement and negotiation with affected industries in the development of a voluntary program can vary. In general, negotiation is minimal but usually involves consultation with affected industries. However, a few programs, such as Energy Star, have involved more direct negotiation. While this higher degree of involvement may favor the placement of these programs in the negotiated agreements category, we keep these programs in the federal voluntary programs category because they stop short of joint design of the program. They also do not offer explicit regulatory relief (see section 3.4).

environmental objectives. Both Green Lights and Energy Star™, for example, focus on reducing energy consumption and improving energy efficiency. The WasteWise program encourages firms to reduce the amount of waste generated and increase recycling.

Increasingly, multi-sector federal voluntary programs promote the adoption of environmental management systems (EMS) as a way to manage and monitor participants' environmental responsibilities and achievements. The National Environmental Performance Track, Sector Strategies, and Design for Environment programs all encourage EMS implementation as a way to increase the likelihood that firms will meet environmental goals. Since firms in any industry can adopt an EMS, their use also encourages participation in voluntary initiatives across a variety of industries (Darnall and Carmin, 2004).

3.2. Single-Sector Federal Voluntary Programs

Single-sector federal voluntary programs in the U.S. differ from multi-sector federal voluntary programs in terms of both the scope of the environmental objectives and the number and type of participating firms that the programs target. While multi-sector federal voluntary programs have general environmental objectives that target firms from different industries, single-sector federal voluntary programs typically focus on more specific environmental problems that are often relevant to a particular industrial sector. For example, the 33/50 program targeted toxic emissions from the chemical industry; the Voluntary Aluminum Industry Partnership targets perfluorocarbon emissions from aluminium producers; and the AgSTAR program targets methane emissions from concentrated animal

feeding operations (CAFOs). Many single-sector federal voluntary programs target global climate change problems associated with transportation-related issues and energy-producing sectors like coal mining and power generation (see Table 1). The focused aim of these programs attempts to provide targeted and effective technological expertise and assistance to participating firms.

3.3. State and Regional Voluntary Programs

A third type of public voluntary program is designed by state, regional, or local authorities, often to implement federal directives. Several regional offices of the U.S. EPA have established pollution prevention programs to help implement the federal Pollution Prevention Act of 1990. Regional U.S. EPA offices also help administer federal voluntary programs like National Environmental Performance Track in a given locality. More often, though, state and regional voluntary programs are employed to confront local environmental problems or issues. For example, the Southern Appalachian Mountains Initiative addresses air quality issues in the Appalachian Mountain region, while Project Loko I'a encourages restoration of coastline and the redevelopment of traditional Hawaiian fish ponds. Finally, some state and regional voluntary programs can be viewed as a testing ground for a national program. The San Francisco Bay Area Green Business Program, for example, is used to gauge the demand for a green business program that could be expanded in the future (U.S. EPA, 2004d). Table 1 lists a few of these state and regional programs.

3.4. Federal Negotiated Agreements

A fourth type of voluntary initiative in the U.S. is negotiated agreements. Unlike public voluntary programs, negotiated agreements are jointly designed by industry and federal regulators. The only two examples of negotiated agreements in the U.S. at the federal level are the Common Sense Initiative and Project XL (see Table 1). These agreements offer firms relief from existing regulations in return for demonstrating environmental performance above and beyond the existing status quo (Mazurek 1998). By involving firms in the regulatory process and by offering regulatory flexibility, negotiated agreements aim to reduce the adversarial relationship between firms and regulators. In addition, it is hoped that regulatory flexibility encourages firms to reduce pollution in the most cost-efficient manner. There has been concern, however, that firms may use negotiated agreements to attempt to influence regulatory authorities. In particular, firms may use negotiated agreements as a smokescreen for real environmental action, and hence delay or even pre-empt future regulations (Lutz, Lyon, and Maxwell, 2000; Maxwell, Lyon, and Hackett, 2000).

Negotiated agreements are not used frequently in the U.S. for several reasons. First, government-business relationships in the U.S. tend to be more adversarial, especially compared to those in Europe, and therefore do not create an environment conducive to negotiated agreements (Lyon and Maxwell, 2001). Second, questionable legal authority of regulatory agencies to exempt firms from existing regulations has prevented the adoption of negotiated agreements (GAO, 1997a; OECD, 1999). A third obstacle to more wide scale adoption of negotiated agreements is the potentially large cost of negotiations. For example,

Intel's Project XL agreement was both time-consuming and expensive to negotiate. It took over 100 official meetings and involved 23 official representatives from different government agencies and the local community (Mazurek, 1998). It took 17 months of negotiation to put the agreement in place, and cost both firm and government a total of $588,000 (Blackman and Mazurek, 2001). Delmas and Mazurek (2001) find that by 2001 the average cost of negotiating an agreement for Project XL had fallen to $108,000. That said, the uncertain legal environment and substantial time and money involved in a negotiated agreement indicate that negotiated agreements are unlikely to be an important form of voluntary initiative in the U.S. in the future. In fact, the Common Sense Initiative is no longer active and Project XL is currently being phased out of operation (U.S. EPA, 2004e).[4]

[4] While the Common Sense Initiative is no longer active, the early work done for this initiative forms the foundation for several recent voluntary programs. The Sector Strategies program, for example, includes two of the original six industries that were part of the Common Sense Initiative. The four other industries of the Common Sense Initiative also are covered by current voluntary programs.

Table 1 *U.S. Voluntary Initiatives*

Name of Voluntary Initiative (year established)	Industry / Sector	Environmental Target
Multi-Sector Federal Public Voluntary Programs		
Climate Leaders (2002)	multi-sector	global climate change
Climate Wise* (1993)	multi-sector	energy efficiency and global climate change
Consumer Labeling Initiative (1996)	multi-sector	labeling
Design for the Environment (1992)	multi-sector	green manufacturing; pollution prevention
Energy Star™ (1992)	multi-sector	energy efficiency and global climate change
Environmental Technology Verification (1995)	multi-sector	green manufacturing, labeling
Green Chemistry (1992)	multi-sector	pollution prevention
Green Engineering (1998)	multi-sector	pollution prevention
Green Lights* (1991)	multi-sector	energy efficiency and global climate change
Green Power Partnership (2001)	multi-sector	energy efficiency and global climate change
Green Suppliers Network (2001)	multi-sector	green manufacturing; pollution prevention
Improving Air Quality through Land Use (2000)	multi-sector	air quality
It All Adds Up to Cleaner Air (1999)	multi-sector	air quality
National Environmental Performance Track (2000)	multi-sector	regulatory innovation
National Waste Minimization Partnership (1994)	multi-sector	pollution prevention
Sector Strategies Program† (2003)	multi-sector	regulatory innovation
WasteWise (1992)	multi-sector	waste management
Water Efficient Product Enhancements Program† (1992)	multi-sector	water

** This program is no longer active † This program has undergone a name change at some time*

Table 1 (cont.)

Table 1 (cont.)

Name of Voluntary Initiative (year established)	Industry / Sector	Environmental Target
Single-Sector Federal Public Voluntary Program		
33/50 Program* (1991)	chemical	reduce toxic waste
Adopt Your Watershed (1994)	agriculture, public	water quality
AgSTAR (1993)	agriculture, CAFOs	global climate change
Best Workplaces for Commuters† (2000)	transportation	air quality and global climate change
Carpet America Recovery Effort (2001)	carpet	recycling
Clean Air Transportation Communities (2001)	transportation	air quality and global climate change
Clean School Bus USA (2003)	transportation	air quality and global climate change
Climate Challenge* (1994)	electric utilities	energy efficiency and global climate change
Coal Combustion Products Partnership (2003)	coal combustion	energy efficiency and global climate change
Coalbed Methane Outreach Program (1994)	coal mining	air quality and global climate change
Combined Heat and Power Partnership (2001)	power generation	energy efficiency and global climate change
Five-Star Restoration Program (1998)	wetlands	habitat restoration
Golf and the Environment (1995)	golf courses	land use
GreenScapes (2003)	landscaping	land use
High Production Volume Challenge Program (1998)	chemical	reduce toxic waste
HFC-23 Emission Reduction Program (1993)	chemical	global climate change
Hospitals for a Healthy Environment (1998)	hospitals	waste management

** This program is no longer active † This program has undergone a name change at some time*

Table 1 (cont.)

Table 1 (cont.)

Name of Voluntary Initiative (year established)	Industry / Sector	Environmental Target
Single-Sector Federal Public Voluntary Program (continued)		
Indoor Air Quality Tools for Schools (1995)	schools	air quality
Landfill Methane Outreach Program (1994)	waste management	global climate change
Mobil Air Conditioning Climate Protection Partnership (1999)	automobile	energy efficiency and global climate change
Natural Gas STAR Program (1993)	oil and natural gas	global climate change
Pesticide Environmental Stewardship (1994)	agriculture; other users	reduce risk from use of pesticides
PFC Reduction/Climate Partnership (1996)	semiconductor	global climate change
Plug-In to e-Cycling (2003)	electronics	recycling
Reduced Risk for Conventional Pesticides (1993)	chemical	regulatory innovation
Ruminant Livestock Methane Efficiency* (1993)	livestock operations	global climate change
Seasonal Gas Use to Control Nitrous Oxide* (1993)	utilities; industrial facilities	energy efficiency and global climate change
SF6 Emission Reduction Partnership for Electric Power Systems (1999)	electric power	global climate change
SF6 Emission Reduction Partnership for Magnesium Industry (1999)	magnesium	global climate change
SmartWay Transport Partnership (2004)	freight	air quality and global climate change
SunWise School Program (2000)	schools	health improvement
Suppliers Partnership for the Environment (2001)	automotive	green manufacturing
Sustainable Future Initiative (2002)	chemical	pollution prevention

** This program is no longer active † This program has undergone a name change at some time*

Table 1 (cont.)

Table 1 (cont.)

Name of Voluntary Initiative (year established)	Industry / Sector	Environmental Target
Single-Sector Federal Public Voluntary Program (continued)		
Voluntary Aluminum Industrial Partnership (1995)	aluminum	global climate change
Voluntary Children's Chemical Evaluation Program (2000)	chemical	information provision
Voluntary Diesel Retrofit (2000)	transportation	air quality
State and Regional Public Voluntary Programs		
California Dairy Quality Assurance Program (1999)	dairy	water quality
Chemical Facility Security (2002)	chemical	pollution prevention
Hospital Compliance Environmental Initiative (2002)	hospitals	reduce toxic waste
Nevada Mining Partnership Program (2001)	mining	reduce toxic waste
Project Loko I'a (1999)	aquaculture	water
S.F. Bay Area Green Business Program (1996)	multi-sector	green goods; labeling
Southern Appalachian Mountains Initiative (1992)	multi-sector	air quality
Sustainable Agriculture Partnership (1993)	agriculture	agriculture

** This program is no longer active † This program has undergone a name change at some time*

Table 1 (cont.)

Table 1 (cont.)

Name of Voluntary Initiative (year established)	Industry / Sector	Environmental Target
Negotiated Agreements		
Common Sense Initiative* (1994)	multi-sector	regulatory innovation
Project XL* (1995)	multi-sector	regulatory innovation
Unilateral Commitments		
Encouraging Environmental Excellence (1992)	textile	pollution prevention
Environmental Stewardship Program† (1990)	oil and natural gas	pollution prevention
Great Printer's Project (1992)	printing	pollution prevention
Green Seal (1992)	general	green goods; pollution prevention
International Standards Organization 14001 (1996)	multi-sector	pollution prevention
Responsible Care® (1988)	chemical	pollution prevention
Responsible Carrier (1994)	shipping	safety
Responsible Distribution Process℠ (1991)	chemical	pollution prevention
Sustainable Forestry Initiative® (1995)	forestry, paper	land use; labeling
Sustainable Slopes (2000)	ski resorts	land use

** This program is no longer active † This program has undergone a name change at some time*

3.5. Unilateral Commitments

A fifth type of voluntary initiative found in the U.S. is unilateral commitments. These programs typically do not involve federal regulators but are industry or trade association-led efforts to improve environmental performance (Table 1 lists a few examples). Motivations for participation in unilateral commitments vary. Some commitments may be a response to outside pressure from consumers and shareholders to improve the image of an industry. The Responsible Care® program, for example, is largely seen as a response by the chemical industry to several accidents and spills, including the Bhopal accident in 1984, which killed over 3,000 people. Other unilateral commitments may be undertaken in an attempt to differentiate members' products from others and to cater to green consumers (Arora and Gangopadhyay, 1995). Some unilateral commitments may attempt to pre-empt future regulation. Nash (2002) writes that the "chemical, petroleum, and forestry industries have used [voluntary initiatives] as defensive strategies to protect themselves from external interference in the form of public regulation." Finally, other programs may be viewed as a mechanism for firms to prepare themselves for future regulation (Lutz, Lyon, and Maxwell, 2000; Maxwell, Lyon, and Hackett, 2000). For example, with the possibility of global climate change regulation on the horizon, some firms are using the Chicago Climate Exchange to demonstrate that reductions in greenhouse gas emissions can occur in a cost-effective manner through the use of a cap-and-trade system. While emission targets are not demanding (members are to reduce emissions by 4% below baseline by 2006), participation in the Exchange since its inception in 2003 has grown from 13 to 51 members and includes a

wide range of sectors such as chemical, pulp and paper, and electric power generation. Approximately 83,000 metric tons of CO2 were traded in January 2004, double the previous month's trading volume. In February 2004, over 400,000 metric tons were traded (Chicago Climate Exchange, 2004).

Unilateral commitments often are developed by industry trade associations or international organizations. The American Chemical Association, for example, started the Responsible Care® program to encourage safety in the handling of chemical products from inception through distribution and disposal. Other examples of industry-led unilateral agreements include Coatings Care™ by the National Paint and Coating Association and the Sustainable Forestry Initiative® by the American Forestry and Paper Association. Another source of unilateral commitments is international organizations. The International Standards Organization introduced ISO 14001 in 1996 to recognize and standardize the efforts of firms in incorporating environmental management systems.

Due to anti-trust concerns, industry-initiated voluntary approaches generally avoid prescribing specific actions, outcomes, or strategies (Kappas, 1997; Mazurek, 1998). Instead, these initiatives offer public recognition, information subsidies, and technical assistance in the pursuit of qualitative goals. They also rarely contain monitoring or sanction provisions, although some effort has been made by companies to appear credible through third-party verification. (OECD, 1999). Most unilateral agreements in the U.S. are best characterized as pollution prevention activities.

4. Common policy objectives of voluntary approaches

The literature discusses a variety of reasons why voluntary approaches should be preferred to other more traditional forms of environmental regulations. However, there is a great disparity between the power of the arguments from a policy standpoint and the empirical evidence supporting such arguments. This section reviews five common policy objectives of voluntary approaches in the U.S. and elsewhere. These objectives include environmental effectiveness, economic efficiency, savings in administrative, monitoring, and enforcement costs, inducement of innovation, and increased environmental awareness. For each of these policy objectives, this section discusses the arguments for and against the achievement of such goals, and whether the available empirical evidence on U.S. voluntary approaches lends support to these objectives.

4.1. Environmental Effectiveness

The most commonly discussed objective of any environmental policy or regulation is how effective it is at improving environmental quality. Does the policy instrument accomplish a measurable environmental goal? It is argued that voluntary approaches are effective because they promote general environmental improvements or emission reductions beyond what is mandated by formal environmental regulation. It is also argued that voluntary approaches are instrumental in inducing firms to reduce emissions by greater amounts than they would have without the voluntary initiative in place. In other words, even

the more environmentally responsible firms will be induced to take actions beyond what is defined as "business-as-usual" behavior.

Critics of these arguments point to the fact that voluntary approaches often set easy-to-achieve targets that barely go beyond what is specified by existing regulation and that, compared to the alternative of establishing a more formal regulation mandating further reductions in emissions, the commitments made by firms to voluntary goals are less stringent and far less demanding (OECD, 1999). Also, once these targets have been set, most voluntary approaches in the U.S. are non-binding. This means that even if a firm agrees to a particular environmental target, it is not legally obligated to achieve it, and may merely use its membership in a voluntary initiative as a marketing tool. Finally, as touched on in section 3, a number of academics have pointed out that firms' incentives to over-comply with existing regulation through adherence to a voluntary goal may, in the long term, be designed to avoid future, more stringent regulations. These firms may, in fact, be co-opting the regulatory policy process by limiting regulators' options in the future. For instance, firms may invest in a particular technology to meet voluntary goals, knowing that it limits the practicality of mandating more stringent and therefore more costly emission reductions in the future (Lutz, Lyon, and Maxwell, 2000; Maxwell, Lyon, and Hackett, 2000).

In many cases, a lack of data does not allow for an evaluation of the effectiveness of a particular voluntary agreement in attaining its environmental goal (see Section 5). Thus, for these programs how environmentally effective they are is still an open question. For those voluntary agreements that have been evaluated, the evidence of their environmental

effectiveness is mixed. Horowitz (2004) finds that public voluntary programs promoting energy efficient products and services have been successful in achieving energy reductions. He estimates that the market effects due to the Green Lights program resulted in savings of over 5.6 million metric tons of carbon in the year 2000 (Horowitz, 2001, 2004). Other studies indicate less success. In many cases where noticeable emission reductions have occurred, factors other than the voluntary approach itself seem to have contributed to the reduction (GAO, 1997b; OECD, 2003). Morgenstern and Al-Jurf (1999) have found that voluntary agreements such as the U.S. EPA's Green Lights and 33/50 programs result in much more modest reductions than what is often claimed by regulators as attributable to the programs themselves. Hartman (1988) finds comparable results for voluntary energy conservation programs in the U.S. King and Lenox (2000) find that U.S. chemical companies that have signed on to the unilateral commitment Responsible Care® improve their environmental performance more slowly than non-participating firms, lending support to the argument that firms use the program as cover for less environmentally benign actions. Welch, Mazur, and Bretschneider (2000) find that participation of firms in the Department of Energy's Climate Challenge program has had no effect on CO2 reduction levels.

Is it possible to improve the environmental effectiveness of voluntary approaches? Alberini and Segerson (2002) demonstrate theoretically that the effectiveness of a voluntary approach increases when there is a credible regulatory threat and reliable monitoring of goal attainment. They also point out that the degree to which a voluntary approach results in real environmental improvements depends on the number of polluters that participate; the amount

of abatement undertaken by each participant, and the effect that the voluntary approach has on the competitiveness of the market.

4.2. Economic Efficiency

A second objective by which environmental regulatory policies are evaluated is economic efficiency. In evaluating whether such an objective is reached, the relevant question is whether a particular approach reaches a given environmental goal at the lowest possible cost to firms and consumers. In particular, how close do voluntary approaches get to the most efficient outcome? Two slightly different arguments are made regarding the efficiency of voluntary approaches. The first argues that, to the extent that voluntary approaches help reduce uncertainties or supply information not provided in the marketplace, they bring to light new ways in which firms can reduce costs of production while also improving environmental performance. This is often referred to in the literature as a "win-win" argument (Lyon and Maxwell, 2001) and can be thought of as efficiency in absolute terms. The second argues for voluntary approaches from the perspective of relative efficiency. Voluntary approaches, while not as efficient as market-based instruments that attempt to internalize and price externalities appropriately in the market, are more efficient than command-and-control regulations because they allow firms greater flexibility to determine the best way to reduce emissions to meet the voluntary goal (OECD, 1999).

Many economists are skeptical of the "win-win" argument and often ask why a firm operating in a competitive market would leave such profit-making opportunities unexploited.

Boyd (1998), through a set of case studies, finds that pollution prevention may not be undertaken by firms due to regulatory barriers; lack of consistent monitoring and enforcement by regulators; or regulatory, market or technical uncertainties and challenges that prevent the diffusion of new technologies. This suggests a potential role for government in offering firms greater regulatory flexibility, technical assistance, and increased pressure to comply with existing regulations, some of which could be provided through voluntary programs.

Regarding the second argument of relative efficiency, there is agreement that in some cases voluntary approaches may get closer to the efficient outcome than command-and-control regulations. However, they are unlikely to achieve full efficiency because, while they often allow firms the flexibility to choose the abatement technique for reaching the environmental goal, they do not establish incentives designed to minimize production costs. Equalization of marginal abatement costs across participating firms - a requisite for minimizing production costs - is not achieved since many voluntary agreements set a common goal for all participants or emission targets are set at the industry level, and these targets often are non-obligatory (Bizer, 1999; OECD, 2003). Finally, concerns have been raised over the effect of voluntary approaches on competitiveness. Participation in a voluntary agreement allows for the possibility of collusive behavior through the creation of barriers to entry for non-participants and foreign firms, the phasing out of particular products, or through price setting (Brau and Carraro, 1999). This is particularly true in a negotiated agreement between government and industry, of which there are currently few examples in the U.S.

There is little empirical evidence on the efficiency or inefficiency of voluntary approaches. A survey of voluntary approaches reveals that, in many cases, abatement targets are not differentiated (i.e., each firm faces the same target); as such these agreements are not dissimilar to an emissions standard that does not specify the abatement technique. In other words, voluntary approaches are likely to suffer the same inefficiencies that result from mandating a uniform standard for all participating firms, amplified by the fact that not all firms participate. Evidence from the unilateral commitment Responsible Care® demonstrates that there is little likelihood that this program can ever achieve an efficient outcome because firms operate within a framework of existing regulations that mandate particular abatement methods. However, there may be some reduction in operating costs due to reduced insurance premiums and worker compensation costs made available to participants (Mazurek, 1998). A study by Nadeau, Cantin, and Wells (2003) implies some gain in economic efficiency for firms participating in Energy Star™. They find that energy efficiency measures undertaken as part of the program are responsible for a market return to member companies of approximately $16,000 per million dollars in asset value. They also find that the cost of not joining the program represents almost 10 percent of the asset value of the non-participants analyzed.

Are there any factors that affect the efficiency of voluntary approaches? A number of publications have observed that voluntary approaches that allow for differentiated abatement targets across firms may increase the efficiency of a voluntary agreement. If that is not feasible, compensation to low-cost firms or the use of bubbles at the firm-level can partially

offset this inefficiency (OECD, 1999). Glanchant (1996) demonstrates theoretically that voluntary approaches are efficient when there exists a high level of uncertainty surrounding the costs of abatement techniques for a concentrated industry with little heterogeneity in abatement activities and costs across firms. Segerson and Miceli (1998) also have observed that, at least theoretically, the efficiency of voluntary approaches depends on the allocation of bargaining power, the magnitude of the background regulatory threat, and the social cost of public funds.

4.3. Reductions in administrative and monitoring and enforcement costs

Proponents of voluntary approaches often claim that the government benefits from reductions in administrative costs as well as declines in monitoring and enforcement costs when compared with more traditional forms of environmental regulation. Government does face some costs when using a voluntary approach: the cost of preparing and sometimes negotiating an agreement, and the cost of implementing the agreement (OECD, 2003). However, government also may benefit from the shift of monitoring and enforcement costs to the private sector, if compliance is self-reported, or to a third-party, if audits are conducted. In the event that government requires submission of reports directly to the agency, it is still likely that monitoring costs are reduced because these requirements are often much less time-consuming than those required by traditional regulation (OECD, 1999).

How large are these cost savings compared to traditional forms of regulation? Alberini and Segerson (2002) point out that the argument of significant cost savings accruing

to government depends on comparison to an inefficient and inflexible policy alternative. To the extent that the regulatory alternative under consideration is a more flexible command-and-control or market-based policy, such costs savings diminish or even disappear. Also, those voluntary approaches that have the lowest administrative costs are also the same approaches that risk being the least environmentally effective since the likelihood of free-riding increases when there is little oversight by a regulatory agency.

To the extent that firms are better informed about abatement activities than a government regulator, voluntary approaches are likely to result in some savings in both administrative and compliance costs. However, the empirical evidence is scarce. A number of studies have demonstrated that as a fraction of the total cost of federal environmental regulations in the U.S., voluntary approaches have contributed little in cost savings (NAPA, 1997, Mazurek, 1998). It has also been noted that administrative and implementation costs tend to be high when many parties are involved, the legal status of the agreement is ambiguous, and a detailed technical analysis of abatement options is needed prior to the implementation of the voluntary approach (OECD 2003). Project XL, a negotiated agreement in the U.S., had high transaction costs initially due to the negotiation of each agreement with an individual firm. For example, Intel's agreement cost the government $110,000 (Blackman and Mazurek, 2001). These costs have fallen substantially since the early agreements (Delmas and Mazurek, 2003). However, there is a bias built into the program of attracting larger firms to participate because they are more likely to be able to absorb the cost of joining (Blackman and Mazurek, 2001).

4.4. Environmental Awareness and Attitudinal Changes

It has also been argued that voluntary approaches are responsible for inducing long-term changes in the environmental awareness of industry, and/or consumers. In other words, by going beyond existing regulations to meet particular environmental goals, firms are educating themselves on the nature of the environmental problem and ways in which it can be mitigated. To the extent that firms promote their membership in these voluntary initiatives to consumers, it may also affect environmental awareness or priorities of consumers and result in a demand for greater emissions reductions. Again, because voluntary approaches rarely set stringent environmental goals, they do not change the status quo of the industry, which allows for little change in the way an entire industry views particular environmental issues. For this reason, participation of firms in voluntary agreements often does little to convince consumers of the sincerity of a firm's environmental commitment and often is viewed largely as propaganda, falling into same category as advertising (Fierman, 1991).

The U.S. EPA (2002) claimed 11,300 participants in its programs as of 2000, up from 6,900 in 1996, an argument for the increased environmental awareness of industry. However, researchers have found that the Responsible Care® program appears to have done little to change consumers' view of the chemical industry. Why has it been so unsuccessful? Researchers point to the fact that the program narrowly promotes its membership to employees and people living near existing plants. The result is that consumer awareness of the program is low. However, individual companies have reported improvements in

community relations and public perception; they have also reported an increased understanding of environmental issues by both industry and community (Mazurek, 1998).

4.5. Innovation and Dynamic Effects

A fifth objective of voluntary approaches is to induce innovation in abatement techniques that make the cost of compliance with environmental regulations decrease over time. It is argued that voluntary approaches induce such innovation because they signal to firms possible future regulatory requirements. In anticipation of meeting such requirements, firms look for ways to reduce the costs of compliance through new, better methods of emission reductions. The Chicago Climate Exchange promotes participation in its emissions trading program as a way to reduce regulatory risks and increase the potential reward for taking early action in the event of legislation (Chicago Climate Exchange, 2004). It is also possible that firms learn of better, more efficient ways of abatement through participation in voluntary programs, either through learning-by-doing that leads to technological improvements over time or information sharing among firms (OECD, 1999).

Critics have pointed out that voluntary approaches rarely set stringent, "technology-forcing" environmental targets and as such provide weak incentives for firms to innovate (OECD 1999). Instead of creating an incentive to innovate, voluntary approaches may be used to buy time and postpone regulation without any intention to seriously meet the voluntary obligations. Since firms are trying to avoid regulation, little innovation takes place (Bizer, 1999; Lyon and Maxwell, 2003). What little empirical evidence exists, suggests that

voluntary approaches provide weak incentives for the development of new abatement technology (OECD, 2003).

While the ways in which voluntary approaches meet the five policy objectives discussed in this section have been explored in the literature on a theoretical basis, the validity of these arguments largely has not been tested empirically. To the extent that empirical research exists, it tends to focus on a narrow set of U.S. voluntary initiatives for which data are available and limits itself to examining the evidence for environmental effectiveness of the agreements. Evidence indicates that few voluntary approaches in the U.S. have resulted in anything greater than moderate reductions in emissions. One possible reason for the limited success of the programs examined is that the firms that tend to participate in the programs are already quite environmentally aware and as such would have reduced emissions beyond what is required by regulation even without the existence of the voluntary agreement. Also, many voluntary initiatives set easy-to-meet goals, which do not translate into large environmental improvements. Finally, programs that have been evaluated tend to be those that have been around the longest, those with which the government has "cut its teeth," and as such may not reflect government learning that has resulted in improvements in the way in which voluntary initiatives are structured. It remains largely unknown if any of the unstudied U.S. voluntary agreements attain the policy objectives highlighted here.

5. Difficulties in Evaluating Voluntary Initiatives

To better understand why there has not been more empirical evaluation of voluntary agreements, we turn to some of the challenges in evaluating the effectiveness of voluntary agreements in meeting various policy objectives. One obstacle to providing a comprehensive evaluation of voluntary initiatives in the U.S. is that voluntary initiatives are a relatively new policy instrument. Voluntary initiatives started in the early 1990s and most began in the middle to late 1990s (see Table 1). Furthermore, voluntary initiatives often set target dates for environmental improvements several years into the future, which imply that it is too early to evaluate many voluntary initiatives. For example, the SmartWay Transport program aims to improve fuel efficiency standards and reduce emissions of carbon dioxide by 33 million metric tons and emissions of nitrogen oxide by up to 200,000 tons by the year 2012.

Another obstacle to the measurement of the effectiveness of voluntary initiatives is that many programs target general environmental objectives and therefore lack a measurable environmental output. While all programs focus on improvement to an existing environmental problem, the achievement of some goals is more difficult to measure than for others. For example, the SunWise program aims to educate school-aged children of the risks of overexposure to the sun. While the program aims to reduce the incidence of skin cancer, tracking individuals twenty to thirty years into the future to measure their health makes it difficult to evaluate the effectiveness of the program.

Even if a voluntary initiative targets a measurable environmental output, a third obstacle in gauging the effectiveness of a voluntary initiative is a lack of data on a measurable output. There are two potential sources of data. First, data may be available

through a national pollution-reporting database, such as the Toxic Releases Inventory (TRI). The TRI, however, does not target greenhouse gases while several voluntary initiatives in the U.S. focus on environmental improvements in this area. For example, the Commuter Choice Leadership Initiative targets carbon dioxide, the AgStar and the Coalbed Methane Outreach programs target methane, and the SF6 Emission Reduction Partnership targets sulfur hexafluoride. None of these chemicals are part of a national pollution-reporting database, and hence, there are no available data on firm emissions.

In spite of a pollutant's exclusion from routinely collected data by the U.S. EPA, data may still be available if the voluntary initiative requires some type of auditing and reporting activities. While many programs do encourage firms to submit annual reports, there is concern about the validity of these data. Firms may intentionally misreport their data, either in an attempt to skew their performance or out of fear that U.S. EPA will use these data to regulate the firm more closely. This problem can be partially mitigated by requiring participants to submit their data to a neutral, third party, as the National Metal Finishing Strategic Goals Program does. Even so, firms may correctly report only the positive aspects of their activities. Most programs do not require firms to submit detailed auditing of their emissions. The lack of data on firms' environmental outputs, either from a national pollution database or from firms themselves, is a serious obstacle in measuring the environmental and economic effectiveness of voluntary initiatives.

Perhaps the most serious obstacle in evaluating the effectiveness of a voluntary initiative is forming a reasonable counterfactual baseline with which to make a comparison.

In establishing the effectiveness of a voluntary initiative, most initiatives simply provide a before-and-after comparison of pollution levels. For example, the 33/50 program encouraged firms to reduce emissions of toxic chemicals relative to firm emissions in 1988. Since participating firms on average met these goals, the program was deemed to be a success (U.S. EPA, 1996). However, of the total reductions in emissions between 1988 and 1994, large reductions took place between 1988, the baseline year chosen for the program, and 1991, the year the program actually started and hence cannot be attributed to the program itself (GAO, 1994; Inform, 1995; Khanna and Damon, 1999). While a successful voluntary initiative may result in lower levels of pollution, a fall in pollution is not necessarily indicative of a successful voluntary initiative. In short, pollution may be declining for several reasons unrelated to the voluntary initiative. First, pollution may fall simply due to a general downturn in production. When the EPA contacted over 1,200 industrial facilities that had informed the agency of changes in generated waste between 1989 and 1990, they found "nearly 70 percent attributed some portion of their emission increases or decreases to production level changes" (GAO, 1994). Also, pollution levels may appear to fall if firms simply substitute production from a regulated substance to an unregulated substance.

A second factor unrelated to the effectiveness of a voluntary initiative that may result in lower pollution levels is technological innovation in an industry. If technological progress in an industry results in more efficient use of inputs and hence less pollution, it may appear that a voluntary initiative is more successful than it actually is. With the 33/50 program, EPA claimed to meet its goals for emission reductions a year prior to its target date. However, a

number of researchers note that pollution levels were falling prior to the implementation of the program, possibly due to technological progress unrelated to the program (GAO, 1994; Inform, 1995; Khanna and Damon, 1999). A GAO report also concluded that "substantial reductions were reported for TRI chemicals not targeted by the 33/50 program, suggesting that production changes or other factors unrelated to commitments made under the program may be largely responsible for the companies' reported reductions" (GAO, 1994).

A third reason why observations of falling pollution levels do not necessarily imply a successful voluntary initiative is self-selection bias. In particular, many of the factors that influence a firms' decision to participate in a voluntary agreement also affect a firms' overall environmental performance. For example, naturally "green" or environmentally friendly firms are more likely to have lower levels of pollution. These firms are also more likely to join a voluntary initiative, either due to a genuine desire to improve their environmental performance or because their lower levels of pollution imply that these firms are closer to achieving the targets set by a voluntary initiative and hence face lower costs in joining. In the Green Lights program, for example, 593 out of the initial 2,308 participating firms were companies that sell, manufacture, and install lighting products (GAO, 1997b). Hence, these firms probably were already aware of possible opportunities for improving energy efficiency prior to joining the program, and any lighting improvements these firms made may have been undertaken regardless of firm participation in the program. Researchers should therefore be wary of crediting a voluntary initiative with reductions in pollution without first taking into account this self-selection bias.

Evaluating the effectiveness of voluntary initiatives in reaching an environmental objective is difficult for several reasons. One main obstacle, the lack of data on a measurable environmental output, can be overcome if voluntary initiatives encourage more defined and detailed goal setting and require more complete data collection and reporting. While voluntary initiatives should attempt to do more in these areas, one also needs to recognize the limitations in enacting these requirements. One of the main selling points of voluntary initiatives is their low cost and flexibility in empowering firms to identify and undertake abatement efforts on their own. As costly measurement and auditing processes are required of participating firms, voluntary initiatives may be less cost effective instruments. Even with more complete data on emissions of participants, another obstacle that continues to plague the evaluation of voluntary initiatives is a lack of data on non-participants. To form a reasonable counterfactual baseline for use in assessing the effectiveness of a voluntary agreement, a rigorous analysis needs to compare the efforts of participants against what non-participants in the industry are doing. This requires a more comprehensive and broader auditing and reporting program of emissions than is currently in place.

In spite of these difficulties, a few voluntary initiatives have been evaluated in a rigorous fashion, including the 33/50 program (Khanna and Damon, 1999), Responsible Care® (King and Lenox, 2000), and Climate Challenge (Welch, Mazur, and Bretschneider, 2000). These initiatives have been successfully evaluated because they do not suffer from the limitations discussed above. In particular, these initiatives are older and hence ready for evaluation, and the initiatives also have some type of measurable environmental output for

which data are available or easily calculated, both before and after the start of the voluntary initiative. Because firms participating in these initiatives are generally large public companies, financial and other production data are also available to control for production changes and other industry effects. Given the availability of data on a measurable environmental output and on finances and production, researchers are able to estimate a two-stage model to take into account the self-selection issue raised above. A rigorous analysis involves a first stage participation equation that estimates the probability of participating in the voluntary initiative. Estimates from this regression then are used in a second stage estimation of the determinants of pollution levels to provide an unbiased estimate of the effect of the voluntary initiative on firm pollution (Khanna and Damon, 1999).

6. Comparison with European and Japanese Voluntary Approaches

What role voluntary approaches play in environmental policymaking and in what form they are implemented varies widely by country. This section presents a brief overview of the key similarities and differences between U.S. voluntary approaches that are discussed in detail in previous sections and voluntary approaches utilized in Europe and Japan.

Voluntary approaches have been utilized in Europe and Japan for a considerably longer period of time than they have in the U.S. (Lyon and Maxwell, 2001). They have been used in Japan since the 1960s and in Europe since the early 1970s, the earliest European example being in France. The first voluntary approach attempted in the U.S., at least between the federal government and industry, did not occur until 1991 (OECD, 1999).

In the last decade, there has been a sharp rise in the use of voluntary approaches as a form of environmental protection by government agencies in the U.S., Japan, and Europe. Japan leads the way in terms of number of voluntary agreements in existence. There are approximately 33,000 voluntary agreements in Japan, mostly at the local level (Sugiyama, 1999, Welch and Hibiki, 2002). As of 1996, approximately 300 national-level voluntary approaches were in place throughout Europe (EEA, 1997). Currently, the U.S. has at least 50 voluntary approaches in place.[5]

While the use of voluntary approaches has grown worldwide, reliance on them as an environmental policy tool has varied widely. The U.S. still does not rely heavily on voluntary approaches; it uses command-and-control regulation as its predominant tool for environmental policymaking. In Europe, while every country is reported to have at least one voluntary approach in place, Germany, Greece, and the Netherlands undertake voluntary approaches in pursuit of environmental goals much more regularly than do other European countries. Together, they account for about ninety percent of the total number of national-level voluntary approaches in Europe (Moffet and Bregha, 1999).

As noted in Section 1, most voluntary approaches in the U.S. are defined as public voluntary programs. While these are increasingly popular in Europe, the most common type of voluntary approach used there is the negotiated agreement (Delmas and Terlaak, 2002a).

[5] Canada and New Zealand also have a number of voluntary agreements in place. According to EEA, New Zealand had 17 agreements as of 1996. The OECD (1999) also reports the existence of voluntary agreements in Australia, Czech Republic, Hungary, Korea, Mexico, Norway, Switzerland, and Turkey. Developing countries are also beginning to make use of voluntary initiatives for emission reductions. For examples and evaluation of some recent developing country experiences with voluntary programs, see Blackman, 2000; Wheeler, 1999; and Rivera, 2002.

In Japan, voluntary approaches fall into two basic categories: those negotiated between local governments and individual plants (the vast majority are of this type), and beginning in the 1990s, unilateral commitments by industry (OECD, 1999).

One of the key contributing factors to the type of voluntary approach propagated in the U.S., Europe, and Japan is the nature of the relationship between government and industry. Lyon and Maxwell (2001) point to a more cooperative government-business relationship in Europe that allows for negotiations to take place, while in the U.S. these relationships are characterized as adversarial. In Japan, negotiated agreements are often used as a way for local government to exert influence over industry behavior subject to environmental regulations that are often determined at the national level (OECD, 1999).

The nature of the role that voluntary approaches play in environmental policy also may differ substantially by country. For instance, voluntary approaches may be designed as complements or substitutes to formal environmental regulation. In both the U.S. and France, voluntary approaches tend to be used to enhance the efficacy and scope of existing regulations (OECD, 1999). In the U.S., voluntary approaches also are used to encourage emissions reductions for sectors or pollutants for which enacting new legislation is politically difficult (for example, in the climate change area). In Germany and Japan, voluntary approaches are viewed as substitutes: they tend to replace traditional forms of regulation. The Netherlands passed a National Environmental Policy Plan in 1989 that specified voluntary approaches as one of its main policy tools for environmental regulation (Delmas

and Terlaak, 2002b). It tends to use voluntary approaches in both capacities: as complements to and replacements for existing regulation (OECD, 1999).

The scope of voluntary approaches in environmental policy is relatively limited in many cases. In the U.S., most public voluntary programs in existence focus on greenhouse gas emissions, energy efficiency, or pollution prevention (Mazurek, 1998). The majority of voluntary approaches in both the U.S. and Europe also target the highest polluting industries in the energy and manufacturing sectors, although there has been some focus in the U.S. on industries not typically subject to formal environmental regulation. Many U.S. voluntary programs address more than one sector, but the majority focus on chemical manufacturing and distribution, electronics, and computer manufacturing. Over 20 percent of voluntary approaches in Europe focus on the chemical industry (EEA, 1997). Voluntary approaches in the Netherlands are found in almost every industrial sector and tend to focus on regulating production processes. In contrast, in Germany voluntary approaches tend to focus on the regulation or phase-out of particular products (OECD, 1999). In other European countries, voluntary approaches also tend to focus on a narrow set of issues: CFC-phase out, greenhouse gas emissions, and waste management. Originally, voluntary approaches in Japan focused on the manufacturing and utility sectors, but more recently they have been expanded to confront environmental issues in the services sector.

Voluntary agreements that are binding – those that exact penalties on a participating facility, firm, or industry when the agreed upon environmental goal is not met - are not the norm in either Europe or the U.S. In Germany, the Constitution actually prohibits the

government from entering a signed, binding agreement. The Netherlands is one of the few OECD countries in which voluntary approaches are almost always binding (OECD, 1999). In the U.S., the government agency has a non-binding agreement, typically a memorandum of understanding (MOU) or partnership agreement with individual firms, which states a firm's agreement to participate but applies no sanction upon withdrawal from the program. Project XL is one of two voluntary approaches in the U.S. with legally binding provisions, which is due to the fact that, in exchange for demonstrated superior environmental performance, it allows participants relief from existing regulations (Mazurek, 1998). As in the U.S., most voluntary approaches in Japan are not legally binding and monitoring is largely self-reported.

The enforceability of voluntary approaches, whether binding or non-binding, also varies by country. In Europe, regulatory agencies often can make the threat of more stringent regulation to force companies to participate in a voluntary approach. The threat of future legislation puts pressure on companies to go beyond existing regulation through voluntary approaches (OECD, 1999). For instance, the fact that actions of the executive and legislative branches of government are closely tied through the parliamentary system in Germany means that regulators can credibly threaten new regulation if a voluntary approach fails (Delmas and Terlaak, 2002b). In the Netherlands, negotiated agreements between government and industry are granted the same legal status as private contracts, which allows for enforcement through the civil courts (Delmas and Terlaak, 2002b). In the U.S., regulatory agencies are held at arms length from the policy process by Congress and therefore lack sufficient credibility to issue threats of new regulation (Delmas and Terlaak, 2002a). In Japan, voluntary approaches

are common at the local level due to the exclusion of local governments from legally setting stricter standards in areas for which national regulations already exist. Compliance with voluntary approaches tends to be quite high, since local governments that control siting and expansion permits often make them contingent on signature to a negotiated agreement (OECD 1999). These agreements also often specify conditions under which sanctions, inspections, and assumption of liability may occur (Welch and Hibiki, 2002).

Most voluntary approaches rely on the concept of collective liability. If the environmental goal targeted by a voluntary approach is not met, industry is held "collectively" liable for its failure and the government may see stricter regulation, regardless of the behavior of individual firms. The concept of collective liability is intimately connected to the inability of government to legally hold particular firms individually liable for their actions. The exception to this case is the Netherlands. In the Netherlands, voluntary approaches typically have an aggregate industry goal or target, but through linkage with a market-based policy instrument such as a permit trading system individual firms are held legally liable to specific commitments and monitoring provisions. This allows for individual liability and sanctions in the event of non-compliance. The only other country in Europe that allow for individual liability is Denmark (OECD, 1999).

7. Conclusion

In the past decade, voluntary approaches have been increasingly used as a component of U.S environmental policy. Authorities mostly have relied on public voluntary programs

designed at either the federal, state, or regional level. Other types of voluntary approaches, such as negotiated agreements and unilateral commitments, have been used much less frequently in the U.S. In general, voluntary approaches have been used to complement existing legislation (for example, implementing aspects of the Pollution Prevention Act of 1990) and in areas where enacting new legislation is difficult for political reasons (for example, in the climate change area).

Proponents of voluntary approaches argue that voluntary approaches effectively provide environmental protection, improve economic efficiency, result in administrative, monitoring, and enforcement cost savings, lead to environmental awareness and attitudinal changes, and encourage innovation. It has been difficult, however, to provide evidence substantiating these claims due to a lack of data and the inherent difficulty of identifying what would have happened in the absence of a voluntary approach. In addition, the literature notes that self-selection, free-riding, and attempts by industry to pre-empt regulation are inherent to the "voluntary" nature of these approaches.

The difficulties in proving the effectiveness of voluntary agreements does not imply that voluntary approaches should not be used. Rather, understanding the difficulties and potential pitfalls of using voluntary approaches will hopefully lead to better designed voluntary approaches in the future. Key design aspects should include more stringent goal setting and improved auditing and data collection. In addition, voluntary approaches are more likely to result in significant environmental improvements when backed by a serious legislative threat.

Also, while it is important to strive for accurate measurement of the effectiveness of voluntary approaches, the inability to measure the effectiveness of all programs or all aspects of a specific program should not prevent the use of voluntary approaches. In fact, voluntary approaches may have the greatest potential in areas where it is especially difficult to measure progress. For instance, voluntary approaches that reduce technological uncertainties or share information between affected parties may lead to increased environmental awareness and attitudinal changes, which may, in turn, result in the correction of market failures at the root of many environmental problems. Credible identification of the environmental quality of firms or their products may encourage consumers and investors to demand greener goods, which provides incentives for firms to improve their environmental quality in the marketplace. To the extent that voluntary approaches can harness market forces, they hold the potential to ameliorate environmental problems and to be effective policy instruments.

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