
A REVIEW OF EMPIRICAL STUDIES ON ENVIRONMENTAL COMPLIANCE

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SUMMARY

In recent years, researchers have begun moving beyond case studies to analyze broader datasets and test specific hypotheses generated by various theories of compliance. These empirical studies offer policymakers insights about the success of specific compliance strategies. However, these studies are still fairly sparse, and many are based on self-reported data by industries and governments which raise questions of accuracy. Some compliance agencies are beginning to collect broader datasets to help determine what is working and what is not, and compliance officials are starting to turn to indicators to measure the status of air and water quality, waste management, and land use. The practitioners' community, including the International Network for Environmental Compliance and Enforcement (INECE), should work together with the research community to generate policy-relevant hypotheses and to further develop the available datasets to test such hypotheses empirically.

1 INTRODUCTION

Most enforcement and compliance agencies have limited and fixed budgets. Therefore, policymakers and practitioners are increasingly turning to empirical studies to analyze the effectiveness of various policies and compliance strategies in order to identify the optimal strategies that would achieve the highest compliance rate at the lowest cost. Academic and NGO researchers also have begun to focus on empirical analysis to test their hypotheses.

However, the empirical literature on environmental enforcement is fairly sparse, and only in recent years have comprehensive data on compliance become available to researchers. Thus, a handful of

studies at the national level have focused either on oil spills or on specific industries such as the pulp and paper industry, where public agencies like the U.S. Coast Guard and U.S. Environmental Protection Agency (EPA) have maintained or funded the data collection.

Empirical studies at the international level are even more scarce. Much of the data on the implementation of and compliance with Multilateral Environmental Agreements (MEAs) come from governments through national reports. As will be discussed later in this paper, self-reporting by governments can result in inaccurate or untimely reporting. The key data, of course, are not what the states say they are doing, but what they actually are doing to imple-

ment their obligations under various MEAs. This includes passing national legislation; providing appropriate training and funding for the agencies responsible for compliance; and undertaking the enforcement and compliance assistance efforts needed to achieve compliance.

Some efforts have been made to build more available datasets on environmental enforcement and compliance. For instance, EPA now requires the disclosure of specified chemical emissions by private firms under threat of stiff penalties through its Toxics Release Inventory program.¹ At the international level, Oran Young, Helmut Breitmeier, Michael Zürn and others have created the International Regimes Database (IRD) to empirically analyze 23 MEAs.²

Despite these efforts, most empirical studies done thus far are incomplete in two ways. First, most available data today are based on self-reported data from industries and governments, and these data raise questions of accuracy. Inadequate data or inaccurate datasets can lead to misleading depictions of what is happening. Moreover, the lack of data also makes it difficult to generate and empirically test policy-relevant hypotheses. Second, most empirical studies have not assessed where on the "compliance spectrum" the targets of their studies fall. Chester Bowles has said that, "20 percent of the regulated population will automatically comply with any regulation, 5 percent will attempt to evade it, and the remaining 75 percent will comply as long as they think that the 5 percent will be caught and punished."³ If the targets of empirical studies fall in the 20% category, then those studies tell us little about the success of the regulation. An appreciation of where on the compliance spectrum firms or industries fall is critical in order for empirical studies to generate meaningful results.

There continues to be a great demand for more well-functioning, reliable, and comprehensive data gathering systems. NGOs and various international networks like INECE have already helped gather and validate information, and they will continue to be key players in the devel-

opment of such information gathering systems. In addition, collaboration between the practitioner and research communities also will be vital to developing more comprehensive empirical data on environmental compliance, as well as to generating the most policy-relevant hypotheses.

2 AVAILABLE EMPIRICAL STUDIES AT THE NATIONAL LEVEL

This section of the paper introduces several empirical studies that have been conducted at the national level. Due to the space limitation, this paper will be able to provide only a few examples of these studies and is not meant to be exhaustive. Moreover, this paper does not necessarily endorse or affirm the conclusions drawn by these empirical studies; rather, it aims merely to provide a general overview of a selection of the available empirical studies on environmental compliance.

2.1 Government Inspection and Compliance

As stated above, many empirical studies at the national level involve oil spills or specific industries such as the paper and pulp industry because relatively comprehensive data is available for these sources. One set of these studies examines the effects on compliance rates from increasing inspections; another set examines the effects on compliance from raising fines or sanctions.

The earliest empirical analysis of environmental monitoring and enforcement activities appears to be Epple and Visscher's 1984 study, which examined the U.S. Coast Guard's enforcement of oil spill regulations and found that increased monitoring activity results in lower oil spill volume.⁴ Cohen extended the Epple-Visscher analysis in 2000 by empirically comparing the effectiveness of different types of Coast Guard monitoring activities, and concluded that: (1) actual monitoring of oil transfer operations was an effective deterrent; (2) random port patrols designed to detect

spills were also effective; and (3) inspections of vessels to determine whether or not they were in compliance with oil spill prevention regulations was ineffective in terms of oil spill volume.⁵

In 1990, Magat and Viscusi studied the impact of government inspections on water pollution levels and compliance rates in the pulp and paper industry in the U.S.⁶ Their study also suggested that higher levels of inspections result in lower levels of pollution. Liu replicated the Magat-Viscusi study in 1995 with updated data and more complete information on inspections and their impacts on compliance rates.⁷ Unlike Magat and Viscusi, Liu found that increased inspections do not necessarily reduce the number of known violations.

Nadeau's 1997 study of EPA enforcement effectiveness extended the previous analyses by including the length of time of violation. Overall, he found that an increase in monitoring and enforcement activities resulted in reduced length of violation.⁸ Laplante and Rilstone's 1996 study of pulp and paper mills in Canada concluded that even the mere anticipation of future inspections leads to reduced emissions and to an increased frequency of self-reporting.⁹

Studies of other industries reveal a similar relationship between inspections and compliance rate. For instance, in 1996, Gray and Deily examined steel industry behavior and government inspections and, consistent with most of the other published empirical papers, found that increased inspections lead to a higher compliance rate.¹⁰

2.2 Sanctions and Compliance

Other studies have focused on the effects of various sanctioning measures. For example, Shimshack and Ward's 2004 study analyzed the effects of fines and found that a fine helps to deter future violations by the sanctioned plant as well as other plants in the same jurisdiction.¹¹ The study also compared the effects of these monetary sanctions against those of intermediate enforcement actions (IEAs), such

as formal administrative orders, formal notices of noncompliance, and administrative consent orders, and concluded that the IEAs have statistically insignificant impacts on compliance.

2.3 Information Disclosure and Compliance

There have been a few empirical studies on non-regulatory compliance tools as well. One such study was done by Konar and Cohen, who studied the impacts of the EPA's Toxics Release Inventory program (TRI). The study found that the firms with the largest negative abnormal stock price returns upon the initial announcement of TRI emissions were the firms that subsequently reduced their emissions the most.¹²

2.4 Different Enforcement Approaches and Compliance

Still other studies have focused on the effectiveness of different enforcement approaches. In a 1995 study, Harrison compared the different approaches to compliance policy that are found in the U.S. and in Canada, focusing on the pulp and paper industry.¹³ She found that there is higher compliance in Canada, where there is a more "cooperative" approach, than in the U.S. In contrast, an earlier similar study by Kagan, Thornton, and Gunningham found that different compliance approaches do not seem to have significantly different impacts.¹⁴ They analyzed environmental performance in 14 pulp and paper manufacturing mills in British Columbia, Canada; Australia; New Zealand; and the states of Washington and Georgia in the U.S., and concluded that, despite the different types of compliance approaches, there was no consistent difference among regulatory jurisdictions in the environmental performance.

3 EMPIRICAL DATA ON ENVIRONMENTAL COMPLIANCE AT THE INTERNATIONAL LEVEL

Empirical data at the international level is even more scarce than at the national

level. However, there have been some efforts to build empirical datasets to study environmental compliance with several MEAs. For example, Young, Breitmeyer, Zürn and others have created the International Regimes Database (IRD). This relational database, which was assembled over a ten-year period, allows researchers to quantitatively analyze a set of 23 MEAs.¹⁵ It appears to be the only such database yet assembled in the world, and will allow researchers to move beyond case studies and “to ‘test’ propositions regarding the formation and performance of regimes using relatively large numbers of records dealing with specific variables.” The authors present an initial analysis showing that specific regimes make a difference in collective outcomes, that strong sanctioning measures in these regimes have important effects on the compliance rate, and that some “softer” measures and compliance assistance also play a powerful role.¹⁶

Other studies have focused on a particular international environmental regime. For instance, Young and Levy, as well Raustiala and a few others, have studied the effectiveness of the Convention on Long-Range Transboundary Air Pollution (LRTAP) and its subsequent protocols.¹⁷ They have concluded that the Convention has enjoyed a relatively high compliance rate, with many member states even going well beyond the regulatory targets.

In 1999, Mitchell, McConnell, Roginko, and Barrett conducted a detailed study on the International Convention for the Prevention of Pollution of the Seas by Oil (OILPOL) of 1954 and the International Convention for the Prevention of Pollution from Ships (MARPOL).¹⁸ They analyzed the amount of tankers’ oil discharges before and after the implementation of these Conventions and concluded that the Conventions likely helped reduce the oil discharges.

In addition, Weiss has empirically analyzed the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol).¹⁹ She noted a large

reduction in the consumption levels of the controlled substances but concluded that the Protocol has suffered from member states’ significant noncompliance with its reporting requirement.

Finally, Reeve has done an empirical study on the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).²⁰ She noted some success of the Convention in curtailing illegal trade in wildlife but also pointed out significant noncompliance rates with the Convention’s requirements for reporting, passing of national implementation legislation, establishment of national scientific authorities, and contribution to the CITES Trust Fund.

4 CONCLUSION

Environmental protection and sustainable development are data intensive efforts. “Uncertainty seems to be the hallmark of the environmental domain. Disagreements over how best to cope with information deficits have translated into bitterly partisan and divisive environmental politics and limited progress in recent years in pollution control and natural resource stewardship.”²¹

We have made significant progress in collecting empirical data at both the national and international levels. Compliance officials and enforcement agencies have begun collecting data, and policymakers have increasingly turned to indicators. Indicators are an important part of a pragmatic, empirically-grounded approach to environmental management based on the collection of hard data on actual consequences of decisions that then inform subsequent rounds of decision-making “in a continuous information feedback loop that enables dynamic readjustment of policy and practice.”²² INECE has significantly contributed in this endeavor by developing an indicators project.²³ In addition, INECE is helping coordinate the efforts of the research community with the practitioner community to ensure that the research community focuses on the most important questions and not just those where the

datasets are most convenient.

All of these efforts have certainly helped us understand the current state of compliance with numerous national and international environmental regulations. However, the available datasets are still scarce to conduct an accurate evaluation of existing policies and strategies. Moreover, environmental and health quality is continuing to deteriorate. Therefore, it is essential to continue and better support the efforts to further build empirical studies on environmental compliance. Moreover, it is equally important to build feedback loops into policy and strategies so that law and governance take account of these empirical findings, adjust accordingly, and get ahead of the environmental problems they are designed to address.

5 REFERENCES

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