



**OECD CONFERENCE ON**

**PUBLIC ENVIRONMENTAL POLICY AND THE PRIVATE FIRM**

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*CONFERENCE PROCEEDINGS*

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## **PUBLIC ENVIRONMENTAL POLICY AND THE PRIVATE FIRM:**

### **CONFERENCE PROCEEDINGS**

During the last few years there has been an increasing awareness on the part of firms of the potential to realise certain commercial objectives through improved environmental performance, and an increased awareness on the part of public policy-makers of the need to understand how firms actually operate when policy-makers are designing and implementing environmental policy. In order to explore these issues a multi-country industrial survey has been undertaken by a consortium of research teams coordinated by the OECD Environment Directorate, analysing the relationship between environmental policy design and firm-level management. This involves the collection of data from over 4,000 firms and facilities in seven OECD countries.

In order to review initial work arising out of this project, a conference on “Public Environmental Policy and the Private Firm” was held on 14-15 June 2005 in Washington D.C. The conference was jointly organized by the OECD, the US Environmental Protection Agency and Environment Canada. The objectives of the Conference were four-fold:

- Present and review the work of the OECD on the links between public environmental policy and private environmental management, innovation and performance;
- Share insights from the research of other academics from across the OECD working on these themes;
- Provide a context in which government officials, business representatives, non-governmental organisations, and academics could discuss these issues in a constructive manner; and,
- Identify the research needs of policy makers and discuss ways in which such needs could be filled by the research community.

The conference brought together about 120 participants from OECD government ministries of environment and industry, representatives of private firms and business organisations, environmental NGOs and research centres, and academics.

Overall, the participants were greatly interested by the research presented and policymakers thought that the OECD research provides interesting and policy-relevant findings. Some participants, mainly academics, raised issues concerning the data collection process and some of the empirical analyses presented. These points will be reflected in the presentation of outputs from the project. In the next two sections we will describe the OECD database strengths and weaknesses and then turn our attention to the main points discussed during the conference.

#### ***Strengths...***

The OECD database covers manufacturing facilities with more than 50 employees in seven OECD countries (Japan, Hungary, Norway, France, Germany, United States and Canada). Questionnaires were mailed to chief executive officers and environmental managers, with follow-

up by telephone. 25% of those receiving questionnaires responded to the survey, with good representation across manufacturing sectors and facility size classification.

The data generated is very valuable for a number of reasons. First, the project is unique in that the database brings together harmonized information on seven OECD countries. This is very important since most available evidence focused on North America (mostly the United States). Since one might expect differences between countries, it is valuable to have a broad coverage in terms of countries, although care must be taken in the empirical analysis and interpretation of the results.

Second, the project targeted small and medium-sized enterprises (SME) as well as larger firms. This is very important since regulators are currently shifting their focus toward smaller firms and most available evidence does not include SMEs at all. The database includes over 2,500 observations from facilities with 250 or less employees and this allows the teams to derive results which are of broader relevance than studies which focus on large firms.<sup>1</sup>

Third, the OECD data cover a wide range of manufacturing sectors. So far most analyses of regulatory impact have been performed in the 'heavily' polluting sectors because those sectors were the first to be targeted by environmental regulations. More and more 'not so' polluting sectors are being targeted by regulators and it is therefore very important to understand how firms in those sectors respond to environmental policies.

Fourth, and perhaps most importantly, data on a number of issues were collected which are not usually available. For instance, there is a rich amount of data on environmental management practices (existence, certification and age of an environmental management system, other environmental management practices, institutional location of responsibility for environmental matters, etc...). In addition, data was collected on the public policy framework, market conditions, and structural characteristics of the facility and firm. This allows for analysis of a wide variety of questions of interest to policymakers.

Fifth, the data was collected in a rigorous manner, following established practices for voluntary business surveys undertaken by post. Questionnaire design (including pre-testing) and survey implementation (stratified sampling, targeting respondents, follow-up, etc...) were consistent with best practice. While it would have been preferable to undertake face-to-face interviews with respondents this would have resulted in a very significant increase in the budget.

#### *... and weaknesses of the OECD database*

The project also has some weaknesses, most of them common to all voluntary surveys, which need to be acknowledged and addressed to the greatest extent possible. Indeed, some of the shortcomings are inherent consequences of the data collection process. However, they do have implications for the nature of the analyses undertaken and for the interpretation and generalisability of the results obtained.

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<sup>1</sup> For instance, in many studies firms in the Standard and Poor 500 are sampled.

First, concerns have been raised about the levels and variation in response rates (from 9% in France to 35% in Norway). However, as was pointed out, the response rates obtained were at the very high end of the range of response rates for voluntary postal business surveys. Moreover, the sample is sufficiently large, relative to the population, for sampling error to be kept to acceptable levels.

However, any response rate less than 100% raises the issue of sample composition. While the sample was stratified across facility size and industrial sectors, if response rates vary within these cells there may be sample bias, affecting the results. Further efforts will be made to document the representativity of the sample. Irrespective, one needs to be careful in interpreting results involving cross-country comparisons. Tests of robustness need to be undertaken to ensure the results hold for specific sub-samples.

More significantly, it is possible that there was some selection bias in the data collection process. Facilities with good 'environmental practices' may have been more likely to respond to the questionnaire than bad performers. Review of the data reveals significant variation in the responses, but efforts will be made to cross-validate with other sources in order to evaluate how significant selection bias may be. In addition, a comparative review of early and late respondents should cast light on this question.

Fourth, the nature of the data collection process raises the potential for some strategic bias amongst respondents. Some 'laggards' may have sought to present themselves as 'leaders'. Some respondents may have tried to downplay the role of regulatory influences on their behaviour, believing this would help make the case for the ineffectiveness of policy stringency. Others, may have done the opposite – feeling that they could only benefit for more stringent policy. However, the results do not reveal significant evidence of strategic bias, although this can be difficult to ascertain.

Fifth, the data collected is mainly qualitative in nature. Without doubt, this helped increase the response rates significantly, but this means that it is harder to quantify some effects and generate firm policy conclusions with respect to some issues. Therefore results where this can play a significant role should be interpreted with great care.

Sixth, some important variables are perception measures and those perceptions may be very different from reality. For instance, facilities responded that at least some measures which are rarely used in practice (e.g. tradable permits) had a significant influence on their behaviour. This poses some challenges regarding which variables should be applied in the analyses and how to interpret our results. More generally, there is a need to be very clear while describing the variables and what they actually mean and measure.

Seventh, the data is just a single cross-section. Depending upon the hypotheses which are to be tested this can be of greater or lesser importance. For cases in which there are significant lags in the response of a given dependent variable to changes in a given explanatory variable this can be a problem. In addition, panel data would allow us to tease out the direction of causality more satisfactorily for cases in which different variables are determined endogenously.

In the following sections, we will present the discussions based on the findings of the OECD project and similar research projects. Finally, we will summarise the discussion on the additional analyses that could be performed using the OECD database and on the overall research needs at the interface public and private environmental policy.

### *Environmental Management and Performance in Firms and Facilities*

The results of OECD research which examined the determinants of a facility's decision to introduce environmental management systems, practices and tools were presented (Henriques et al. 2005). The research sought to answer the following questions: What factors influence whether or not a facility will implement an EMS? What factors influence whether or not a facility will certify its EMS? What factors influence whether a facility hires a person explicitly responsible for environmental matters? What factors influence the comprehensiveness of a facility's environmental management practices (auditing, reporting, accounting, etc...)?

They conclude that in general, a facility's resources and capabilities play a critical role in affecting the level of environmental initiatives across the seven OECD countries. In addition, relative to facilities in the United States, facilities in all countries (except Norway) are less likely to have a person explicitly designated as being responsible for environmental issues and tend to implement fewer environmental management practices. All countries except Canada are more likely to certify their EMS relative to facilities in the United States.

Somewhat surprisingly, public technical assistance programs appear to act as a substitute to the implementation of private environmental management initiatives. Second, although government incentive programs that encourage the adoption of environmental management appear to increase a facility's adoption of an EMS, the hiring of an individual responsible for environmental matters and the comprehensiveness of its EMS, it also reduces the likelihood that the facility will have its EMS certified. Third, although regulators view regulatory pressures as having a negative influence on a facility's decision to implement an EMS or other environmental management practices, more frequent inspections encourage facilities to invest in environmental matters via the hiring of persons responsible for environmental issues and implementation of a greater number of environment-related practices.

One participant from the business community pointed out that more and more facilities are mainstreaming environmental issues in their operations: environmental management within facilities is moving away from the explicit designation of a specific employee or a department being responsible for environmental issues to more delegated responsibility being shared by each department involved. Since the database holds information of the institutional location of responsibility for environmental matters (i.e. senior management, production/operations, environmental department, etc.) some light can be cast on this phenomenon in possible future work.

The focus of discussions shifted to the assessment of the links between public policy incentives and corporate environmental performance in the OECD project (Johnstone et al. 2005). Public policy incentives can influence environmental performance in two ways: in a direct manner through the application of 'traditional' environmental policy instruments (whether direct regulation, market-based instruments, etc..) and in an indirect manner through efforts to affect the

decision to implement an environmental management system (EMS) and practices. Precisely, the research seeks to answer the following questions: What public policy variables affect environmental actions and performance? Does the introduction of an EMS result in increased propensity to undertake concrete actions or achieve improvements in environmental performance? What public policies promote EMS adoption and do they affect the relationship between management and performance?

The research concludes that in general self-perceived policy stringency has a significant positive impact on environmental performance. The same results hold for the frequency of inspections. In addition, the results indicate that EMSs have an appreciable influence on environmental performance, even when the possible endogeneity of the decision to implement an EMS with performance is controlled. However, it was pointed out that even if EMSs lead to better environmental performance, EMSs do not necessarily pass a cost/benefit test. One should compare the value of the environmental improvement arising from their introduction with the implementation and maintenance cost of an EMS (Glachant).

General policy variables also have an influence on the decision to implement an EMS, with performance standards having a positive influence on such decisions. Among the targeted incentives provided by the regulators to implement an EMS the provision of financial support and the reduction of inspection frequency have the most important influence, which can raise concerns about the efficacy of public support for the introduction of an EMS.

In particular, if the environmental improvement arising from the introduction of an EMS is affected by the motivation for its introduction this can have important policy implications. For instance, there is considerable research seeking to determine whether EMSs are primarily used by firms as a signal to indicate good environmental performance, or whether they genuinely help facilities to better manage environment-related issues (King). Research is needed to understand which view best fits reality – although it is likely that both are at least partly true. However, the case for providing incentives for the introduction of EMS's and other environmental management practices is weaker if they are primarily used as a signal by facilities.

Others argued that it is easier for public authorities to regulate when an EMS is in place, but that the presence of an EMS is no guarantee of compliance. Some evidence from the United Kingdom (Cheesbrough) suggests that EMSs lead to better environmental performance but not necessarily to better compliance. In addition, examples from Japan show that EMSs can be too rigid and therefore inhibit sudden adjustment in situations where they are much needed (Nakamura). Interestingly, it was pointed out that some firms may decide not to implement an EMS, or not to certify it if they have one in place, because they fear litigation. The presence of an EMS may make firms more vulnerable since they are less able to argue that they were not aware of non-compliant behaviour or environmental damages generated.<sup>2</sup>

#### *Environmental Innovation and Research*

The results of OECD research examining the determinant of environmental innovation were presented (Arimura et al. 2005). The research 'proxies' environmental innovation by

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<sup>2</sup> For a theoretical argument see Pfaff and Sanchirico (2000).

environmental research and development (R&D) and sought to answer the following questions: What promotes environmental R&D? Does environmental policy strength play a role? Do different policy instrument have a different impact? Does the presence of an EMS or other environmental management tools promote R&D?

The research reached the following conclusions. First, as expected, environmental R&D is responsive to environmental policy stringency. Second, amongst the different environmental management practices, the presence of an environmental accounting system in particular seems to matter a great deal with respect to investment in environmental R&D. Third, environmental policy instrument choice does not have a direct influence on environmental R&D but it does have an important indirect influence on environmental R&D, via the effect on the environmental accounting systems. Overall, well designed environmental policy can induce environmental innovation by stimulating investment in environmental R&D.

However, concerns were raised by the use of a binary variable to model this decision. It was pointed out that a model in which actual expenditures were used as the dependent variable may have yielded very different results (Nakamura). Moreover, since much innovation does not necessitate investment in research and development, but rather more incremental adaptation of available technologies, alternative 'proxies' may be preferable. This is, of course, compounded by the fact that much research and development does not lead to commercially viable innovations.

Research from the OECD project on the choice between investment in changes-in-production-processes (CPP) and end-of-pipe (EOP) technologies to reduce environmental impacts of production (Frondel et al. 2005). The research sought to answer the following questions: Why do facilities decide to implement CPP rather than EOP? Does the application of different environment policy instruments have a different impact? Do (environmental) management tools play a significant role?

The report concludes that regulatory measures and the stringency of environmental policy are positively correlated with end-of-pipe technologies while facilities looking for cost savings are more likely to adopt cleaner technologies, involving CPP. In addition, general management systems and environmental management tools seem to support the implementation of cleaner production processes. The policy implications of this work are two-fold. First, the introduction of (environmental) management tools can improve the information basis for decisions to invest in cleaner technologies. Second by additionally charging for the use of waste and energy and other environment-related inputs incentives to invest in CPP would increase. This is consistent with other research (Brunnermeier) which suggests that innovation (measured by the patenting activity) responds to policy incentives (proxied by reported pollution abatement expenditures).

An area which is often overlooked in the environmental literature is that the innovation process is risky. This should be addressed in future research – perhaps assessing the role that a long-sighted and transparent policy framework can have on innovation. It should be borne in mind that while environmental regulation can induce the diffusion and incremental improvement of technological best practice, it can impose some adaptation costs. These should be minimised through the use of flexible instruments. Moreover, the stringency of environmental policies are determined in part by the current level of technical change. As such, environmental policies should respond to changes in available technology, as well as induce such changes. However, while the regulatory

framework can create novel market opportunities, it was argued that in some situations current environmental policies may be diverting efforts to implement more drastic innovations, encouraging firms to focus their effort on trying to find readily available ways to comply with regulations.

Policymakers participating at the Conference highlighted the fact that in many countries 'pollution prevention' is the increasingly the primary approach to environmental policy, and that the policy framework needs to be designed such as to encourage its application. It is therefore instrumental to understand the determinants of the choice between EOP and CPP. It was also pointed out by policymakers that the links between environmental policies and innovation should not only focus on the production side but also on the product side. Indeed, environmental policy can create incentives to come up with more environmentally-friendly products and this should be accounted for while evaluating those policies.

### *Links between Environmental and Commercial Performance*

The results of OECD research examining the links between environmental and commercial performance were presented (Darnall et al. 2005). The research seeks to answer the following questions: Does it pay to be 'green' and if so does this have implications for public policy? Do industrial sectors differ in their ability to derive financial benefits from environmental actions? Do "late" environmental movers derive more low-cost improvements and therefore reap greater financial benefits than "early" movers? Are firms operating in sectors experiencing high growth more or less likely to derive financial benefits from environmental actions?

The research concludes that that 'it pays to be green', but not if the government forces you to be green – i.e. reductions in environmental impacts are associated with increase in profits but, facilities operating in a more stringent regulatory framework have lower profits. Sectors did not differ in their ability to earn positive profits from their improved environmental performance.

It was argued that information about the benefits of reducing their environmental impacts should be dispersed to firms especially to SMEs. However there is no need to target this information to specific sectors. In addition, it was argued that a reliable system that identifies which facilities are good environmental stewards should be implemented. Third, information about the companies with good environmental performance should be made available. However, these points were questioned by some participants who felt that the market itself was able to process and disseminate the necessary information and there was no specific need for a public role. This remains an area warranting further research.

Other research presented (Lizal) suggests that ownership structure may influence environmental performance indirectly through financial performance. There is also some empirical support for the Porter hypothesis. Even if the short-term impact of environmental policies on productivity growth is negative, in the long-run this impact is positive (Lanoie). It was also noted that most studies on the links between environmental and financial performance cannot control for firms' unobservable characteristics since they do not have time series panel data. Therefore, the apparent links between environmental and commercial performance could be drive by unobservable characteristics such as 'good management'.

Thus, a number of participants noted that successful firms do a lot of things well and therefore the observed links between good environmental and commercial performance may be a direct consequence of good management, rather than any specific relationship between the two variables of interest. A study of Norwegian plants (Telle) across the period 1990-2001 demonstrate that the relationship between environmental and commercial performance ‘disappears’ when one controls for a plant’s unobservable characteristics.

### ***Business and Government Roundtables***

This roundtable was organised to give business representatives and policymakers an opportunity to share their views on the key issues in the relationship between the design of environmental policy and firm-level decision making with respect to environmental management and performance. The roundtable was chaired by Jay Benforado (Director, National Center for Environmental Innovation). The other participants were Peter Sol (Environment Canada), Michael Kuhndt (Wuppertal Institute), Lars Aagaard (Confederation of Danish Industries), Chantal-Line Carpentier (Commission for Environmental Cooperation) and Stephen Harper (Intel Corporation).

First, a participant noted that within OECD countries, policies play two different roles: the first is to implement safeguards (with penalties in case of non-compliance) and the second one is to encourage environmental stewardship (with rewards). Which one is the ‘right track’? Participants agreed that both tracks are needed and are in fact complements rather than substitutes. Sometimes the ‘carrot’ can even be embedded within the ‘stick’ (give example). More generally, since firms value flexibility highly, they might be willing to accept more stringent regulations if those regulations are more flexible.

Second, participants agreed that cooperation between the government, the business community and civil society is needed in the preparation of environmental regulations. This is interesting because it provides a forum in which the various stakeholders can share information. The government can announce forthcoming regulations and therefore avoid taking the firms by surprise. Similarly, the business community can inform the government on the technical feasibility of proposed regulations. Civil society can also have its say in the process and overall, regulations may be more acceptable for all the parties involved. However, it was recognised that not all information is shared equally, and there is potential for all sides to behave strategically. Moreover, some forms of cooperation can be distortionary – i.e. protecting market insiders or domestic firms.

Third, participants from the business community also highlighted the fact that what firms need are clear and stable long term objectives. This point has been made previously with respect to innovation, but is more generally valid. Policy needs to be incremental and the regulator should focus on setting the target, and avoid specifying how specifically it should be achieved by regulated firms. Whenever possible, time should be given to firms to prepare themselves for the regulation, and allow for the synchronisation of compliance with regulations and investment plans and capital turnover.

Fourth, a participant noted that the way environmental issues are currently managed during the product life could be improved. Indeed, currently 80% of the management efforts are concentrated to a stage (i.e. production process) where only 20% of the environmental impacts occur. More

effort should be targeted at the supply chain and at the consumption phase. In addition, natural resource use, the firms and consumption should be linked and better understood.

### *Identification of Research Needs*

This session was held to identify specific research needs at the interface public and private environmental policy for policymakers. Some of the discussions were devoted to the need to obtain a better measurement system for environmental performance. The strength of the OECD project arises in part from weaknesses in existing data collection practices. For many countries data on key firm-level environmental variables (e.g. management practices, abatement expenditures, environmental technologies, effluent and emissions) are not available, and if available they are not collected in a co-ordinated manner across countries (reference to EU).

More generally, what we mean by environmental performance is not always clear. Should we focus only on the production process? Should we take the supply chain into account including the consumption phase? While there is evidence that consumers, financial markets, employees and others value good environmental performance, it is not clear that they are able to distinguish between good and bad environmental performers in the market. If this is not so, there is a case for a public role, but precisely what form this role should take is unclear. For instance, it is not evident that support for facilities which use EMS's as a signal would serve the public interest.

If one wants to deal with long-term pollution problems, technological innovation is indispensable. Therefore, environmental policies should be designed in a way which is likely to spur environmental innovation. Unfortunately, a robust theory of the links between environmental policy and environmental innovation is lacking. Various participants shared their concerns about this and called for more research on this important topic. On the empirical side, there is a need for smaller, more compact sample of firms to which a given instrument, expected to have an impact on innovation, has been applied to understand better the real impact of different instruments. The next step should then be to generalize those findings with bigger datasets.

There was also some debate about different paths regulations are taking. Some countries favour rewarding the leaders in environmental performance while others target the laggards. How can the two groups be identified and where should policy efforts be focussed? Is the government best suited to provide the kind of recognition leaders are looking for? Should the government try to help the laggards or should it simply let the old/dirty facilities close down? Since such groups and definitions are fluid and incentives for one group can affect the behaviour of the other, research is required in this area.

In addition, some participants were particularly concerned about the role of SMEs. A majority of them are neither leaders nor laggards, but are simply confused about the nature of environmental regulations, and even whether they are subject to different parts of the regulatory framework. It should be noted that it is not always easy to differentiate them at first sight. There is the need to understand the SMEs' responses to environmental policies and to find ways to help them understand those policies. There are also some concerns on how to implement good policies targeted toward the SMEs, not least because of the high administrative costs.

Some investment funds are targeting 'green companies' and want to incorporate environmental performance criteria in their investment decisions. To be able to do so they need some harmonised and credible information. While some initiatives have been launched, there was considerable scepticism about the credibility of the information basis upon which environmental performance was evaluated. Indeed, firms tend to collect their own data on environmental performance and one cannot always tell if differences in environmental performance data reflect real differences in performance or simply capture differences in the data collection process.

Transaction costs in implementing regulations were also discussed and some issues were raised. Are transaction costs lower with economic instruments than with command-and-control ones? Are there some trade-offs in terms of transaction costs between broad and specific regulations? Since the research community has generally focussed on the environmental effectiveness and economic efficiency of different policy measures, administrative costs are relatively under-examined and warrant further analysis.

And finally, while they were generally viewed favourably, there was a degree of scepticism about the value of EMS's, particularly if they are actively encouraged by public authorities. Firstly, it is important to determine whether they are primarily used as 'signals' of environmental performance, or whether they have a determinant role in bringing about such performance. Secondly, more attention should perhaps be focussed on discrete concrete environmental management tools, rather than EMS's per se.

The database collected by the OECD can be used to address some of these issues, but clearly the research agenda is much broader. Nonetheless, the database should be exploited to the extent possible. Furthermore, it was recognised that the work of the OECD would be further enhanced if the follow-up work was undertaken in one of two ways: co-ordinated collection of micro-level data on key environmental variables through official data collection; and, undertaking another round of the existing survey to allow for improved analysis and more credible results in a number of key areas.

*Conference Papers (available shortly at [www.oecd.org/env/cpe](http://www.oecd.org/env/cpe))*

Arimura et al. (2005) An Empirical Study of Environmental R&D: What Encourages Facilities to be Environmentally-Innovative?

Darnall et al. (2005) Does a Firm's Financial Performance Predict its Financial Performance?

Frondel et al. (2005) End-of-Pipe or Cleaner Production? An Empirical Comparison of Environmental Innovation Decisions across OECD Countries

Henriques et al. (2005) Environmental Management Systems and Tools: an international perspective

Johnstone et al. (2005) Many a Slip 'Twixt the Cup and the Lip: Direct and Indirect Policy Incentives to Improve Environmental Performance

*An Agenda and PowerPoint versions of the Conference Presentations can be obtained from:  
[http://www.oecd.org/document/62/0,2340,en\\_2649\\_33713\\_35089598\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/62/0,2340,en_2649_33713_35089598_1_1_1_1,00.html)*

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14 June 2005 - 15 June 2005

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