

Executive summary

It is well-understood that in the absence of public policy interventions firms will face inadequate incentives to take into account the environmental impacts of their production choices. It is also well-understood that market-based instruments and flexible performance standards are a more efficient means for public authorities to provide such incentives than more direct forms of direct regulation. However, a detailed analysis of the effects of public environmental policy on the inner workings of the firm has been largely absent from the vast body of literature which has been marshaled in support of these insights.

In this volume an assessment of the effects of environmental policy and other factors on environmental management, performance and innovation is provided. It does so by summarising results based upon empirical analyses undertaken in the following areas:

- The determinants of having in place an environmental management system or tools;
- The determinants of undertaking various investments to reduce selected environmental impacts;
- The determinants of investing in environment-related research and development;
- The determinants of improving environmental performance through integrated clean production rather than end-of-pipe abatement; and,
- The links between commercial strategies and performance and environmental actions – i.e. ‘win-wins’.

The database covers a wide range of issues, with observations from over 4,000 facilities in seven OECD countries

The empirical studies undertaken drew upon a database which includes observations from approximately 4,200 facilities with more than 50 employees in all manufacturing sectors in seven OECD countries (Canada, France, Germany, Hungary, Japan, Norway, and United States). The data was collected by means of a postal survey conducted in 2003. Respondents were generally chief executive officers (CEOs) and environmental managers.

Data was collected on facility-level environmental practices, including physical investment in abatement, research and development expenditures, and implementation of environmental management systems and tools. In addition, the database provides information on the characteristics of the environmental policy framework to which facilities are subject. And finally, data was collected on other factors such as whether the facility manufactured final goods or intermediate inputs, whether it targeted local or international markets, whether it is listed on the stock exchange, whether it was profitable, and a host of other factors.

Policy stringency encourages improved environmental performance, clean production and research and development

There is evidence that perceived (environmental) policy stringency has a positive influence on:

- *environmental performance* – Those facilities which see the environmental policy framework as “stringent” are more likely to have undertaken significant investments with respect to a variety of environmental impacts, as well as to have reduced the effects of their production practices on these environmental impacts in the preceding three years.
- *clean production* – Perceived policy stringency encourages changes in production processes, especially toward processes in which production of conventional outputs and pollution abatement efforts are integrated, rather than being addressed through ‘end-of-pipe’ technologies (e.g. scrubbers, filters, etc.).
- *research and development* – Investment in environment-related research and development is also encouraged by stringent environmental policies. Policy stringency provides strong incentives for firms to search out alternative means of improving environmental performance.

Environmental-commercial ‘wins-wins’ do exist, but they are not induced by the environmental policy framework

Environmental factors seem to play only a limited role in a facility’s overall commercial performance, with factors such as the nature of the market (and the product), not surprisingly, being considerably more significant. However, good environmental performers are still somewhat more likely to report being profitable, and to experience sales growth. This suggests that there are some “win-win” opportunities available at the level of the individual facility. The evidence indicates that most of these relate to supply-side factors (e.g. cost savings) rather than demand-side opportunities (e.g. product differentiation).

However, the role of perceived public environmental policy stringency on commercial performance (profitability, value of shipments) is consistently negative. This suggests that those “win-wins” that do arise are not induced through public policy – they emerge as a consequence of incentives internal to the firm. This is actually reassuring, because it implies that facilities are undertaking initiatives to improve environmental performance which are in their private commercial interest (input cost savings, reduced liabilities, etc.), and that public authorities are (appropriately) focusing only on the measures that would not otherwise be undertaken (i.e. benefits primarily accrue externally to the firm).

More flexible policy measures encourage investments in clean production and environment-related R&D

The choice of environmental policy instrument affects the means by which an individual facility will achieve its reported environmental performance. For instance, approximately 10% of facilities report that they have invested in environment-related R&D. However, the likelihood of having done so depends upon the nature of the policy framework to which they are subject. In particular, since returns on R&D are likely to be higher the greater is the potential scope for implementing any given innovation, flexible instruments (such as market-based instruments and performance standards) should have more positive effects than more prescriptive instruments (because the latter constrain technological choices).

Indeed, in the analyses undertaken it is found that policy flexibility *directly* induces environmental R&D. Introducing more flexible instruments can also have a positive *indirect* influence, by encouraging introduction of environmental accounting - which in turn encourages investment in environment-related research and development.

The choice of environmental policy instrument on the decision whether to invest in an integrated “change in production process”, rather than in “end-of-pipe” (EOP) abatement, was also explored. The former can be characterised as ‘clean’ production since a change in production process is likely to reduce environmental impacts at source. It may also be more efficient since economies between production of the conventional output and pollution abatement can be exploited. However, the ability of a facility to exploit these possibilities is clearly affected by the policy framework to which they are subject. In particular, it was found that the presence of direct regulations (technology standards) increases the propensity to invest in EOP, while environmentally related taxes and (to a lesser extent) performance standards favour the introduction of change in production process. The presence of input bans also favours the introduction of change in production process measures.

Environmental management systems improve environmental performance, but incentives for their introduction should be designed with care

In the sample approximately 39% of facilities report that they have an environmental management system, with many also reporting the implementation of other specific environmental management tools (environmental accounting, reporting, training, etc.). In the empirical work undertaken it was found that the implementation of environmental management systems and tools have a positive effect on environmental performance, which is consistent with previous work in this area. Moreover, for facilities that have already implemented environmental management systems, there is some evidence of a positive role being played by third-party certification, as well as by the length of time in which the EMS has been in place. This suggests the importance of EMS “quality”.

Given this positive management-performance relationship, it is not surprising that public authorities are increasingly interested in examining how public policy can support the introduction of EMSs and related tools, and there is evidence that perceived policy stringency encourages facility managers to do so. Clearly, EMSs and related tools (such as environmental accounting and reporting) provide information which is helpful to managers in their efforts to ensure compliance with environmental policies and improve their environmental performance more generally. However, the role of public policy seems to be less significant in this decision than that of other influences (especially downstream buyers).

In addition to the effect of the general policy framework on environmental management, the OECD project also examined the role that more targeted public policy initiatives aimed at encouraging the introduction of EMSs have on facility-level decision-making. Here, it was found that perceived reductions in inspection frequency and the provision of financial assistance are the two most important direct policy incentives for the implementation of environmental management. The former effect is most important for large firms; the latter is particularly relevant for small and medium-sized firms. The finding that there is a positive relationship between the introduction of EMSs and the perception that this will reduce inspection frequency is troubling, because this implies that public policy incentives could generate a direct negative effect on environmental performance, whatever the indirect positive benefits via improved environmental management might be.

Perhaps the greatest benefit of flexible instruments is the effect they have on the delegation of responsibility for environmental matters inside the firm

70% of facilities reported that they had designated somebody as being explicitly responsible for environmental concerns within the facility. In many cases (17%) these individuals were in specialized environmental health and safety departments, but a large percentage also reported that they were in senior management (23%) or had more general responsibilities for production and operations (11%). A small percentage (4%) reported that they were in finance or accounting positions. This is significant since both the likelihood of incurring environmental R&D expenditures or investing in 'clean' production are significantly influenced by the location of the individual who is designated as being responsible for environmental matters.

In the case of R&D, the results indicate that it is important that this individual have access to sufficient financial resources; in the case of "clean production", it is important that (s)he be able to directly influence production decisions. Even if the decision about the location of this individual is a decision (rightly) left to the facility managers themselves, it is affected by the public policy regime. Policy instruments which allow for far-reaching and integrated production/abatement strategies, and which transform environmental practices into commercial decisions, will encourage managers to shift responsibility for environmental practices upwards within the corporate hierarchy, and to "mainstream" implementation throughout the core of the facility. This may be one of the most important (and most often overlooked) benefits of introducing more efficient environmental policies, such as market-based instruments.