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Standard economic doctrine assumes that firms exist in an equilibrium in which they have already optimized the products and services they offer and reduced production costs as much as possible. In such a static model economists do not expect to find additional cost savings waiting to be exploited by firms – any more than they expect to find a $10 dollar bill lying on the ground. If it had been there, it would already have been picked up. This doctrine views regulation always as a burden, imposing some additional cost above the minimum that has theoretically been reached.

In reality, however, this static model of competition has become increasingly obsolete. Today competition is dynamic and based on innovation. In recent years companies have been discovering that, when their attention is focused by properly designed environmental regulations, their innovative responses can improve, or at least do not hurt, their ability to compete with other companies domestically and internationally.

Creative responses to regulation

Environmental standards, if well designed, can trigger innovation that may partially or more than fully offset the costs of complying with them. They can improve a firm's competitive position in a number of ways. They may direct the firm's attention to the cost of incomplete utilization of resources and encourage the collection of more information about wastes -- for example by increasing the number of activities that are monitored, or installing higher-quality systems and devices for monitoring and reporting. When companies improve their measurement and assessment methods to detect environmental costs and benefits, they raise corporate awareness, and increase the incentive to encourage and reward innovations that enhance resource productivity.

Such innovations may reduce product cost by eliminating expensive materials, reducing unnecessary packaging, or simplifying design. This was the result, for example, of a 1991 Japanese recycling law, which led firms to emphasize reducing disassembly time. Innovative responses to appropriately designed regulations can also change production processes in the direction of better material utilization, or finding valuable uses for production by-products. Discharges, scrap and emissions should be regarded as clues to opportunities for cost reduction. Until corporations accept this approach, pressure must be applied through regulations.

The most limited type of response to environmental regulation involves “end of the tailpipe” solutions, seeking ways to deal with pollution problems after they have occurred. Innovations aimed solely at this goal may reduce the cost of complying with regulations, but are unlikely to achieve more than that. The responses that are more likely to serve the aims of the company, as well as of society, are those that take two steps beyond such pollution control measures as waste processing and waste disposal.

The first step is *pollution prevention*, for example using material substitution or closed-loop-processes to limit the waste generation. Firms that are sensitized to the need to understand their environmental impact may acquire valuable information about their production processes. "A recent study of process changes in 10 printed circuit board manufacturers, for example, found that 13 of 33 major changes were initiated by pollution control personnel. Of these, 12 resulted in cost reduction, eight in quality improvements, and five in extension of production capabilities." (106)

The second step – important for regulators as well as for firms – is to reframe environmental issues in terms of *resource productivity*, which is “the efficiency and effectiveness with which companies and their customers use resources.” (106) When this is the focus, it becomes evident that wastes generated by a firm are symptoms of an avoidable opportunity cost, whether it derives from wasted resources, wasted efforts (e.g., avoidable downtime) or diminished value of the final product.

Better regulations will achieve better results

Unfortunately, under the prevailing economic assumption of an inevitable tradeoff between social benefits and private costs, an adversarial relationship between regulators and regulated has often resulted in requirements that imposes higher than necessary compliance costs. If competitiveness is to be better aligned with environmental improvement, environmental standards must be designed to foster innovation in products and production technologies. This requires that regulations focus on outcomes, not technologies.

Standard-setting agencies should not try to second-guess what industry might invent; environmental rules need to be phrased as goals that can be met in a variety of ways. Moreover, regulations should be designed to apply to the latest practical stage in the production chain that goes from raw materials and equipment, to the producer, to the consumer. This will maximize the producer’s flexibility to find opportunities for innovation upstream of the point of regulation. Additionally, regulations should stress the use of market incentives.

Environmental regulations should strive for clarity and good coordination. When it is clear what the regulations are, who must meet them, and how long they will be in effect, industry is more likely to address them through fundamental innovation, rather than adopting incremental solutions or trying to delay or relax their implementation. There is also a need for appropriate coordination between industry and regulators, among regulators at different levels and places in government, and among regulators in different countries.

Industry should participate in standards formulation from early on in the process as is common in many European countries. Companies should not need to deal with multiple regulatory bodies posing inconsistent goals and approaches. On the national level, regulatory policies should be consistent with the practices of other countries – and ideally be slightly ahead of them.

> "This will eliminate possible competitive disadvantages relative to foreign competitors who are not yet subject to the standard, while at the same time maximizing export potential in the pollution control sector. Standards that lead world developments provide domestic firms with opportunities to create valuable early-mover advantages. However, standards should not be too far ahead of, or too different in character from, those that are likely to apply to foreign countries, for this would lead industry to innovate in the wrong directions." (114)

Governments can play some other useful roles in aligning business interests with the social need for environmental protection. They can help to create demand pressure for environmental innovation, for example by supporting eco-labeling. They should also position themselves as demanding buyers of environmental solutions and environmentally friendly products. They can create for a for settling regulatory issues so as to minimize litigation, e.g., through mandatory arbitration. And they can play an important role in collecting and disseminating information about innovative ways for companies to reduce their environmental impact at minimum cost, or even to come out ahead in the process.

Response to critics

Not all environmental damages can be avoided without cost. For example, society cannot tolerate the generation of toxic substances, and may have to increase the cost to firms of generating them. It is then up to firms to seek innovations that avoid toxicity while going as far as possible towards offsetting the cost of doing so. While no claim is made that fully offsetting technologies can always be found, this possibility is far greater than economists have tended to project.

Some critics simply address the question of frequency: they say that innovative offsets to the cost of environmental compliance are a very rare phenomenon. Logically, however, there are reasons to believe in the convergence of social and private costs, at least in the area of pollution prevention and resource productivity. Pollution indicates that resources are being wasted, often requiring a firm to perform non-value-creating activities such as handling, storage and disposal.

Critics of environmental regulations cite studies finding that compliance with such regulations is costly for firms. These costs have been exaggerated in studies depending upon (often inflated) estimates of compliance costs furnished by the industry in advance of the regulation, or looking only at the early stage, before the innovation response has emerged. In addition, net compliance costs are often overestimated by assuming away innovation benefits. In opposition to these findings, there are plenty of other studies which show no evidence that environmental regulations hurt industrial competitiveness – in itself a striking result, when one considers that regulations have so often been designed in ways that decreased industry's ability to respond intelligently.

"The notion of an inevitable struggle between ecology and the economy grows out of a static view of environmental regulation, in which technology, products, processes and customer needs are all fixed. In this static world, where firms have already made their cost-minimizing choices, environmental regulation inevitably raises costs… The new paradigm of international competitiveness is a dynamic one, based on innovation." (97)