



## Environmental policies to stimulate technological innovation

**Environmental policies** must provide the right incentives for the development of innovative technologies that reduce pollution and mitigate the effects of climate change. A recent study has investigated the characteristics of policies that are likely to encourage green innovation and concluded that those that are stringent, predictable and flexible are the most effective.

**Motivating green technological innovation** is a major challenge for policy makers. Previous studies suggest market-based instruments, such as taxes and tradable permits, are more likely to encourage innovation than direct forms of regulations, such as technology-based controls and performance standards. However, the researchers suggest in some cases direct comparisons between market-based instruments and direct regulation can be misleading and a better approach is to use underlying policy characteristics to assess what incentives are desirable for technological innovation.

This study suggests that policy characteristics that are likely to encourage technological innovation include:

- Stringency – the environmental target should be ambitious.
- Predictability – the policy measure should not increase investor uncertainty.
- Flexibility – the policy lets the investor identify the best way to achieve the environmental objective.
- Incidence – the policy should directly target the pollutant.
- Depth – the policy should provide continuous incentives for technology development.

The researchers drew these conclusions by examining patent data, used as indicators of environmental innovation, from over 80 national and regional intellectual property offices across the world for the effects of different measures on technological innovation. They explored the influence of three of the most important attributes: stringency, predictability and flexibility, on the development of new technologies for a wide variety of environmental concerns.

The results suggest that stringent environmental policies create strong incentives for technological improvements, which effectively reduce harmful impacts on the environment. In particular, stringent policies increase the likelihood of the development of innovative technologies which abate air and water pollution and improve solid waste management. The stricter the environmental targets, the greater the incentives to produce higher levels of innovation in order to avoid paying the costs imposed by the environmental policy.

However, stringency alone does not necessarily encourage the optimal level or direction of innovation. Predictability and flexibility are two other policy attributes that encourage technological development.

Uncertainty over a country's long-term policy intentions will discourage investment in new technologies. Research and development is costly and the outcomes are already uncertain; frequent policy changes will affect investors who need governments to behave in a predictable way.

Flexible environmental policies promote more innovation than prescriptive policies of equal stringency, as prescriptive policies tend to constrain technical development. Flexibility gives firms greater incentives, additional to those provided by policy stringency, to identify innovative solutions that comply with regulations and meet environmental objectives.

For example, a stringent tax on nitrogen oxides pollutants (NOx) in Sweden created a strong incentive for companies to seek abatement options, which included a wide range of innovative solutions to minimise emissions.

**Source:** Johnstone, N., Haščic, I. and Kalamova, M. (2010). Environmental Policy Design Characteristics and Technological Innovation: Evidence from Patent Data. *OECD Environment Working Papers*. No. 16: OECD Publishing. Download from: [www.oecd.org/dataoecd/32/2/44805905.pdf](http://www.oecd.org/dataoecd/32/2/44805905.pdf) (See also [www.oecd.org/environment/innovation](http://www.oecd.org/environment/innovation) for related work.)

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