Fostering green technological innovations: The role of environmental policy

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Outline

• Green technologies and their benefits
• Environmental policy instruments for green technology innovations
• Main environmental policy requirements
• Conclusions
What is Green Technology?

• Green technology: any technology that has the potential to significantly improve environmental performance relative to other technologies

• Related terms
  – Environmentally-sound technologies
  – Low-carbon technologies
  – Climate-smart technologies
Areas of green technology

• Air and water pollution abatement
• Waste management and recycling
• Water purification and recycling
• Renewable energy
• Energy efficiency
• Sustainable building materials
• Etc.
Benefits of innovative green technologies

• Improvements in environmental quality
• Improved cost effectiveness of environmental policy
  – Lower costs for achieving a given objective
  – Achieve more improvements for the same costs
• Exploit “win-win” opportunities
  – Improved environmental outcomes at lower cost
Types of (green) innovations

- Product innovation (product characteristics)
- Process innovation (production method)
- Marketing innovation (Product design, Packaging)
- Organizational innovation (business practices, etc.)

- Extent of innovation
  - Incremental innovation (small changes to products; processes, etc.)
  - Radical innovation (new products, processes, etc.)
Environmental policy and innovation activities

• Environmental policy can create incentives for the development and diffusion of green technologies by increasing the demand (of firms, consumers, government) for low-cost cleaner production methods and more environmentally-friendly products.

• Environmental policy as a “demand-pull” factor for green technologies.
Environmental policy instruments

• Two main categories of instruments:
  – Economic instruments
    • Incentive-based or market-based instruments, such as taxes on pollution; tradable permits; subsidies etc.
  – Regulations

• Other types of instruments:
  • Green procurement
  • Eco-labeling
Economic instruments: Tax on emissions of air pollutants

• Tax per unit (ton) of emissions of a pollutant
• A continuous incentive for pollution reduction
• Polluter decides about ways and means of pollution abatement
• But: Tax rate has to be strong enough to create incentives for pollution abatement!
• Otherwise: Tax only serves to generate revenues for the government.
Sweden : Tax on NOx emissions

•Introduced stringent tax in 1992
•Created incentives for adoption of the latest abatement technologies, which had to be mainly imported
•First year: only 7% of firms had this technology.
•Second year: proportion rose to 62 per cent!
Direct regulations

• Traditional command and control policy:
  – Mandatory uniform technology standards,
  – Issue: cost effectiveness
  – No incentives to improve environmental performance once the standard has been achieved.

• Modern types of regulations based on best available technologies (BAT):
  – Define performance standards (e.g. energy efficiency)
  – Give industry freedom to choose technology – creates incentives for innovation!
Japan’s Top Runner Programme

- Energy efficiency standards for 21 products (e.g. refrigerators; TVs)
- Best performing model of a product group: standard for all other products;
- Companies to meet the new baseline standard
- Failure to meet standard is made public!
- Continuous incentives for improvements in energy efficiency!
Subsidies and tax incentives

Examples:

• Support purchases of less polluting passenger cars - based on different categories of emission levels (g CO2/km)
  – Used in France since 2007 (Bonus/Penalty system);

• Differential taxation of motor fuels
  – Leaded vs. unleaded petrol
  – Accelerated phasing out of leaded fuels!
Feed-in tariffs for renewable energy

• Encourage investments in renewable energy sources (wind, solar, small hydro etc.)
• Renewable energy producers receive a long-term price guarantee for all electricity they produce
• Often combined with minimum quotas for renewable energy in total electricity supply of utilities.
Public procurement

• Public sector: large consumer of goods and services

• Green procurement policies: aim at selection of goods and services that minimize environmental impacts

• Define environmental criteria to be used
  – Recycled paper; energy efficiency standards, clean fuel vehicles, etc.

• Limited information on extent of public green procurement
Key requirements for innovation-friendly environmental policy

- Stringency
- Flexibility
- Predictability and credibility
Stringency

• Policy objectives should be both ambitious and realistic
• Low emission tax rates / weak regulatory standards : Weak incentives for innovation activity!
• Performance standards : progressive tightening in line with developments of economically feasible BAT.
Flexibility

• Flexible policy regime:
  – Focus on environmental outcomes
  – Allow firms to identify the best way to meet the environmental objective
  – Technology-neutrality: avoid prescriptions of certain pollution abatement methods

• The more flexible the policy regime the greater the scope for innovation!
Predictability and credibility

- Set realistic targets (short-, medium and long-term) for expected environmental performance
- Avoid unanticipated large changes in policy parameters to reduce adjustment costs associated with increased policy stringency
- Unpredictable policy regime: creates investor uncertainty and leads to postponement of investments in innovative activities
Interaction of demand and supply forces for innovation

• Environmental policy is only a necessary condition for creating incentives for green technological innovations!

• Wide range of supply-side factors that determine innovation in general, including eco-innovation:
  – Overall capabilities of the national R&D sector;
  – public R&D support;
  – Inward FDI and knowledge flows
  – Extensive international collaboration
  – Access to finance, etc.
Technology transfer

• Many countries, notably smaller ones, meet their demand for environmental technologies mainly from foreign sources.
• Firms have to build absorptive capacities to adapt technologies to local conditions
• Remove trade barriers to trade in environmental technologies
• Effective patent protection
Conclusions

• A mix of economic instruments and regulations can spur the development of innovative environmental technologies and accelerate the diffusion of existing ones.

• Innovation policy in general should focus on creating favourable supply-side conditions for innovative activities, including in the area of environmental technologies.
Conclusions (II)

• Green technology innovations should become integral part of sectoral development strategies

• Closer integration of innovation policy and environmental policy requires effective policy coordination between government departments in charge of innovation; industrial sector development; and those in charge of environmental protection.
THANK YOU!