Complementary supply-side measures for green innovation

Skills and infrastructures

Government support for training and skill enhancement is central to the development of a highly trained workforce with the technical and scientific expertise needed for green technology and innovation. Several studies and programmes have addressed the need for “green” labour in downstream sectors through the upskilling of the workforce (OECD, 2011a). Meeting the complex challenges of green technologies and innovation will also require efforts on the upstream side: researchers who understand several disciplines, even if they are more specialised in some than in others. The challenge is to adapt or adjust graduate training programmes and curricula to create ecosystem thinking in science. The Green Innovation Management Educational Unit at the Center for the Promotion of Interdisciplinary Education and Research of Japan’s Kyoto University may serve as an example of ecosystem thinking in science.

Infrastructure is a prerequisite for the production of knowledge. Research infrastructure has many dimensions, both tangible and intangible. It supports the design, deployment and use of technology. As integrating knowledge from different disciplines becomes essential for green research, large national and international research infrastructures will play an increasing role. Existing multidisciplinary and basic science research infrastructures, for example, have already permitted essential advances in material sciences and in the comprehension of fundamental physics mechanisms, which are the basis of innovation in some green R&D activities. In addition, scientific research can lead to technological advances, but technology also affects advances in science. Large databases have become increasingly important and advances in quantum photonics have significantly affected the mechanisms for moving data faster, as exemplified in the accelerating use of supercomputers (Stephan, 2010).

The sharing of equipment and research materials will play a considerable role as research infrastructure investments are costly. Several initiatives have attempted to leverage resources and achieve economies of scale. In the European Energy Research Alliance, one of the SET Plan initiatives, the research infrastructure issue is central to the development of joint research activities. Policy options also include provision of funding to the research infrastructure facility to subsidise free access, or provision for funding access as part of research grants in the form of technology vouchers. In Australia, for example, the New South Wales government has implemented a system of TechVouchers to encourage collaboration and use of research infrastructure.

Networks and partnerships

Clusters, networks and technology platforms can also be viewed as mechanisms for increasing the supply-side response but also for bringing supply and demand together. In general, agglomeration effects arise when proximate economic activities benefit companies because of access to skilled labour and to specialised suppliers and because of inter-firm knowledge spillovers. They can bring together innovating firms, university laboratories and downstream users, and thereby internalise positive network externalities that might otherwise be lost. For example in northern and southern California, inter-firm and inter-sectoral knowledge spillovers facilitated and nurtured the emergence of green clusters from agro-food, information and communication technology (ICT) and biotechnology industries (Burtis et al., 2006).

For such reasons, knowledge-intensive firms locate in localities/regions with highquality scientific infrastructure (e.g. universities and PRIs) and will co-locate with other knowledge-intensive firms. Clusters and agglomerations may therefore account for a large share of a country’s innovative efforts in green industries. For example, about 60% of Finland’s environmental business is covered in the Finnish clean tech cluster, and 80% of the sector’s R&D is conducted in this framework (Nordic

Innovation, 2012).

Public-private partnerships (PPPs) can provide effective ways to mobilise private and public resources for green innovation by drawing on the respective advantages of the private and public sectors. The formation of strategic government-industry R&D consortia has intensified in recent years in OECD and non-OECD countries. The aim is to address the lack of core technological competences and long-standing problems involving general purpose technologies that can hamper promising development paths (e.g. Germany's National Platform for Electric Mobility or China's industry-research strategic alliances). Private-private partnerships such as the Electric Power Research Institute (EPRI), which pools the research capacities of US utility firms, illustrate the importance of R&D cooperation in a sector in which no actor has adequate capacity on its own (Lee et al., 2009).

Intellectual property rights and knowledge dissemination

Intellectual property rights (IPRs) play a crucial role in new product development and diffusion of knowledge. On the one hand, they encourage investment in innovation by allowing firms to recover their investment costs. On the other, tensions can arise between technology diffusion and maintaining appropriate incentives to invest in innovation. For green technologies, IPRs can take various forms. For example, in wind-power technology IPRs may include patents for the wind turbine; a copyright for software related to aerodynamics, generators and blade controllers; a design for the turbine; and a registered trademark for the brand. Furthermore, the manufacturing process is covered by the concept of "trade secret".

Various proposals have been made to expand green innovation by using the IPR system as a channel for technology development and diffusion. Some OECD governments have sought to encourage actors to learn about the IPR system and apply for green patents. Still others push for changes to accelerate technology transfer to developing countries.

The effectiveness of an IPR regime relies on effective institutions and procedures such as effective enforcement. Competition authorities play an important role in ensuring that patents are not used anti-competitively (e.g. through standard setting). To accelerate the development and diffusion of green technologies, innovation incentives can include lower application fees, prioritised examination, expedited examination, approval procedures and diminished standards in the "green" area (see Maskus, 2010, for an overview). Fast-track programmes for green patents have recently been introduced in some national IP offices. These vary widely in their eligibility requirements and process parameters (Lane, 2012). Some national and regional patent offices offer access to search and patent mapping services. The Korean Intellectual Property Office (KIPO), for example, launched the Green IP Information Project to collect and analyse various green technologies.

By facilitating access to prior inventions and providing incentives for the disclosure of new inventions, the sharing of public sector knowledge (e.g. through "open science") serves as a powerful framework for disseminating knowledge relevant for green technologies. The rationale for public policies that support "open science" focuses on the economic and social efficiency aspects of rapid and complete information disclosure for the pursuit of knowledge (Aghion et al., 2009). Open science initiatives that support access to research data and knowledge networking initiatives (e.g. OECD Guidelines on Access to Research Data from Public Funding) can help foster the exchange of proprietary knowledge.

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