Policy Brief

Eco-innovation and green competitiveness

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Background

The current European policy debate focuses on the Europe 2020 strategy for smart, sustainable and inclusive growth. The Europe 2020 strategy was launched not only with regard to overcoming the financial crisis, but also with a vision to address the long-term challenges, among them globalization and trade, and pressure on resources and environmental concerns. After four years of implementation, the EU launched a process of taking stock of the experience (COM (2014) 130 final), which aims at helping to develop the strategy for the 2015-2020 period.

The implementation of the Europe 2020 goals started seven flagship initiatives, among them 3 with specific importance for Eco-Innovation:

- The Flagship Initiative on "Innovation Union" calls for increasing R&D spending and improving innovation efficiency. It defines a more strategic approach to innovation as an important area of action, and committed explicitly to developing an Eco-innovation Action Plan.
- The Flagship Initiative on "Resource Efficient Europe" aims to support the shift towards a resource-efficient and low-carbon economy. However, it also links increasing resource efficiency to securing growth and jobs for Europe, by stimulating innovation, improving competitiveness and opening up new export markets.
- The Flagship Initiative on "Integrated Industrial Policy for the Globalisation Era. Putting Competitiveness and Sustainability at Centre Stage" underlines the importance of a strong manufacturing value chain for the EU. It puts attention to a radically changing global business environment, with globalizing value chains and emerging economies catching up. It calls for an integrated approach, and for using strategic intelligence such as impact assessments and insights into sectoral innovation performance.

The GLOBIS project aims at rethinking globalisation in the light of sustainable development. Within this project, Fraunhofer ISI performed a case study on "Global Eco-innovation, economic impacts and competitiveness". This policy brief puts the main results of this case study into the context of stock taking of the experiences related to the above mentioned initiatives.

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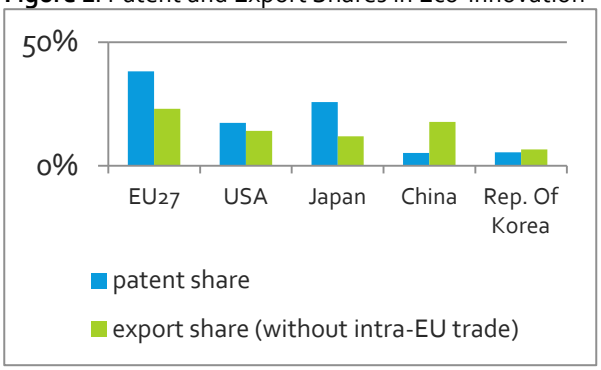
Sectoral eco-innovation watch

Eco-Innovation is any form of innovation resulting in or aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources. A systematic classification of eco-innovations has to take the most pressing environmental problems into account. Thus, even though there is no final list of fields of eco-innovation, technological delineations of eco-innovations typically encompass innovative technologies which relate to the following 5 different technology classes:

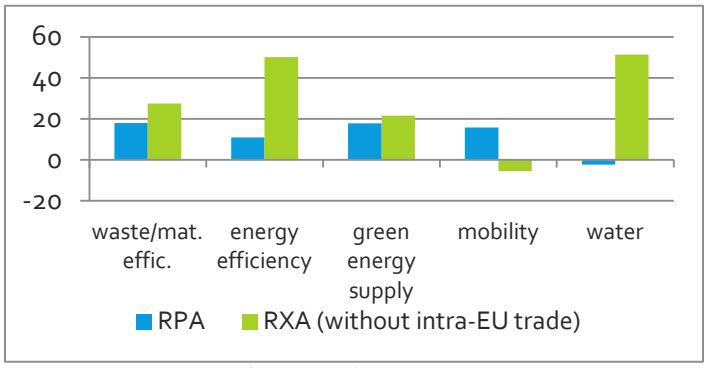
Green energy supply	Energy efficiency	Waste and material efficiency	Green mobility	Water supply and sewage treatment

Figure 1: Patent and Export Shares in Eco-innovation



Source: calculation of Fraunhofer ISI

Figure 2: Specialisation of EU 27 in subsectors of eco-innovation



Source: calculations of Fraunhofer ISI

Using the latest available data, the analysis of technological capability underlines the leading role of the EU in eco-innovations. More of one-third of transnational patents relevant for eco-innovations originates from the EU. This is well above the share of Japan and the US. Even if trade is measured without intra-EU trade, the EU lies ahead.

Since 1990, the five regions shown in Figure 1 constantly account for about 90 % of eco-innovation relevant patents. However, during this time, various changes in the distribution among the countries have been taking place:

- The EU lost more than 10 percentage points since 1990; especially during financial crisis, the patent share of the EU was reduced by about 8 percentage points.
- The US has kept her patent share constantly from 1990 to 2002, but has been losing constantly since then around 10 percentage points.
- Japan has been picking up patent shares especially since the late 1990s and has increased her share by 12 percentage points since 1990.
- China and South Korea have emerged as new players in the last 10 years, with substantial increases in their shares in the last years.

With globalization and fast growing emerging economies, it is no surprise to see that the shares of the EU 27 are shrinking. However, with increasing division of labour among the world's region, it is especially the sectors in which a region is especially strong which show the best opportunities for future success. These strong sectors are identified by looking at the specialization pattern in patents (relative patent advantage, RPA) and trade (relative export advantage, RXA), which are normalized between -100 and + 100. If a region has a positive specialization, the analysed field is stronger than the average of the region.

The data shows a positive specialization for eco-innovations in both patents and trade. Thus, eco-innovations are a field in which the opportunities for the EU to achieve the Europe 2020 goals are in particular good. However, a disaggregated analysis also shows the challenges Europe has to cope with, e.g. in the mobility and the water sector.

Success factors for green competitiveness

Eco-innovation needs to be accelerated in order to safeguard the environment and to increase European competitiveness. The following success factors have to be taken into account when assessing the competitive advantage of countries:

- Technological capability of the country: international trade performance depends on technological capabilities. If a country has a comparatively high knowledge base, it also has an additional advantage in developing and marketing future technologies.
- Market factors on the supply side: If countries already show a high level of successful technological applications, they will find it easier to export their products.
- Domestic market factors on the demand side: A growing (domestic) demand oriented towards innovations and readily supporting new technological solutions leads to economies of scale and learning effects, which drive the costs of the technology down.
- Structure of actors and involvement in communication along value chain: Powerful economic actors are able to develop new (foreign) markets, and to drive future process and product development. Interaction along the value chain between suppliers, users and science are an important element, as well as integration into international value chains.
- Innovation-friendly regulation: For eco-innovations, the demand depends very much on the extent of environmental policy. However, the regulation should be open to diverse technical solutions, and should set the standard for the regulatory regime, which other countries are likely to adopt.

The patent and trade data presented above indicates that Europe still has a very good technological capability and favorable market factors on the supply side. The other factors are more difficult to evaluate on an aggregated basis, and require a technology specific analysis.

Policy impact on eco-innovations and green competitiveness

Eco-innovations have penetrated to the markets relatively quickly in form of renewable energy. Therefore renewable energies are a very good example to illustrate the effects of policies on innovation and green competitiveness:

- There is strong empirical evidence that the creation of demand, which has been triggered by policies such as feed-in-tariffs, has been accelerating innovation. Patent data, but also data relating to technical characteristics show a tremendous innovation dynamics especially in renewable energy technologies.
- Innovations not only show up such as technological innovations. In addition, the move to renewable energies has led to new actors becoming active. The interaction of direct and indirect, technical and organizational innovations is what constitutes a system innovation which enables the transformation towards sustainable energy system.
- The policy style is of uttermost importance for the effect of policies. Stringent mid-term targets are in particular an important element, which seems to be more important than implementation details of instrument choice.

The renewable energy policies in Europe have also triggered internationally relevant innovations. The development of the relevant capacities e.g. in Asia is also the result of equipment being imported from Europe, into which European know-how and experiences had been integrated. Over time, this has not only contributed

to declining costs and prices of the technologies in Europe, but has simultaneously sparked innovations, e.g. in manufacturing equipment. The enormously reduced costs of renewable energy technologies have facilitated application in developing and newly industrializing countries. These countries are now pursuing entirely new strategies in the expansion of their electricity systems. Thus, Europe has initiated an innovation process which spills over internationally.

Policy Recommendations

Europe shows an above average specialization in eco-innovation, which underlines the opportunities to make them a cornerstone of the Europe 2020 strategy. However, catching-up of Japan and new competitors require that the EU further strengthens this sector. The analysis within the GLOBIS project leads to the following recommendations:

- The EU should increase its positive specialisation in eco-innovation, and should reverse the trend of losing patent shares, which has accelerated during financial crisis. One important measure is to invest heavily in increase of knowledge base for eco-innovation, e.g. in the context of European and member state innovation policy programs. These programs should systematically link technological to organisational and institutional innovations, and should give room to include new actors.
- Creation of domestic demand is a key for success. The EU should continue with ambitious environmental policies in order to establish herself as frontrunner in green competitiveness. The environmental policies should be designed to allow for diverse technological solutions, and integrate more systematically the opportunities for growth of eco-innovation niches.
- Targets for the diffusion of eco-innovations are important. In order to foster innovation, they should be on technological level. Thus, the empirical evidence speaks for having separate targets for renewable energy development for 2030; they should be accompanied by targets in other areas.
- Innovations are increasingly taking place in international networks and changing global value chains. This requires a selective industrial policy: Depending on its technological capability and strength of actors, a country can be strong along most parts of the value chain, e.g. the EU in wind energy. In other cases, a country can be strong on segments of a value chain only; in photovoltaics, for example, the EU is strong on machinery for PV production, supply of silicium and integration of modules into the energy system, but less so in photovoltaic cell production. In the first case, industrial policy should aim at strengthening the complete value chain. In the latter case, a combination of concentrating on domestic strengths in the value chain, and securing cooperation with international strong actors in the other parts of the value chains will be an alternative option.
- Establishing European actors as coordinators of international value chains is becoming more important. European innovation policy should include this perspective more prominently in the formulation of her research programs. This also calls for increased opportunities for international partners outside the EU to participate in such programs, in order to strengthen international value chains under European leadership.

The increasing importance of international value chains makes industrial policy more complex. Thus, policy formulation should be supported by sound strategic intelligence. Monitoring of the five classes of success factors for green competitiveness on a technology specific level becomes a permanent task, which should supplement evaluation of programs and impact assessment.