POLICY SHIFT FOR THE LOW-CARBON TRANSITION
IN A GLOBALLY EMBEDDED ECONOMY

Towards a policy toolbox for eco-innovation

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This policy brief presents an evaluative framework for policymakers, consisting of five questions, to support the development of policy instruments for eco-innovation.

Austria has committed to a transition to a low-carbon economy. Eco-innovation (innovation that results in a reduction of environmental impact) plays a crucial role in this transition. Research and development (R&D) on, and the diffusion of, low- and zero-carbon technologies is crucial for the global community to meet the 2°C target enshrined in the Paris Agreement. Which policy instruments need to be implemented in Austria to support eco-innovation is yet to be assessed.

Why policy intervention?

Firms typically invest in R&D when they think they can develop, produce and sell a new technology and make a profit. Customers (which may be firms or households) typically buy the new technology when it fulfills a need and the price is acceptable to them. However, there are four reasons why the supply of, and the demand for, eco-innovations might be too low if left to the market. First, firms invest less in R&D than society wants. Firms do not take into account that when they invest in R&D, they provide a service for other firms since the new technology can form the basis of further new technologies for other firms: any new technology builds on the knowledge of earlier inventions. We call this *the positive externality of new knowledge*. This first dynamic spillover can be supported via government support for R&D. Second, the costs of producing a complicated, new technology typically decrease as the total amount produced or consumed increases. For example, the production of wind turbines has become cheaper over the past decade as more were being produced. We call this the *positive externality of learning by doing*. This second dynamic spillover can be supported via government support for the diffusion of the new technology. Importantly, this decrease in cost quickly decays, and so should the support. Third, for some technologies (so-called network technologies) the benefits from consumption of the technology depend on the number of users of the same network. For example, the owner of a plug-in electric vehicle benefits more from his car if there are many other users and, hence, many charging stations are provided. We call this third dynamic spillover a *network externality*. It can be supported via government support for the diffusion of the network technology. Importantly, only few technologies qualify as network

technologies. Finally, firms and households may have insufficient knowledge about a newly available technology, which could hamper its diffusion. When a firm or household has adopted a new technology, it acts as a source of information for other firms and households. The information provided by users may induce others to purchase it as well. We call this fourth dynamic spillover the *positive externality of knowledge availability*. Importantly, the size of this dynamic spillover is unclear.

Austria's current policy toolbox for eco-innovation

Austria currently has a wide array of policy instruments that deal with the four dynamic spillovers. It has general and specific subsidies for R&D. It also has various environmental policy instruments that support the diffusion of eco-innovations. Examples in the context of the buildings sector are building codes such as *OIB-guideline 6* that supports the diffusion of new, energy-saving technologies, and the *Umweltförderung im Inland*, which provides subsidies for households and companies to invest in environmentally benign technologies.

Still, as new technologies are being developed and new policy objectives are identified, there might be a need for new policy instruments. In addition, an assessment of existing policy instruments can help reduce the regulatory burden for firms and households or reduce the burden of financial instruments on the government budget.

The international dimension

The fact that Austria is a small open economy affects its scope to deal with each of the dynamic spillovers. It is subject to international economic developments. For example, the Austrian automotive sector supplies most of its products to Germany. Hence, the scope for the Austrian automotive sector and the Austrian government to invest in a particular eco-innovation will depend on the willingness of the German automotive sector to buy and implement the eco-innovation. Austrian support for a particular network technology should be coordinated with other countries. In this way, Austria can prevent itself from investing in a network technology that eventually is only available in Austria (for example, battery electric vehicles versus fuel cell electric vehicles). In a related fashion, Austrian subsidies for the diffusion of a particular technology may accrue to foreign producers, depending on the export position of the given sector (this does not mean that these subsidies are a bad idea). Finally, Austrian policy makers have to take into account EU policies.

Evaluating the policy toolbox for eco-innovation: Five questions

To support policy makers in the development of a toolbox that supports eco-innovations, we have developed an evaluative framework that consists of five questions. Answering these questions helps policy makers to assess whether a new policy instrument is needed, and (if so) how it should be designed.

1. What should be the *focus* of the instrument?

That is, which dynamic spillover should the instrument address, and how direct should it address this spillover?

2. What should be the *scope* of the instrument?

What should be its technological scope, and what should be its environmental scope? That is, should the instrument be generic (such as a generic R&D subsidy) or specific (such as a subsidy for electricity from solar PV to support the diffusion of this technology).

3. What are existing instruments (including international ones) and how do they potentially *interact* with a potential new instrument?

An existing policy instrument may negatively affect the effectiveness of a newly proposed instrument, and vice versa.

4. Can multiple instruments form a portfolio of *complementary* instruments without inefficient interaction?

Since eco-innovations suffer from multiple market failures (an environmental externality and at least one of the dynamic spillovers), multiple instruments are needed. Answering this question and the previous one should also answer the question whether a new instrument is necessary at all.

5. What should be the *timing* of the instrument or instrument portfolio?

Should the instrument be announced in advance or require a testing phase? Should the instrument be assessed regularly or have a sunset clause? For example, a diffusion subsidy to support learning-by-doing for an eco-innovation should only be temporary as this dynamic spillover decays over time.

An application to the buildings sector

The buildings sector consumes large amounts of energy, especially for space and water heating. For an application of our evaluative framework, we assume that a new thermal insulation technology has entered the market. This technology will have passed the phase of R&D so the first dynamic spillover does not apply. Hence the *focus* of the instrument (either an existing one or a new one) should be one or more of the other dynamic spillovers. Since thermal insulation is not a network technology, only the dynamic spillovers of learning-by-doing and knowledge availability remain. Thermal insulation is not complicated in production, so learning benefits are expected to be limited here, but there might be some learning effects for the construction sector in applying the new insulation technology. In addition, there might be some benefits from knowledge availability within the construction sector that warrants support for diffusion. The technological *scope* is limited to the specific insulation technology; the environmental scope is limited to energy efficiency in the buildings sector. Regarding *interaction* with other instruments, we observe that there are three existing instruments that are relevant: OIB guideline 6 (thermal insulation standards), the Wohnbauförderung (subsidies for newly constructed and renovated buildings, conditional on energy performance standards), and the Umweltförderung im Inland (adoption subsidies for energy efficiency and emission reduction technologies).

The answers to the previous questions suggest that the instruments needed for the new insulation technology are aimed

at diffusion of the technology and the availability of information. The three existing instruments all support the diffusion of new technologies, so it seems that no new diffusion instrument is needed. Regarding information availability: it might be interesting to check for the existence of information programs for firms in the construction sector. For the two different subsidy schemes – *Wohnbauförderung* and *Umweltförderung im Inland* – it might be useful to assess them in terms of *complementarity*: are there inefficiencies in joint adoption of these different subsidy schemes and can they be adjusted to each other in a more efficient way?

Regarding the *timing* of the instrument: we identified three relevant existing instruments, which need to be updated with the new thermal insulation technology; there might be scope for a new information instrument if none exists. Since an information instrument is neither novel nor complicated, a test phase is not required. However, all instruments would need to be regularly reviewed as newer, better technologies may arrive over time.

In sum, the existing policy instruments for diffusion of eco-innovations in the buildings sector seem to be well-designed and probably only need updating with the latest technologies. Perhaps the introduction of an information instrument, insofar it does not yet exist, may be required.

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