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Why does the combination of the European Union Emissions Trading Scheme and a renewable energy target makes economic sense?

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ABSTRACT

The European Climate and Energy mix of targets and policies has been criticised by many economists. In particular, it is often argued that the renewable energy targets do not make economic sense, because they represent an expensive option to reduce CO2 emissions within a cap-and-trade scheme such as the European Union Emissions Trading Scheme (EU ETS). In addition, it has also been claimed that support for renewable electricity deployment negatively interacts with the EU ETS, having a dampening effect on the CO2 price, which favours the dirtiest technologies and is detrimental for the greener ones. In this article we argue that this mainstream economic view is short-sighted and that a multidisciplinary economic analysis of the climate and energy policy mix is required. Mainstream economic analysis is based on a narrow approach for the assessment of instrument combinations and neglects relevant insights from several economic disciplines, including innovation economics and political economy approaches. In reality, economic theory supports the combination of an ETS and renewable energy targets. The existence of different policy goals and market failures, the demand-pull influence of renewable energy policies on innovation, a political economy approach and the different risk exposure of renewable energy technologies call for a policy mix. Although policy combinations are not a panacea and bring problems on their own, the aforementioned negative interaction between renewable energy deployment and the carbon price in the EU ETS can be mitigated through appropriate coordination and/or instrument choice and design.

1. Introduction

A combination of targets and policies in the climate and energy policy realm has been adopted in the EU for both 2020 and 2030. The 2020 package sets three key targets: a 20% cut in greenhouse gas emissions (GHG)(from 1990 levels), 20% of EU energy from renewable energy sources (RES) and a 20% improvement in energy efficiency. For 2030, these targets include a 40% cut in greenhouse gas emissions compared to 1990 levels, a 27% share of renewable energy consumption and 27% energy savings compared with the business-as-usual scenario. Those targets and policies interact between each other in complex ways. One of these interactions occurs between the deployment of electricity from RES (RES-E), which is triggered by the RES targets and national support schemes, and the European Union Emissions Trading Scheme (EU ETS), which is the flagship of EU climate policy.

In recent years, the share of electricity generation from renewables in the EU has quickly grown from around 14.8% in 2005 to 25.4% in 2013 [1], largely due to rapid increases in wind and solar investments. Large scale deployment has spurred economies of scale and product innovation, which has in turn contributed to rapid declines in costs, bringing maturing renewable energy technologies (RETs) closer to and in some cases below cost-parity with conventional generation ([2,3]). Arguably, the RES targets in the RES-E Directive for 2010 and the RES Directive for 2020 have leveraged significant growth in renewables, helping to broaden and accelerate an already existing trend in several countries (Denmark and Germany, for example). The EU's pull policies in the form of targets and dedicated RES support have been considered by many to be behind the improvements and costs reductions of RETs by creating certainty and facilitating advancements along the learning curve ([4,5]).

In spite of this progress, it is quite often claimed that the aforementioned targets do not make economic sense, because they represent an expensive option to reduce CO2 emissions within a cap-and-trade scheme such as the EU ETS. It has also been claimed that support for RES-E deployment negatively interacts with the ETS, having a dampening effect on the CO2 price, which favours the dirtiest technologies and is detrimental for the greener ones (see Section 2). This is more than a mere academic debate, with some countries arguing against dedicated support for RES (e.g., Poland [6] , p.3) and RES

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targets (e.g., U.K [7]., p.2) and claiming that a climate target is enough.

In this article we focus on the combination of the EU ETS and RES support and review the arguments in favour of such combination. We argue that economic theory does not support those mainstream economic criticisms and that a broader, multidisciplinary economic analysis of the climate and energy policy mix is required. Mainstream economic analysis is based on a narrow approach for the assessment of instrument combinations and neglects relevant insights from several economic disciplines, including innovation economics and political economy approaches. It is likely based on either wrong or unrealistic assumptions (policy-makers only have one goal, there is only one market failure), a misunderstanding of the drivers of innovation (neglecting the influence of demand-pull) and a lack of political economy thinking, which critically affects the political feasibility of climate and energy policies and should be taken into account in their design. The existence of different policy goals and market failures, the demand-pull influence of renewable energy policies on innovation and a political economy approach call for a policy mix. In addition, the aforementioned negative interactions between RES-E deployment and the carbon price in the EU ETS have likely been exaggerated and they can be mitigated through appropriate coordination and/or instrument choice and design.

Accordingly, this paper is structured as follows. The following section describes the two main criticisms from the mainstream perspective. A response to those criticisms taking into account different perspectives is provided in Sections 3–6. The last section concludes.

2. The mainstream view

2.1. A CO2 price is all we need. RES targets are economically inefficient

Part of the criticism of the combination of those targets and policies focuses on the negative effect of RES targets on the cost-effectiveness of mitigation of greenhouse gases. It is argued that supporting currently expensive technologies to mitigate CO2 emissions such as renewables crowds out cheaper ones in the marginal abatement cost curve, resulting in higher than necessary costs to reduce emissions [8–16]. Therefore, adding an instrument to support RES-E to an already existing ETS would not make much economic sense, given that RES-E is an expensive way to tackle CO2 emissions and, since CO2 emissions are covered by a cap in an ETS, RES-E deployment triggered by RES-E policies does not lead to additional CO2 emissions reductions and results in higher compliance costs with the CO2 target than would be the case in the absence of those policies ([17,18]).

2.2. The interaction of an ETS and RES support leads to conflicts due to the negative impact on the carbon price

[19] argues that "green promotes the dirtiest", i.e., that RES-E generation as a result of deployment policies results in lower CO2 prices which benefit conventional fossil-fuel generation, i.e., it leads to an increased production from the most CO2-intensive power generation technologies (e.g., coal vs. gas) compared to an ETS alone. In addition, this lower price decreases investments and/or innovation efforts aimed at low emission technologies in sectors and segments covered by the ETS [20].

3. The policy mix is needed for strictly economic reasons

The aforementioned mainstream economic view is short-sighted on economic grounds and a climate and energy policy mix (and particularly, the coexistence of an ETS and dedicated RES-E support) can be justified on the basis of economic theory.

3.1. Theoretical arguments based on innovation economics and system of innovation approaches

A main economic argument to support the combination of those targets and policies is the existence of three market failures in the realm of low-carbon technologies:

i) The *environmental externality* refers to firms not having to pay for the damages caused by their GHG emissions.
ii) The *innovation externality* is related to spillover effects enabling copying of innovations. They reduce the gains from innovative activity for the innovator without full compensation, meaning that private actors will autonomously conduct less R & D than the optimal level.
iii) The increased deployment of a technology which results in cost reductions and technological improvements due to learning effects and dynamic economies of scale may result in a positive *deployment externality*. Even companies that did not initially invest in the new technologies may benefit and produce or adopt the new technology at lower costs. Although investors can partially capture these learning benefits, e.g. using patents or their dominant position in the market [21], they do not capture all these learning benefits.[1] Thus, investments in the new technology will stay below socially optimal levels. Learning is certainly a source of innovation and cost reductions but it does not come freely. It is the result of previous investments. Note that this implies circularity: diffusion is endogenous to the level and evolution of costs, but costs are also affected by the degree of diffusion [25].

Since the above market failures cannot be corrected with a single instrument, different types of interventions addressing those market failures are needed.[2] While the mainstream view recommends the implementation of a policy which leads to a CO2 price, this would only internalize the environmental externality, but not the other two. Public support for RD & D is needed to address the innovation externality and dedicated deployment support for renewable energy technologies can be justified to tackle both the innovation and the deployment externality. [33] formally shows that, in the presence of an innovation externality, a carbon price will not be efficient and lead to higher CO2 mitigation costs.

It could be argued that such deployment support is not needed, because the CO2 price would provide the necessary market pull that, in addition to the supply push of R & D support is recommended by the literature on innovation economics to trigger innovation. The problem is that, while a high CO2 price would have some positive impact on the innovation activities in the less mature low-carbon technologies, it can not be expected to trigger radical innovation in those technologies, as empirically shown by [34]. Although bringing sufficient incentive for cleaner technologies is arguably a "second aim" of the EU ETS, it has clearly underperformed in this regard, as shown by several empirical studies.[3] Its demand-pull influence is simply too weak.

While RD & D support is a necessary supply-push influence, it has to be complemented by strong market formation (demand-pull). There is an abundant literature from innovation economics and innovation studies (including the systems of innovation literature) showing that

[1] Different types of learning effects have been considered in the literature, including learning by doing [22], learning by using [23] and learning by interacting [24].

[2] There are other market failures that might contribute to under-investment in innovation, including constrained access to credit for small innovative firms, informational problems and costs and agency issues (split incentives) [27–29].

[3] [34] show that the EU ETS fosters eco-innovation, although the effects are rather modest and incremental [36]. conclude that the EU-ETS has limited effect on the innovation activities (adoption and R & D) for power generation technologies. Using matching analysis and patent data [37], show a modest impact of the EU ETS on low-carbon innovation. It has not affected the direction of technological change [38]. find that ETS and non-ETS firms show few differences in relation to process and product innovation [39]. find mixed empirical evidence on the role of the EU ETS in promoting innovation.