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Are the interactions between the EU's renewable energy support and its emissions trading system (ETS) really so negative?

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1. Introduction

In order to put the world economy on an emissions concentration path which minimizes the risk of collapse of the climate system, drastic emissions reductions will be required. As shown by economic model simulations, whether emissions will be reduced and the costs of so doing will depend strongly on the availability of low-carbon technologies across different time frames. Therefore, low-carbon transformations require diffusion of existing and new technologies. The diffusion of renewable energy technologies is a crucial element in the required transformation of the energy system, e.g. in the energy transition.

A combination of targets and policies has been adopted in the EU for both 2020 and 2030.[3] This includes targets for renewable energy sources (RES). It is quite often claimed 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 EU Emissions Trading Scheme (ETS). In addition, critics of the approach also claim that support for renewable electricity deployment negatively interacts with the ETS,

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[3] The 2020 package sets three key targets: a 20% cut in greenhouse gas emissions (from 1990 levels), 20% of EU energy from renewables and a 20% improvement in energy efficiency. For 2030 these targets include a 40% cut in greenhouse gas emissions compared to 1990 levels, at least a 27% share of renewable energy consumption and at least 27% energy savings compared with the business-as-usual scenario.

having a dampening effect on the price of CO2, which, in turn, favours the dirtiest technologies and is detrimental for the greener ones.

In this short note I argue that this mainstream economic view is flawed and that a multidisciplinary economic analysis of the climate and energy policy mix is required. Mainstream economic analysis is based on a narrow approach in the assessment of instrument combinations and it neglects relevant insights from several economic disciplines, including innovation economics and political economy approaches, as well as the results of model simulations. Economic theory does support the combination of an ETS and RES targets. The mainstream view is based on either wrong or unrealistic assumptions (e.g. policy-makers only have one goal or that there is only one market failure), a misunderstanding of the drivers of innovation (e.g. neglecting the influence of demand-pull) and a lack of integration of political economy thinking. When we consider the existence of different policy goals and market failures, the demand-pull influence of renewable energy policies on innovation and a political economy approach a policy mix is the right way forward. In addition, I argue that the aforementioned negative interaction between RES deployment and the carbon price in the ETS can be mitigated through appropriate coordination and/or instrument design.

The following section describes the two main criticisms from the mainstream perspective. A response to those criticisms is provided in sections 3, 4 and 5.

2. The mainstream view

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

It has been argued that adding a support instrument for electricity for renewable energy sources (RES-E) to an already existing ETS does not make much 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 do not lead to additional CO2 emissions reductions (Braathen 2007, Frondel et al 2010). Renewable energy technologies are generally more expensive low-carbon technologies, and RES-E policies allow them to take part in the electricity generation mix (McKinsey 2009). This leads to higher compliance costs with the CO2 target than would be the case in the absence of RES-E policies.

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

Böhringer and Rosendahl (2009) argue 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 increased production from the most CO2-intensive power generation technologies 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 (Matthes 2010).

3. A policy mix is needed for strictly economic reasons

This mainstream economic view is flawed for several reasons and a climate and energy policy mix (and particularly, the coexistence of an ETS and dedicated RES support) can be justified on economic grounds.

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

The 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, which reduces the gains from innovative activity for the innovator without full compensation, meaning that private actors will autonomously conduct less R&D than what is needed overall.

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* (Stern 2006). 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 (Neuhoff et al. 2009), they do not capture all these learning benefits. 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 (del Río 2014).[4]

Following Tinbergen's dictum that multiple market failures require multiple instruments (Tinbergen 1952), policy mixes can be justified to account for the coexistence of market failures to achieve certain policy goals. Since the above market failures cannot be corrected with a single instrument, different types of interventions addressing those market failures are needed.

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 Research, Development, and Demonstration (RD&D) is needed to address the innovation externality and dedicated deployment support for renewable energy technologies can be justified to account for the deployment externality. An ETS cannot achieve both targets (CO2 and RES-E deployment) cost-effectively (Jensen and Skytte 2003, Fisher and Newell 2008, Huber et al 2004). While a high CO2 price would have some positive impact on the innovation activities in the less mature technologies, it cannot be expected to trigger radical innovation in those technologies, as empirically shown by Rogge et al. (2013) and others. Its demand-pull influence is too weak. In addition, RD&D support is a necessary supply-push influence, but it has to be complemented by strong market formation (demand-pull). There is an abundance of literature belonging to the areas of innovation economics and innovation studies (including the systems of innovation literature) showing that market formation is critical to trigger innovation effects in the energy sector (see del Rio and Bleda 2012 for an

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[4] There are other failures (some of them sector-specific) that might contribute to under-investment in innovation in market-only environments. These include constrained access to credit for small innovative firms, informational problems and costs and agency issues (split incentives) (Newell 2009, Edenhofer et al 2009, McKinsey 2009). They can vary across different technologies and sectors (Edenhofer et al 2009). Other authors go beyond the traditional market failure discussion and claim that there is a "system failure." A "system perspective" has emphasized the existence of inertia in complex technological systems, path dependency and lock-in (Unruh 2000, 2002).

overview). Furthermore, RES-E deployment instruments are also innovation instruments in so far as market creation feeds back into private R&D. This does not rule out the need to balance both types of support for RETs.

3.2. Arguments based on theoretical and empirical insights from Public Choice and political economy approaches.

There is also an abundance of economic literature suggesting that we can hardly expect a high EU ETS CO2 price in the short term.[5] Public Choice and political economy thinking in general would suggest that it is not politically profitable to implement (whether at the national or EU level) a stringent policy which leads to high carbon prices, at least in the short-term, as it would be unlikely to help policy-makers win votes and get re-elected. And powerful interest groups are likely to lobby strongly against legislation which leads to a very high CO2 price. This leads to high CO2 prices being socially unacceptable and politically unfeasible. Support for RES deployment may possibly lead to higher (implicit) carbon prices, but this support is likely to be more politically palatable since the costs are more hidden.

3.3. Model simulations suggest that early RES deployment is a second-best strategy.

A look at the current international negotiations on a climate agreement suggests that there is already a substantial delay with respect to an economically-optimal course of action (Edenhofer et al. 2009). Unless meaningful and binding emissions reductions are agreed in Paris in November 2015, a second-best strategy based on strong support for renewables is likely to lead to lower costs than with a delayed climate agreement without early RES deployment. Model simulations support this finding (Bauer et al. 2012).[6] Furthermore, strong RET deployment may provide a hedge against low stabilization targets.

To sum up, economic theory justifies the existence of the EU ETS together with RES targets and public support (policies) to achieve those targets. Obviously, it does not justify any level of such support. But this can be addressed with the choice of instrument and design elements in deployment support.

4. The negative interaction is the result of a very narrow and static perspective on efficiency

While a lower CO2 price would undermine innovation efforts in RES, the (non-existent or very low) CO2 price in the past has not been the main source of innovation for these technologies. Rather, it has been the response of investors and project developers to the existence of dedicated support for RES that has led to innovation. Therefore, again, a combination of policies can be recommended.

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[5] Since 2011, expert elicitations in the International Emissions Trading Association (IETA) survey have shown a continuous drop in CO2 prices. In the last wave of the survey (May 2015), EU ETS price expectation for the last phase (2013-2020) is 10.8 € (IETA 2015). This figure rises to 18.4 € when considering the period 2020-2030. One of the most relevant results shown by this survey is related to how much the carbon price should be in order to drive low carbon investments (29.6 €).

[6] Bauer et al (2012) show that an early RET deployment reduces the additional mitigation costs of delayed climate policy. In the three scenarios considered by these authors, it is shown that the costs in the first-best scenario (without delays in a climate agreement) are lower than the costs of early deployment (with delays) and these costs are lower than the costs without early deployment (with delays). Simulations with the GREEN-X model show that due to learning effects, a higher intermediate RES-E target generates higher costs of RES-E support over the period 2006–2010, but results in lower costs for society over the whole period from 2006 to 2020 (Huber et al 2007).

More importantly, the appropriate efficiency concept when dealing with long-term problems where innovation is likely to play a critical role is that of *dynamic efficiency*, which refers to the ability of an instrument to generate a continuous incentive for technical improvements and cost reductions. Model simulations suggest that promoting technological changes may be costly in the short term, but cheaper in the long-term.[7] If currently expensive technologies with a significant cost-reduction potential as a result of learning effects are not promoted today, the overall costs of attaining long-term targets would be higher because underdeveloped expensive technologies will be needed at a later date to meet those targets.

Besides, the mainstream view suggests that policy-makers only have one goal (to reduce CO2 emissions) and two assessment criteria to achieve those goals (static efficiency and effectiveness). If this was the case, then a CO2 mitigation instrument would be all that we need. But policy-makers have several goals in the climate and energy realms and more than two assessment criteria (e.g. dynamic efficiency, equity, social acceptability, political feasibility, local impacts). Both RES-E deployment and an ETS share one common goal (CO2 emissions reductions) but RES-E deployment contributes to other goals in addition to CO2 reduction, including the diversification of energy sources leading to a lower dependence on fossil-fuels.[8] Combinations of instruments may be justified if they address different goals.[9] Note that the criteria should assess the functioning of the entire policy mix and, in particular, the contribution of instruments and design elements to all the policy goals, and not only the contribution to a single goal.

On the other hand, are the interactions between support for the sets of policies really so negative? According to model simulations using PRIMES, a computable general equilibrium (CGE) economic model, the extra costs of the “other benefits” would represent 0.05% of GDP at best, whereas improvement in terms of job creation from the RES policy would represent between 0.3% and 0.5% in 2030 (EC 2014a).

Two other factors that call the thesis of negative interactions into question are that the emissions reductions from RES-E deployment may have been taken into account in the setting of the CO2 targets (EC 2008, EC 2014a) (see below) and that, even if they had not been taken into account, RES deployment has had comparatively little impact on the CO2 emissions reductions and low ETS prices in the last decade with respect to other more relevant factors (mostly the economic crisis) (Spencer et al. 2014, EC 2014b).

A different vision suggests that both types of policies (an ETS and dedicated RES support) could mutually reinforce each other, rather than conflict. The carbon price in an ETS would reduce the amount of funds devoted to RES promotion in a RES-dedicated policy. And, dedicated RES support would put currently expensive technologies on the shelf to achieve substantial emissions reductions at low costs in the future.

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[7] *Huber et al.* (2007) have shown that, due to learning effects, a 2010 target of 15% rather than 13.2% generates lower costs for society over the whole period 2006–2020, but higher costs for the RES-E strategy over the period 2006–2010. The 15% target implies that higher cost technologies are developed earlier.

[8] Regarding the goals, in the climate and energy realm these usually include the three traditional dimensions of energy sustainability, i.e., environmental sustainability (CO2 mitigation and other pollutants), security of energy supply (diversification of energy sources) and economic sustainability (a competitive energy system, i.e., affordable energy) (see, for example, EC (2012). But governments also have other relevant goals (and policies serving those goals), including employment and industry creation, regional and rural development and support for innovation.

[9] However, several authors argue that there might be other alternatives to RES-E deployment which may achieve the non-CO2 targets and goals in a more effective and/or cost-effective manner (Frondel et al. 2010, Fischer and Preonas 2010). While this might be true, there is clearly a role for RES-E deployment in achieving the CO2 and non-CO2 goals, i.e., their potential contribution to those goals, and particularly to the security of energy supply, should not be disregarded, as shown by IEA (2010).

5. The negative interactions can be mitigated though instrument choice, proper design and coordination

Finally, even if we assumed that both targets interact in a negative manner under a perspective of static efficiency, the choice and design of the instruments and coordination between targets and policies could partly alleviate such negative interaction.

In particular, if the CO2 and RES-E targets were ex-ante coordinated (e.g., the expected CO2 emissions reductions due to RES-E deployment would be considered when setting the ETS cap), then the alleged problem of reducing CO2 emissions as a result of RES-E deployment could be mitigated. A more stringent CO2 cap (and, thus, a higher CO2 allowance price) would then result. Of course, due to uncertainty about how much CO2 emissions will be reduced due to an additional amount of RES-E, it is not an easy task to make a precise adjustment to the emissions reduction target (Skytte 2006). Furthermore, given the trade-offs between different criteria, the role of coordination is necessarily limited (del Río 2014). It might be argued that, for political economy reasons (i.e., given the associated benefits and costs), it is difficult to achieve coordination when the targets and instruments fall under different jurisdictions and, thus, the respective policy-makers have different interests and views on coordination.

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