# A Public Choice View on the Climate and Energy Policy Mix in the EU: How Do the Emissions Trading Scheme and Support for Renewable Energies Interact?

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**Abstract** In this paper, we analyze the rationale for an energy policy mix when the European Emissions Trading Scheme (ETS) is considered from a public choice perspective. That is, we argue that the economic textbook model of the ETS implausibly assumes (1) efficient policy design and (2) climate protection as the single objective of policy intervention. Contrary to these assumptions, we propose that the ETS originates from a political bargaining game within a context of multiple policy objectives. In particular, the emission cap is negotiated between regulators and emitters with the emitters' abatement costs as crucial bargaining variable. This public choice view yields striking implications for an optimal policy mix comprising RES supporting policies. Whereas the textbook model implies that the ETS alone provides sufficient climate protection, our analysis suggests that support for renewable energies (1) contributes to a more effective ETS design and (2) may even increase the overall efficiency of climate and energy policy if other externalities and policy objectives besides climate protection are considered. Thus, our analysis also shows that a public choice view not necessarily entails negative evaluations concerning efficiency and effectiveness of a policy mix.

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## 1 Introduction

The current mix of policies in European climate and energy policy consists most prominently of the EU Emissions Trading Scheme (ETS) on the European level and additional policies supporting renewable energy sources (RES) on the level of member states. Started in 2005 and entering its third trading period in 2013, the ETS sets an overall cap on $CO_2$ emissions in the EU. Following the economics textbook, the ETS corrects externalities from $CO_2$ emissions in a cost-effective manner as its trading mechanism minimizes the costs of emission reductions. On top of the ETS, the member states of the EU employ policies supporting RES. Since 2009, member states have legally binding targets concerning their national share of RES. Via these RES targets and policies, member states express different levels of ambition and different technology priorities. This policy mix of a European cap-and-trade system and national RES-support schemes draws harsh critique concerning efficiency and effectiveness of policy intervention.

Several mainstream economists argue that the ETS suffices for optimal climate and energy policy, whereas additional instruments only reduce overall efficiency (e.g., Sinn 2011). From this perspective, the ETS represents a first-best policy instrument which ensures that anthropogenic climate change is strictly limited to an optimal (or at least politically determined) level. Hence, there is no need for additional policy instruments, which interfere with the ETS in a detrimental way: for instance, subsidies for RES undermine the carbon price within the ETS, thereby distorting the trading mechanism's price signal (Fankhauser et al. 2010). Thus, pushing relatively costly RES technologies into the market increases the overall social cost of climate protection and reduces the efficiency of policy intervention. In this way, RES subsidies may also lower public acceptance of renewable energies (Frondel et al. 2012) and thus may reduce the political leeway for climate protection in general (Weimann 2008).

While mainstream economists find fault with the efficiency of the policy mix, others question the effectiveness of the policy mix due to regulatory capture. Helm (2010: 195) argues that "capture has, indeed, been the norm rather than the exception." In particular, the ETS abounds in loopholes and only simulates effective climate protection. So far, ETS-related effective emission reductions have not occurred and cannot be expected to occur in the future, since "the EU ETS avoids the politically difficult cases having to be addressed" (ibid.: 190). Similarly, Spash (2010: 169) suggests that emissions trading "is creating a distraction from the need for changing human behavior, institutions and infrastructure" and likens mainstream economists' approval of emissions trading to the drug "soma" in Aldous Huxley's novel "Brave New World." From this view, European climate and energy policy appears as another instance of "simulative politics" that only "sustains the unsustainable" without effectively addressing environmental problems (Blühdorn 2007).

Thus, there is the puzzling situation that European climate and energy policy is criticized from two different directions—both resulting in very negative assessments of the current policy mix. While the attacks on RES-support policies draw on *efficiency* arguments from the economics textbook, the critiques of the *effectiveness* of the ETS follow from a public choice perspective on regulation. In their extremes, however, both alternatives seem to be futile for practical policy advice: either one strives in vain for the attainment of ideal, textbook-like policies or one succumbs to a fatalist diagnosis of merely symbolic politics.

Other approaches in the literature, which employ a realistic public choice view on climate and energy policy without a fatalist stance, appear to be more useful: Brunner et al. (2012) provide specific policy recommendations on how to address the commitment problem of climate policy. Hanoteau (2005) establishes a political-economy model of emissions trading, which shows how stringency of regulation might be increased by free allocation of allowances.

Hence, the literature so far provides specific public choice analyses of stand-alone ETS on the one hand and general discussions of the policy mix on the other hand (e.g., Sijm 2005; Kemfert and Diekmann 2009; Lehmann and Gawel 2013). What is lacking from the literature, however, is a public choice analysis of how the current main instruments of European climate and energy policy interact. To fill this gap, we assess the impacts of additional RES-support policies on the ETS from a public choice perspective. In particular, we analyze the specific rationale for a policy mix when the ETS originates from a political bargaining game within a context of multiple policy objectives.

The analysis starts from a hypothetical reference case under which the ETS provides a sufficient first-best policy instrument. This case arises if (1) climate protection is the sole objective of energy policy intervention and (2) the design of the ETS corresponds to the idealized textbook model. The first assumption rests on the twofold premise that only market failures justify policy interventions and unregulated $CO_2$ emissions are the only relevant market failure related to energy provision. The second assumption implies an exogenously given, optimal emission cap perfectly implemented by efficient instrument design. However, we argue that policy objectives beyond climate protection, such as member states' RES targets or specific technology restrictions (e.g., Germany's nuclear phase out), must not be ignored. These objectives may be economically warranted—e.g., due to externalities arising from fossil-nuclear energy production (long-run risks of nuclear power, oil spills, security of supply)—or simply politically set. Furthermore, we point out that the design of the ETS should be conceptualized as the result from repeated bargaining games between regulators and interest groups which try to maximize their rents. Concluding that the real ETS cannot be expected to live up to the textbook's requirements, we examine what the relevant deviations imply for the design of climate and energy policy. We differentiate four possible cases which we address in turn (see Table 1).

We first replicate the reference case A (Chap. 2), where the ETS is efficiently designed and only meant to address climate change. In this case, additional RES policies are welfare-decreasing. We subsequently demonstrate that in case B (Chap. 3), where the emission cap results from continuous bargaining, RES-support schemes may increase the effectiveness of emissions trading. In particular, we argue

**Table 1** Framework (own illustration)

| | | Objectives of regulation | |
|---|---|---|---|
| | | Single objective: Climate protection | Multiple objectives/ externalities |
| ETS design | Corresponds to the textbook model | Case A (Chap. 2) | Case C (Chap. 4.1) |
| | Results from a political bargaining game | Case B (Chap. 3) | Case D (Chap. 4.2) |

that the level of the politically set cap is not a function of the overall social costs of climate and energy policy; rather, the cap depends on the abatement costs of powerful ETS participants only. As the ETS abatement costs decrease with deployment of RES technologies, we expect RES policies to have a *positive* effect on the eventually politically feasible level of the ETS cap. This conclusion rests on the assumption that ETS participants (who benefit from lower allowance prices) are better able to influence political decisions than household electricity customers (who face higher retail electricity prices due to RES deployment). From this point of view, RES may help to attain more ambitious reduction targets. In case C (Chap. 4.1), we assume that the ETS is ideally designed yet multiple policy objectives need to be achieved. We point out that, following the classical Tinbergen rule, a policy mix is needed in this case to address multiple policy objectives at a least cost. Finally, we argue that in practice, climate and energy policy most likely operates in a context such as case D (Chap. 4.2), where the ETS needs to be continuously negotiated and multiple objectives are to be attained. This makes a strong case for additional instruments supporting RES. First, RES policies help to reduce the political costs of implementing emission reductions. Second, RES support may actually improve the overall efficiency of climate and energy policy as it helps to internalize other externalities than climate change if corresponding first-best policies are not enforceable.

## 2 Reference Case: Ideal Emissions Trading for Climate Protection

Under case A, optimal climate protection is the only regulatory goal that complements energy policy's main objective of providing efficient energy supply. Furthermore, the ETS is efficiently designed: the emission cap E is exogenously given and corresponds to the optimal level E* where marginal abatement costs exactly equal the marginal social damages from climate change. Under these circumstances, the ETS perfectly internalizes the climate change externality, and additional policies only undermine the Emissions Trading Scheme (Fankhauser et al. 2010; Frondel et al. 2008, 2010, 2012; Paltsev et al. 2009; Sinn 2011; Weimann 2008).

Let us restate this argument in more formal terms. With:

K—aggregate abatement costs of ETS-regulated sectors
D—difference costs of renewable compared to conventional energy sources ($D > 0$)
C—social costs of climate and energy policy ($C = K + D + S_1$)
$\bar{E}$—emission cap
$\theta$—share of RES in the overall electricity mix, with $\theta \in [0;1]$
$S_1$— climate change-related damages

The social costs of climate and energy policy C depend on the share of RES in the following way:

$$C(\theta) = K(\theta; \bar{E}^*) + D(\theta) + S_1(\bar{E}^*) \text{ with } \frac{dC}{d\theta} > 0 \text{ as } \frac{dK}{d\theta} < 0, \quad \frac{dD}{d\theta} > 0, \quad \frac{dS_1}{d\theta} = 0 \text{ and } \frac{dD}{d\theta} > \left|\frac{dK}{d\theta}\right|. \tag{1}$$

In this setting, as the emission cap is fixed at the optimal level $\bar{E}^*$, the RES subsidies have no effect on the level of climate damages $S_1$. They only affect the ETS abatement costs K and the RES-related difference costs D. On the one hand, pushing RES into the energy market lowers the demand for emission permits and brings down permit prices. Thus, RES subsidies reduce abatement costs for ETS participants. On the other hand, the overall expenses for RES increase in $\theta$ since RES are currently more expensive than conventional energy sources. The first-order condition for static optimality would require that these effects are of equal size so that $\frac{dD}{d\theta} = -\frac{dK}{d\theta}$. However, the technology-oriented climate policy supporting RES in addition to the (optimal) cap $\bar{E}^*$ is very likely not to lead to a least-cost way of overall emission reductions. Hence, the specific policy mix and the share of RES ($\theta > 0$) are most likely inefficient and $\frac{dD}{d\theta} > \left|\frac{dK}{d\theta}\right|$.

Consequently, under case A, the social costs of climate and energy policy C increase in $\theta$. RES do not lower the overall level of emissions. They only yield a distortion of the energy mix by inducing inefficient technology substitution. That is, emission reductions for climate protection cost more than necessary and the policy mix is inefficient.

## 3 Emissions Trading Under Political Bargaining for Climate Protection

### *3.1 The Public Choice Approach for Instrument Design*

In this chapter, we relax the assumption that the ETS is ideally designed. Instead, we analyze how political bargaining affects the actual ETS if climate protection is the only policy objective (case B in Table 1). In particular, we ask how additional RES-support policies bear on the negotiation of the emission cap.

To that aim, standard assumptions of the public choice approach concerning the main actors involved in environmental policy making are assumed to hold. Commonly, three actor groups are identified: (1) voters, (2) politicians/regulators, and (3) regulated industries' interest groups.[1]

1. Voters are rational agents who cast their votes in accordance with their self-interest so as to maximize their expected utility (Downs 1957). While non-monetary interests such as environmental preferences may also form part of voters' self-interest, economic motives might often be of primary concern. For instance, Scruggs and Benegal (2012) show empirically that public opinion on the importance of climate protection crucially depends on the state of the economy—in particular, the financial and economic crisis in Europe starting in 2008 entailed a substantial decline in public concern about climate change.
2. Emitting industries and their interest groups aim at minimizing the burden of environmental regulation. Olson (1965) und Tullock (1967) propose the concepts of rent-seeking and regulatory capture to explain how small, well-organized interest groups are capable of affecting policy design in order to extort resources to the detriment of less organized interest groups and the wider public. Kirchgässner and Schneider (2003: 379) list several reasons why industry interest groups are "not only better organized than environmental interest groups but also better suited to achieve their self-interested goals."
3. Politicians act as transfer brokers who redistribute welfare from less organized groups within the society to well-organized groups (McCormick and Tollison 1981). Politicians' main motivation is to get (re-)elected. Yet, in a "politics without romance" view (Buchanan 1984), this does not lead to the naïve conclusion that politicians generally try to maximize social welfare. Rather, their brokering activities serve to foster support from the recipients of redistribution, be it local constituencies, interest groups, or specific parts of the electorate.

Assumptions (2) and (3) constitute the main theoretical background for the discussion below. Assumption (1) is implicitly included in assumption (3) as voters' preferences are at least one explanatory variable for politicians' choices.

Table 2 provides an overview of those parts of our argument which are based on these public choice assumptions. In addition, there can be found empirical confirmation for the hypotheses used. Therefore, Table 2 also contains the available empirical evidence that substantiates the different claims. The following sections unfold the respective arguments in detail.

[1] Often public bureaucrats are included as a fourth actor group. Yet in this paper, we do not analyze the specific effects of bureaucrats' involvement in policy design. Note, however, that adding bureaucrats would only contribute to our argument that policy design should be assumed to be far from optimal.

**Table 2** Overview of empirical evidence (own illustration)

| Argument | Support | Sources |
|---|---|---|
| Interest group influence on ETS design (Sect. 3.2) | Strong empirical evidence | Markussen and Svendsen (2005), Anger et al. (2008), Skodvin et al. (2010) |
| Interest group influence on RES policies (Sect. 3.3) | Strong empirical evidence | Jenner et al. (2012), Dagger (2009) |
| Lower abatement costs make tighter cap negotiable (Sect. 3.3) | Tentative empirical support | COM (2008a), COM (2008b) |

## 3.2 *ETS Design as a Result of Political Bargaining*

Theoretical as well as empirical research suggests that the ETS's design is heavily influenced by industry lobbying. Lai (2008) derives analytical conditions for grandfathering of allowances to prevail in instrument design, and Hanoteau (2005) theoretically shows that the allocation mechanism should be particularly prone to lobbying. Indeed, the empirical findings fully corroborate this reasoning. Markussen and Svendsen (2005) demonstrate how interest groups successfully lobbied for a grandfathering of allowances during the introduction of the EU ETS in 2005. Also, the numerous exemptions from full auctioning during the scheme's revision in 2008 can be traced back to lobbying efforts (Skodvin et al. 2010). Anger et al.'s (2008: 17) empirical analysis of a cross-section of German firms shows the important effects of industry lobbying on the overall stringency of regulation:

> Our results suggest that those EU ETS sectors represented by more powerful interest groups have not only benefited from a preferential allocation of emissions allowances compared to other ETS sectors—they were also able to lower the abatement burden of the EU ETS as a whole at the expense of overall economic efficiency.

These results indicate that the emission cap cannot be assumed to correspond to some objective valuation process exogenous to the political process. A comparison of the current ETS allowance price and estimates for the marginal damages of emissions adds to that reasoning. In April 2013, the allowance price for 1 tonne of $CO_2$ fell below 3 euros. In contrast, Tol's meta-study (2012) estimates the average social cost of emitting 1 tonne of $CO_2$ between 5 and 76 euros, depending on the pure rate of time preference. In other words, only if the lowest estimates for climate damages are used as a reference, current allowance prices could be considered as optimal. It seems likely that an inefficiently lax cap contributes to the low allowance prices.

Therefore, the emission cap itself should be seen as a bargaining token—a variable that needs to be negotiated with affected parties. Section 3.2 addresses the question which independent variable(s) determine the emission cap in a more detailed, formal way. Empirically, the initial emission cap in the EU ETS was aligned to a business-as-usual emission scenario for affected industries (Heindl and Löschel 2012). That is, the initial trading period from 2005 to 2007 was intended to be a policy test phase, and only later trading periods are actually meant to effectively reduce emissions. The second trading period from 2008 to 2012 was also marked by significant over-allocation of emission allowances (Morris 2012). The third trading period from 2013 to 2020 introduces only an annually linear reduction of the cap by 1.74%. In other words, the task of negotiating effective emission reductions remains.

Thus, in the real-world context of Europe's climate and energy policy, the negotiation over the stringency of regulation is no one-shot game. Instead, regulators and interest groups will repeatedly debate the ETS cap: in order to attain the aims of the EU's Roadmap 2050, that is, almost full decarbonization of Europe within the next 40 years, the ETS would have to be extended and the cap significantly reduced. The declared prospect of both extension of the scheme and tightening of the cap increases the challenges for successful regulation. Helm (2010: 189) argues that "the political price of widening the scheme will inevitably be dilution." Thus, the argument that a dynamic perspective does not alleviate the challenges for a textbook-like design of the ETS is straightforward: a continuous tightening of the cap would have to overcome equally rising resistance of affected interest groups. Thus, the EU's commitment to climate protection suffers from regulatory uncertainty and a lack of credibility (Brunner et al. 2012). This commitment problem, in turn, reduces investment incentives (Dixit 1989, 1992) and leads to a dynamically inefficient ETS.

## 3.3 *Bargained ETS and RES Support: Effectiveness and Efficiency of the Policy Mix*

Assuming that the emission cap is no longer fixed but has to be negotiated, the decisive question becomes: which variable(s) determine the cap's stringency? In standard economic literature, it is suggested that a stricter cap becomes politically more feasible when the overall costs of climate and energy policy decrease (Weimann 2008: 56). Translating this view in the above notation, $\bar{E}$ is no longer fixed at $\bar{E}^*$ but a function $\bar{E}(C)$, with the emission cap increasing in the overall costs C, which in turn increase in the share of RES, $\theta$. Thus, the standard argument yields:

$$\bar{E} = \bar{E}(C(\theta)) \quad \text{with} \quad \frac{d\bar{E}}{d\theta} = \frac{d\bar{E}}{dC}\frac{dC}{d\theta} > 0, \text{since}$$

$$\frac{d\bar{E}}{dC} > 0, \quad \text{assuming that} \quad \frac{dC}{d\vartheta} > 0 \tag{2}$$

In other words, the emission cap becomes more lenient if expensive RES technologies crowd out cheaper abatement possibilities. Not only does RES support make climate protection more expensive, but it also leads to *less* overall climate protection! In short, the standard argument contends that the more expensive actual emission reductions get, the less emission reductions are politically implementable.

The main weakness of the argument that $\bar{E} = \bar{E}(C)$, even though describing a political interaction, is its lack of plausibility from a public choice point of view. If regulators were maximizing social welfare, they would jointly determine the share of RES and the emission cap so as to minimize the overall costs C of climate and energy policy. From a public choice perspective, however, both the emission cap and the share of RES should be considered as heavily influenced by lobbying. Thus, rather the abatement burden of regulated industries K should be seen as the politically decisive variable. In the above notation, the emission cap then depends on the abatement costs within the ETS, or $\bar{E} = \bar{E}(K)$. This claim builds on the organizational advantages of powerful industry interest groups as compared to the wider public (see assumption (2) above). Regulators must "sell" the emission regulation to a well-organized lobby. One way to achieve this consists in transferring part of the abatement burden *outside* the ETS. It turns out that RES-support policies—by lowering the ETS abatement costs—exactly fulfill this transfer function:

$$\bar{E} = \bar{E}(K(\theta)) \text{ with } \frac{d\bar{E}}{d\theta} = \frac{d\bar{E}}{dK}\frac{dK}{d\theta} < 0, \quad \text{since} \frac{d\bar{E}}{dK} > 0 \text{ and } \frac{dK}{d\theta} < 0. \quad (3)$$

In other words, supporting RES makes a stricter emission cap feasible because it lowers the abatement burden of affected industries. Figure 1 illustrates this point.

Without RES deployment (i.e., $\theta_0 = 0$), emitting industries' demand for allowances is given by their aggregated marginal abatement cost curve $K'_0$. In this situation, the initially bargained emission cap $\bar{E}_0$ ($>\bar{E}^*$) leads to abatement costs represented by the gray triangle CGI. Climate policy misses effective and efficient cap design since in that case the burden AEI is politically not feasible. Introducing RES deployment (i.e., implementing $\theta_1$) shifts the emitting industries' marginal abatement cost curve to the left: RES crowd out electricity production by fossil

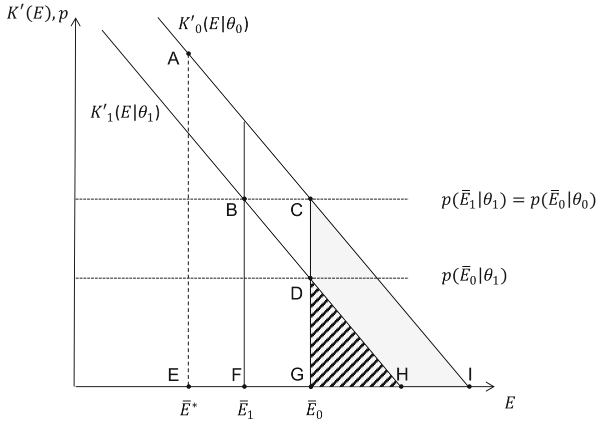


**Fig. 1** Interaction between ETS abatement costs and RES (own illustration)

fuels, which decreases the demand for emission allowances.[2] This, in turn, means lower allowance prices and reduced abatement costs (shaded triangle DGH). Yet this also involves space for bargaining and tightening the cap: compared to the initial situation with $\bar{E}_0$ and $\theta_0$, emitting industries now would be better off at any $\bar{E}_1 < \bar{E} < \bar{E}_0$ because tightening the cap to $\bar{E}_1$ would just keep the industry's abatement burden constant (BFH = CGI). Thus, regulators' bargaining position improves and some $\bar{E}_1 < \bar{E} < \bar{E}_0$ should become negotiable. Furthermore, Fig. 1 implies that if the optimal emission cap $\bar{E}^*$ is stricter than $\bar{E}_1$, increased RES deployment contributes to a more efficient cap. While $\bar{E}^*$ might not be politically feasible (or not exactly known at all), RES deployment may at least help to shift the emission level in the right direction. Since $\bar{E}^*$ is politically not available, the policy mix including RES supporting policy has to be compared with the situation given in $\bar{E}_0$ which is neither effective nor efficient.

The additional costs of RES policies, in turn, are primarily borne by electricity customers as subsidies are funded from a surcharge on the retail electricity price. It is eventually primarily households and small and medium enterprises (SME) who pay for RES policies because large industry customers are often widely exempted from the surcharge, as in Germany, for example. In fact, the latter may actually benefit from declining wholesale electricity prices which (also) result from decreasing $CO_2$ allowance prices. Thus, RES policies redistribute some of the costs of climate protection from emitting industries to the wider public (see assumption (3) above). Furthermore, RES-support policies act as a kind of stakeholder support (Bennear und Stavins 2007) for advocates of stricter emission caps and the transition to a renewable system. The higher the share of RES, the more convincing the position of environmental groups calling for more climate protection. In sum, RES-support policies could be interpreted as the "political price" to pay for stricter emission caps. Obviously, the level of RES support may also be influenced by lobbying activities of producers of RES technologies (Jenner et al. 2012; Dagger 2009). In the above terminology, the difference costs D are in this case not only technically determined (price difference of RES and conventional energy sources) but also resulting from a bargaining process between green industries and the regulator. That is, the more successful green industries' lobbying efforts are, the higher the level of remunerations and the higher D.

What does assumption (3) imply for the efficiency of the policy mix? The overall costs of climate and energy policy, using Eq. (3), read:

$$C(\theta) = K(\bar{E}(K(\theta)); \theta) + D(\theta) + S_1(\bar{E}(K(\theta))) \tag{4}$$

First observe that $\theta$ is the only independent variable here because $\bar{E}$ just mediates the indirect effects of $\theta$ on K and $S_1$. An analytical solution of (4) for the optimal $\theta$

[2]For instance, Weigt et al. (2012) show that between 2006 and 2010, German RES production reduced $CO_2$ emissions from the German electricity sector by 10–16% compared to a scenario without RES.

would require balancing all the direct and indirect effects of $\theta$, which is mathematically not straightforward.[3] However, some hypothetical static equilibrium choice of $\theta$ is irrelevant here and would miss the point: we are asking whether, under condition (3), RES deployment necessarily decreases overall welfare. This is not the case as the sign of $\frac{\mathrm{dC}}{\mathrm{d}\theta}$ is indetermined:

$$\frac{\mathrm{dC}}{\mathrm{d}\theta} = \frac{\partial K}{\partial \bar{\mathrm{E}}} \frac{\mathrm{d}\bar{\mathrm{E}}}{\mathrm{dK}} \frac{\mathrm{dK}}{\mathrm{d}\theta} + \frac{\partial K}{\partial \theta} + \frac{\mathrm{dD}}{\mathrm{d}\theta} + \frac{\mathrm{dS}_1}{\mathrm{d}\bar{\mathrm{E}}} \frac{\mathrm{d}\bar{\mathrm{E}}}{\mathrm{dK}} \frac{\mathrm{dK}}{\mathrm{d}\theta} >< 0 \tag{5}$$

The direct and indirect effects of $\theta$ may balance (5) in either way: the first term on the right-hand side, the indirect effects of RES on the abatement costs via making a tighter emission cap politically feasible, is positive. The second term, the direct effect of RES on the abatement costs through a lower demand for emission allowances, is negative. The third term, the increase in difference costs from a rise in RES, is positive, and the fourth term, the indirect effect of RES on climate damages through a tighter emission cap, is negative. In sum, the combined effects of RES on overall welfare are unclear if the impacts of RES on the ETS cap are taken into account.

# 4 Emissions Trading Under Multiple Policy Objectives

## *4.1 Ideal Policy Design: Case C*

Under case C, a textbook-like ETS faces a regulatory system consisting of multiple policy objectives, e.g., several energy-related externalities to be addressed at the same time. Since Tinbergen (1952), it is an established result that there must be at least one policy instrument for each independent policy objective. To be effective, the number of instruments must exactly match the number of objectives. The context of climate and energy policy is no exception in that respect (see, e.g., Jensen and Skytte 2003; Knudson 2009). Thus, even an ideally designed ETS cannot attain a system of multiple policy objectives.

There are two different ways to make sense of the multitude of policy objectives, such as RES targets, efficiency targets, or technology-specific targets. On the one hand, it might be argued that the numerous goals in European climate and energy policy lead to unnecessary distortion of energy markets. In this view, all objectives besides climate protection are to be neglected. On the other hand, the objectives could be interpreted as a legitimate representation of citizens' preferences (e.g., regarding the desired technology mix) or a second-best attempt at internalizing non-climate externalities (e.g., RES targets as one way of limiting the scale of damages generated during production and transport of fossil fuels if direct first-

[3]In Eq. (4), the first term on the right hand side contains a problematic circularity in that K depends on $\bar{\mathrm{E}}$, which in turn depends on K.

best regulation is politically not feasible). This would imply that the objectives are not devoid of economic logic. Sure enough, this question is a topic of its own and cannot be addressed here in detail (see for a discussion Gawel et al. 2013). However, it seems fair to say that a realistic representation of climate and energy policy in Europe cannot content itself with climate protection: while on the EU level politicians struggle to establish a common climate policy, on the national level member states pursue a broad set of openly diverging objectives, especially within the field of energy policy.

In the following, it is assumed that there are other externalities besides climate change (say, oil spill and nuclear risks) that justify additional environmental objectives next to climate protection. How does the introduction of RES-support policies affect overall costs of climate and energy policy when an ideally designed ETS is already in place? To answer this question, add a new damage term $S_2$ to Eq. (1), which gives Eq. (6). $S_2$ represents non-climate change-related damages of fossil-nuclear energy production, such as oil spills or radiation damages from nuclear power:

$$\begin{aligned} & \mathrm{C}(\theta) = \mathrm{K}\left(\theta; \bar{\mathrm{E}}^*\right) + \mathrm{D}(\theta) + \mathrm{S}_1\left(\bar{\mathrm{E}}^*\right) + \mathrm{S}_2(\theta) \\ & \text{with } \frac{\mathrm{dC}}{\mathrm{d}\theta} >< 0 \quad \text{since} \\ & \frac{\mathrm{dK}}{\mathrm{d}\theta} < 0, \quad \frac{\mathrm{dD}}{\mathrm{d}\theta} > 0, \quad \frac{\mathrm{dS}_1}{\mathrm{d}\theta} = 0 \quad \text{and} \quad \frac{\mathrm{dS}_2}{\mathrm{d}\theta} < 0 \end{aligned} \tag{6}$$

Thus, a new, positive effect of increased RES deployment on the social cost of climate and energy policy enters the picture. In consequence, the sign of $\frac{\mathrm{dC}}{\mathrm{d}\theta}$ is indetermined. As long as the difference costs for RES are higher than their benefit in terms of reduced $S_2$ damages and reduced ETS abatement costs, the social cost of policy intervention increases. If the reduction in $S_2$ and ETS abatement costs outweighs the deployment costs, RES lower the social cost of climate and energy policy. As the cap is fixed, climate protection remains optimal, whatever the level of RES expenditures.

## 4.2 *Political Bargaining: Case D*

Under case D, the ETS design results from negotiations with affected parties, and a regulatory system consisting of multiple policy objectives is in place. Arguably, case D represents the most realistic setting, as it neither assumes ideal policy design nor reduces all externalities to climate protection. This setting reinforces the argument for a policy mix that includes other instruments beyond emissions trading.

In order to account for the political genesis of the ETS, assume that $\bar{\mathrm{E}} = \bar{\mathrm{E}}(\mathrm{K})$. Furthermore, consider additional non-climate damages $S_2$. Introducing RES-support policies in this setting, the social cost of climate and energy policy reads:

$$C(\theta) = K(\bar{E}(K(\theta)); \theta) + D(\theta) + S_1(\bar{E}(K(\theta))) + S_2(\theta) \quad (7)$$

with $\frac{dC}{d\theta} >< 0$ since

$\frac{\partial K}{\partial \bar{E}} \frac{d\bar{E}}{dK} \frac{dK}{d\theta} > 0$ (i) indirect effect on abatement costs
$\frac{\partial K}{\partial \theta} < 0$ (ii) direct effect on abatement costs
$\frac{dD}{d\theta} > 0$ (iii) difference costs
$\frac{dS_1}{d\bar{E}} \frac{d\bar{E}}{dK} \frac{dK}{d\theta} < 0$ (iv) indirect effect on climate damages
$\frac{dS_2}{d\theta} < 0$ (v) direct effect on non-climate damages

Again, solving (7) for static equilibrium values of $\theta$ would face a circularity problem (within the indirect effect on abatement costs), but hypothetical optimal choices are irrelevant for our public choice argument. Instead, the relevant question is whether $\theta$ necessarily decreases overall welfare. In Eq. (7), this claim can be refuted: subsidized RES deployment reduces overall social costs via three terms—the direct effect on ETS abatement (ii), the indirect effect on climate damages (iv), and the direct effect on non-climate damages (v). In contrast, subsidized RES deployment increases overall social costs via two channels—the indirect effect on abatement costs (i) and the difference costs (iii). Thus, the sign of $\frac{dC}{d\theta}$ is a priori indetermined and depends on the relative weight of positive and negative terms. It is clear, however, that under case D, the argument for RES-support policies is stronger and the argument for ETS as a single instrument is weaker than under all other cases A–C.

Moreover, it may be noted that some authors argue for a long-term perspective on $\frac{dD}{d\theta}$ with increasing costs of fossil energy carriers and decreasing costs of RES (Nitsch et al. 2012). Hence, in the long run $\frac{dD}{d\theta} < 0$ might become more likely, and this prospect increases the probability of $\frac{dC}{d\theta} < 0$. Furthermore, energy systems have been optimized for producing and transporting energy from fossil fuels. In other words, they are characterized by a very high degree of path dependency (Goldthau and Sovacool 2011), also termed "carbon lock-in" (Unruh 2000). Considering the long-term cost scenarios, it may, therefore, be beneficial to subsidize current RES deployment in order to overcome the path dependency in energy systems (Lehmann et al. 2012; Lehmann and Gawel 2013).

## 5 Discussion and Outlook

An evaluation of the policy mix in European climate and energy policy critically depends on the perspective applied to policy objectives and instrument design. A narrow focus on textbook-like emissions trading and climate protection yields a fundamentally different assessment than a public choice perspective applied to a setting of diverse policy objectives and multiple externalities. Table 3 summarizes the results of the differentiated analysis carried out in this paper. Evidently, the mainstream argument on the harmful consequences of RES-support policies to the detriment of the ETS as a first-best policy instrument only holds under the restrictive assumptions of case A. In the other cases B, C, and D, the effect of RES-support policies on the overall social cost of policy intervention is not that clear as often argued. In particular in case D, where not only climate externalities are considered and the ETS must be negotiated with vested interests, the deployment of RES may even have positive effects on the efficiency of the policy mix. In sum, RES-support policies do not necessarily decrease the efficiency of climate and energy policy, and they are not necessarily irrelevant for the overall GHG emissions.

Besides efficiency of the policy mix, the effectiveness of the deployed instruments is of main concern. Here, our analysis provides a strong argument for including RES-support policies in the policy mix because RES subsidies could improve the effectiveness of the ETS. By lowering the allowance price and abatement costs, RES subsidies make a tighter emission cap negotiable. This relation holds if the emission cap derives from a bargaining process between regulators and emitters. In conclusion, RES subsidies might be interpreted as the "political price" to pay for introducing and tightening an emission cap.

These results rely on stylized model assumptions, which raises the question of their empirical plausibility (see Table 2). Since our argument "RES-subsidies make a tighter emission cap negotiable" points to a possibility, rather than claiming an inevitable development, it is not possible to instantly refute or confirm it on an empirical basis. However, a closer look at the current status of and the prospects for the EU ETS highlights some critical issues.

First, our argument may be supported from the fact that the EU, within its "20/20/20" package, simultaneously established goals for emission reductions and RES buildup. That is, RES projections were included when devising the ETS targets (COM 2008a, b). Yet ex ante RES production can only be estimated, and actual RES

**Table 3** Overview of results (own illustration)

| | | Objectives of regulation | |
|---|---|---|---|
| | | Single objective: climate protection | Multiple objectives |
| ETS design | Corresponds to the textbook model | Cap: $\bar{E} = \bar{E}^*$<br>Externalities: $S_1$<br>$d\bar{E}/d\theta = 0$<br>$dC/d\theta > 0$<br>**Case A** | Cap: $\bar{E} = \bar{E}^*$<br>Externalities: $S_1, S_2$<br>$d\bar{E}/d\theta = 0$<br>$dC/d\theta ?\ 0$<br>**Case C** |
| | Results from a political bargaining game | Cap: $\bar{E}(K(\theta))$<br>Externalities: $S_1$<br>$d\bar{E}/d\theta < 0$<br>$dC/d\theta ?\ 0$<br>**Case B** | Cap: $\bar{E}(K(\theta))$<br>Externalities: $S_1, S_2$<br>$d\bar{E}/d\theta < 0$<br>$dC/d\theta ?\ 0$<br>**Case D** |

production might turn out higher (smaller) than expected, as has been the case in Germany, for instance.

Second, however, iteratively tightening the cap ex post, depending on prior RES progress, is not unproblematic. Changing the cap retrospectively "could possibly also entail counterproductive effects" (Matthes 2010: 34) because it increases uncertainty for affected industries which in turn might further erode the dynamic efficiency of the ETS. Also, the current discussion about "backloading" some of the allowances for trading period III indicates the resistance that each proposal to tighten the cap will be met with. Thus, even low allowance prices and correspondingly low ETS abatement costs do by no means guarantee a stricter emission cap.

Finally, the proposed mechanism may become more relevant the longer the time horizon. So far, the ETS has been closely aligned to the emitters' business-as-usual (Heindl and Löschel 2012). Until 2020, the EU has set a linear cap reduction factor of $-1.74\%$ annually (basis year 2010). It is clear that extrapolating this trend will not provide for the ambitious goal of an almost carbon-free economy in 2050. In other words, the really hard ETS negotiations are still to come—and the further cap stringency will have to deviate from business as usual, the more important (ceteris paribus) the level of RES diffusion.

As the influence of powerful interest groups on policy making cannot be assumed away—in the real world, that is—the question is how to deal with this influence when giving policy advice. Two diametrically opposed reactions exist. First, it is suggested that economists should engage in "lobbying for efficiency" (Anthoff and Hahn 2010), thereby providing a counterweight to special interests in order to increase overall efficiency. In a similar vein, Helm (2010: 194) advises politicians to reap the "premium on simplicity" by implementing simple policy schemes which are "harder to capture" than complex schemes. However, this appears almost tautologically considering that it is the very influence of organized interests that causes the complexity of policy regimes. Second, Spash (2010: 192) suggests that we abandon all hope that ineffective instruments like the ETS could be saved from dilution and capture: "After all, the reason for emissions trading is that corporations and the technostructure proved too powerful for the political process to establish a tax or direct regulation in the first place." Consequently, in a rather pessimistic outlook, Spash (ibid.) estimates that only fundamental (and unlikely) changes in "economic structure, institutions and behaviour" could remedy the situation.

Yet we believe that viable policy advice can neither build on combating the influence of organized interests nor on visionary social change. Instead of treating vested interests as a lamentable characteristic of politics, we propose to accept the interest-driven process of policy design and implementation as a necessary background for policy advice. Thus, political feasibility should be a main criterion when evaluating current policies and drafting recommendations (Gawel et al. 2012).

From this perspective, we argue that the interaction of EU ETS and national RES policies may be quite useful: making the ETS more effective by tightening the cap is probably one of the top priorities in current European climate and energy policy. Here our analysis provides an additional, hitherto overlooked justification for RES-support policies: by transferring some of the abatement burden outside the

ETS sectors, RES policies strengthen the EU's bargaining position toward emitting industries. Moreover, addressing non-climate externalities by second-best technology-oriented policies (nuclear phase out, RES support) might be considered a pragmatic satisficing policy approach if first-best policies are not available or create prohibitive political cost. Thus, supporting RES in general (albeit deficiencies in detail) might be in a sense a well-nigh clever contribution in practice to the aims of least-cost and effective energy and climate policy under real-world conditions.

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