Energy Policy ∎ (∎∎∎∎) ∎∎∎–∎∎∎

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Good things do not always come in threes: On the excess cost of overlapping regulation in EU climate policy

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HIGHLIGHTS

- EU Climate and Energy Package almost quintuples costs for EU-wide emission abatement.
- The main source of excess cost of EU climate policy are energy efficiency mandates.

ARTICLE INFO

Article history:
Received 17 August 2015
Received in revised form
15 November 2015
Accepted 28 December 2015

JEL classification:
D61
H23
D58

Keywords:
Climate policy
Overlapping regulation
Computable general equilibrium

ABSTRACT

Since the mid-1990's the European Union (EU) aims at pushing global climate policy. The objective is to promote international cooperation by the adoption of substantial EU-wide greenhouse gas emission reduction targets and their least-cost implementation. Our quantitative impact assessment of the EU Climate and Energy Package shows that the myriad of instruments used in the EU to curb greenhouse gas emissions is doomed to generate substantial excess cost. We conclude that EU climate and energy policy should better disentangle its choices of objectives, targets, and policy instruments on rigorous economic grounds in order to improve the coherence and overall cost-effectiveness of policy initiatives.

1. Introduction

To avoid dangerous climate change, international climate policy aims at limiting the increase in average global surface temperature to 2 °C above the pre-industrial average. The 2 °C target implies drastic reductions in global greenhouse gas (GHG) emissions from business-as-usual levels (IPCC, 2014).

The global public good nature of GHG emission abatement, however, provides strong free rider incentives for countries. Since countries are sovereign, there is a lack of effective mechanisms to enforce GHG emission reduction which contributes to the poor performance of international climate treaties so far (Böhringer, 2014; Aldy, 2015; Aldy and Pizer, 2015; Michaelowa, 2015). From a normative perspective, the key challenge in international climate policy is the fair effort sharing of global GHG abatement (Tavoni et al., 2015).

Against this background, it is regarded as crucial that major industrialized countries which stand out for large shares of historical GHG emissions and a high ability to pay lead the way. In this vein, the European Union (EU) pushes climate policy since the mid-1990's. The objective is to promote international cooperation by the adoption of substantial unilateral emission reduction targets and their least-cost implementation. The fundamental idea is to signal that it is possible to decarbonize larger economies without significant economic repercussions.

Following the efficiency rationale of market-based regulation, the EU launched an EU-wide emissions cap-and-trade system in 2005: the so-called EU emissions trading scheme (EU ETS).[1] The EU ETS was not only the key regulatory instrument to comply with the Kyoto Protocol but plays a pivotal role in the EU post-Kyoto climate policy as stated in the Climate and Energy Package adopted in 2009 (European Commission, 2008). The package commits the EU to transform itself into a highly energy-efficient, low-carbon economy until 2020. It includes three major objectives

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[1] For critical appraisals of the EU ETS see, for example, Convery and Redmond (2007), Ellerman and Buchner (2007), Ellerman and Joskow (2008), Convery (2009), Böhringer and Lange (2013), or Ellerman et al. (2014).

http://dx.doi.org/10.1016/j.enpol.2015.12.034
0301-4215/

collectively known as the 20-20-20 targets to be achieved in 2020: (i) to reduce EU greenhouse gas emissions by at least 20% below 1990 levels[2] (ii) to reach 20% of renewable energy in total EU energy consumption, and (iii) to increase energy efficiency by 20% as compared to business-as-usual in 2020.

EU policy makers have appraised the EU Climate and Energy Package as a milestone for Europe's ability to act for the benefit of its citizens. The political self-appraisal may however be questioned from the perspective of cost-effective climate policy design: not only should there be a rationale for market interference as such but also for the choice of specific policy targets and the way these targets are implemented.

Regarding the climate protection objective of the EU package, at least the reasoning behind market interference is uncontroversial. Without regulation, GHG emissions are considered for free, thereby causing a severe market failure since economic agents do not take into account the social cost of GHG emissions. In view of the global public good nature of climate protection as well as uncertainties in external cost estimates for climate change, one could still argue on the reasonableness of unilateral action and the specific choice of the 20% reduction target. However, as has been argued before, unilateral emission reduction might induce other countries to follow suit in the battle against climate change; and one can see the 20% target for the EU until 2020 as an appropriate short-term contribution to the need for substantial reduction of global GHG.

A key point of criticism on EU climate policy refers to its practical implementation which is doomed to make emission reduction more expensive than necessary. Cost-effective regulation would call for a comprehensive EU-wide emissions trading system to assure that emission abatement is undertaken where it is cheapest within the EU.[3] The EU ETS, however, is limited to energy-intensive industries accounting for just around 50% of EU-wide GHG emissions (Achtnicht et al., 2015). Emission abatement in the remaining non-ETS segments of the EU economy (e.g. transportation or agriculture) is based on complementary country-specific regulation. Since there are no tight links between the ETS and the non-ETS emission "markets", marginal abatement cost across these segments will typically not be equalized – such market segmentation could cause substantial excess cost (Böhringer et al., 2005).[4] Another potential source of excess cost is the use of multiple overlapping instruments. Beyond emissions trading the EU builds on the explicit promotion of renewable energy production and energy efficiency to achieve GHG emission reduction with a myriad of regulatory measures including subsidies to renewable energy, efficiency standards for buildings, or specific product policies such as banning incandescent light bulbs or patio heaters (EFI, 2013). Yet, with one primary policy objective the use of multiple instruments can create costly overlaps (Tinbergen, 1952).

The pitfall of excess cost in EU climate policy due to inefficient implementation has been the subject of extensive economic research. A meta-analysis undertaken by the Energy Modeling Forum (EMF) in 2009 points to additional cost because of emission market segmentation and/or additional targets for renewable energy as compared to cost-effective regulation provided by comprehensive emissions trading stand-alone (for a summary see Böhringer et al., 2009). In a similar vein, Fankhauser et al., (2010), Fischer and Preonas (2010), Boeters and Koornneef (2011), Goulder (2013), Helm (2014), or Flues et al. (2014) state that the combination of an emissions cap-and-trade system with renewable promotion policies generates excess cost in climate policy.

Our analysis complements previous economic impact assessments of EU climate policy by incorporating mandated energy efficiency improvements as the third regulatory policy dimension of GHG emission reduction. Based on simulations with a large-scale multi-region, multi-sector computable general equilibrium (CGE) model of international trade and energy use, we find that mandated energy efficiency improvements are a particularly expensive policy instrument to reduce GHG emissions as they enforce larger deviations from the cost-effective abatement patterns emerging from uniform emission pricing stand-alone.

The remainder of this paper is organized as follows. In Section 2, we lay out our numerical framework for the quantitative impact assessment of the EU Climate and Energy Package. In Section 3, we present and discuss our results after describing the policy scenarios. In Section 4, we summarize and conclude.

2. Method of assessment: computable general equilibrium analysis

In general, there is no specific model, which fits all requirements for comprehensive impact assessments, but rather a suite of models or methods depending on the policy measure or issue to be assessed and the availability of data. However, when it comes to economy-wide analysis of policy interferences a strong case can be made for computable general equilibrium (CGE) models that have become a standard tool for economic impact assessment (Böhringer and Löschel, 2006).[5]

CGE models build upon general equilibrium theory that combines behavioral assumptions on rational economic agents with the analysis of equilibrium conditions (Cardenete et al., 2012). They provide counterfactual ex-ante comparisons, assessing the outcomes with a reform in place with what would have happened had it not been undertaken. A key strength of the CGE approach is that it comprehensively represents price-dependent market interactions of economic agents based on microeconomic theory and empirical data. The simultaneous explanation of the origin and spending of the agents' incomes makes it possible to address both economy-wide efficiency as well as distributional impacts of policy interference.

Section 2.1 provides a non-technical summary of the CGE model underlying our simulation analysis.[6] Section 2.2 lays out information on the data used to parametrize the model.

2.1. Non-technical model summary

The static CGE model used for our numerical analysis features a representative agent in each region that receives income from three primary factors: labor, capital, and fossil-fuel resources (i.e. coal, gas and crude oil). Labor and capital are intersectorally mobile within a region but immobile between regions. Fossil-fuel resources are specific to fossil fuel production sectors in each region. Production of commodities, other than primary fossil fuels is

[2] The EU committed itself to a more stringent 30% target as part of a comprehensive international agreement on condition that other major emitting countries in the developed and developing worlds will undertake "comparable efforts".

[3] We abstain here from the discussion of more sophisticated second-best effects such as emission leakage which could call for additional complementary instruments such as border carbon adjustments.

[4] Note that uncertainty on abatement cost could in principle provide an efficiency rationale for market segmentation (Mandell, 2008; Creti and Sanin, 2011)

[5] Obviously, modeling complex socio-economic systems requires simplifying assumptions. The main objective of numerical analysis is then to develop robust insights on the direction of policy impacts and their order of magnitude (rather than emphasizing the informational value of precise numbers).

[6] For a detailed algebraic description of the generic CGE model see Böhringer and Rutherford (2010). For details on the incorporation of bottom-up activity analysis into top-down CGE models see Böhringer (1998).

Please cite this article as: Böhringer, C., et al., Good things do not always come in threes: On the excess cost of overlapping regulation in EU climate policy. Energy Policy (2016), http://dx.doi.org/10.1016/j.enpol.2015.12.034