Energy Economics 68 (2017) 1–3

Contents lists available at ScienceDirect

Energy Economics

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

Editorial

Informing the Transitions towards Low-carbon Societies

1. Global approaches to energy policies and low-carbon transitions

The Atlantic Workshop on Energy and Environmental Economics (AWEEE) is a biennial scientific meeting, born in 2004, which is organized by Economics for Energy (Spain) with the collaboration of CEPE at ETH Zürich (Switzerland) and the CAWM at the University of Münster (Germany). Over the years, the AWEEE (www.eforenergy.org/toxa) has become a lively outlet for the discussion of advanced research on energy and environmental issues among leading world academics and young researchers in the field. This supplemental issue, which is the fourth of a series started with this journal back in 2011, collects thirteen papers by participants in the seventh AWEEE, held in A Toxa (Galicia-Spain) in June 2016. As guest editors, we are once again, thankful to Richard Tol (editor-in-chief of Energy Economics) for his continuous support, and also to the many anonymous reviewers whose impartial and effective work allowed us to finalize this issue in few months.

As on previous occasions, this supplemental issue reflects the growing interest and outreach of the profession in the analysis of energy and climate policies. This is of course related to the political and socio-economic developments and prospects seen in the last few years: from the implementation of intense energy transformation processes in a number of countries to the new climate policy framework set by the Paris Agreement. Unlike previous issues, such as the one dealing with energy efficiency (De Miguel et al. 2015), the papers in the issue show a wider diversity. We have grouped them under a common theme: academic inputs to inform policies and transitions in the energy domain. If socio-economic research of good quality may contribute to the improvement of decision making in almost any area, huge transformation processes should not be carried out without proper scientific assessment and guidance. The papers in this issue can be seen, more or less directly, as contributing from three perspectives: global views, the role of innovation and national approaches to inform policies in the transition towards low-carbon societies.

Global approximations are key to dealing with the general matters behind this issue. For instance, temperature responses and optimal climate policies depend crucially on the choice of a particular climate model. To illustrate the effects of climate model uncertainty on optimal policy formulation, Rezai and van del Ploeg (2017), one of the keynote presenters in the seventh AWEEE, describe and compare the temperature modules of three prominent integrated assessment models (DICE, FUND and PAGE). A dummy temperature module based on the view by climate denialists is added in order to make the analysis more realistic and relevant for the current international debate on climate policies.

Given that damages from climate change typically occur after long delays and in the form of more frequent realizations of extreme and random events, Ghidoni et al. (2017) analyze the implications of decoupling polluting actions (emissions) and their consequences (damages) in a laboratory experiment. They find that sustaining coordination might be more difficult when decision makers have different attitude to reactions: observational decision-makers might just focus on actions as assumed in most theories of long-run cooperation and react to emissions, whereas others might be of an experiential type and react to damages. The authors show that a sizable share of participants is in fact of an experiential type: they condition their emission actions on the level of individually experienced damages, not on observed emission choices of others. The coexistence of experiential and observational decision-makers, however, does not impair cooperation. Yet, spiraling emissions may be the consequence of the behavior of observational decision-makers, which confound late actions of experiential types in response to damages with low punishments as the reaction of others to a deviation from cooperation.

The paper by Kaltenegger et al. (2017) deals with the impact of global value chains on energy footprints. Energy footprints are consumption-based indicators, which record the energy used to produce a country's final demand. In order to disentangle key characteristics of global value chains and their effects on the global energy footprint, the authors present a computation of the energy footprint of nations addressing the role of globalization. It is shown that global energy footprint has increased substantially in recent years and is expected to continue growing. Increased economic activity is the most important driver for the increase in energy footprints, but there is also a substantial contribution of changing global value chains. Given the growing concerns on the linkages between the ongoing socio-economic globalization and energy use and emissions, the paper sheds light on the relevance of the matter and may be useful for the design and implementation of international policies in this area.

Emissions trading is usually seen as a powerful policy tool to deal with global greenhouse gas mitigation, given its cost-effective properties and the promotion of new low-carbon technologies. Output-based allocations (OBAs) are typically used in emission trading systems to reduce leakage in sectors at risk. Recent work has shown they may also be welfare enhancing in markets subject to supply and demand shocks by introducing some flexibility in the total cap; this may result in a carbon price closer to marginal damage. The paper by Meunier et al. (2017) extends previous work to simultaneously include both leakage and volatility. The authors set up a simple two-sector, two-region model to analyze OBA rates in a model with uncertain output prices.

Finally, "economy-energy" equilibrium models have emerged as a dominant tool to investigate future pathways taking into account technological aspects, economic behavior, markets, and policy. A

https://doi.org/10.1016/j.eneco.2018.01.031

challenge for any model of this kind is to represent situations that involve large departures from a benchmark mix of energy technologies that would be associated with “deep” transformations of the energy sector (e.g., energy mix with a high penetration of renewables or near-complete decarbonization). Landis and Rausch (2017) propose a new approach, which allows to model competition between technologies in the context of electricity generation. Hence this procedure may be able to accommodate large changes in the shares of different energy technologies in response to increasingly stringent energy and climate policies, as is actually happening in a number of developed countries.

2. The role of innovation

Three papers explicitly deal with this important matter of innovation in the issue. Cohen et al. (2017) use product-level data from the UK refrigerator market to analyze the effects of changes in electricity price on innovation directed at energy efficiency. Given the relevance of these appliances in household energy consumption and their expected expansion in emerging and developed economies in the future, this is indeed a relevant issue. Unlike much of the prior literature on the relationship between energy prices and innovation, that has primarily used patent data, this paper employs information on the performance of actual products in the market place. The authors estimate a dynamic panel-data probit model and use that model to simulate the effects of energy price increases on the probabilities of a particular appliance being commercialized in the UK market and the associated effects of energy price changes on energy use of the average refrigerator.

De Miguel and Pazó (2017) address the relationships between environmental regulation and innovation, and their impact on price-setting behavior in Spanish manufacturing firms throughout 2009-2014. They also explore the determinants of decisions on environmental protection investment. Their objective is to provide new evidence for the weak and the strong version of the Porter hypothesis by paying special attention to asymmetries between product and process innovations, and between small and large firm behavior. The authors conclude that evidence both for the weak and the strong version of the Porter hypothesis is present, although firm size matters for the impact that environmental regulation has on innovation and prices. Again, the paper provides some useful indications on the role of policies to foster innovation in the private sector.

Finally, Witajewski-Baltvilks et al. (2017) study the drivers and consequences of price-induced technological change on energy efficiency. Based on a theoretical model and empirical analyses, it is shown that induced technological change in energy intensive industries has a clear potential to reduce energy demand. In the theoretical model, the level of innovative activity is determined by energy expenditure and in the long run they are both related to the growth of energy costs. Higher energy costs temporarily increase energy spending, inducing innovations and shifting the demand for energy down until the initial level of energy share of income is restored. Based on the theoretical model, the calibration of quantitative models with endogenous technological change might see empirical improvements. More specifically, the results can be used to calibrate Integrated Assessment Models to project energy efficiency growth and thus inform more adequately on energy policies and transitions.

3. Assessing climate and energy policies

The second keynote speech of the seventh AWEEE focused on the US (pre-Trump) approach to climate mitigation. In a more specific paper, Palmer et al. (2017) analyze the problem of leakage of economic activity and emissions under heterogeneity in regulatory approaches and climate policy stringency within and between regions. They focus on using the allowance value as a production incentive (output based allocation) to remedy emissions leakage to sources not covered by the regulation. Using a detailed simulation model of the US electricity sector, they study the effectiveness and cost effectiveness of different production incentives for addressing emissions leakage within the context of US EPA's Clean Power Plan. The paper shows that an updating of the initial distribution of emissions allowances based on a facility's share of total electricity generation remedies over two-thirds of the amount of leakage that might be expected under other types of program designs.

Additionally, intensity standards have gained substantial momentum as a regulatory instrument in US climate policy. Böhringer et al. (2017) use a multi-sector, multi-region computable general equilibrium model to ask whether intensity standards as part of a unilateral climate policy can substantially reduce leakage emissions in other countries. The authors show that intensity standards may rather increase than decrease counter-productive carbon leakage. Moreover, standards can lead to considerable welfare losses compared to emission pricing via carbon taxation or an emissions trading system.

In order to promote the adoption of energy efficient technologies (such as energy efficient cars, appliances or heating systems), crucial for climate change mitigation, several governments have chosen to subsidize them through rebates or reduced interest rate on loans. A major problem related to this approximation is the presence of a free riding behavior, i.e. subsidies are given to households that would have adopted the energy efficient technologies without financial help. The paper by Olsthoorn et al. (2017) provides an empirical analysis on the ex-ante effects of free riding of a rebate program for energy efficient heating systems. To do so, the authors performed a contingent valuation choice experiment using a sample of homeowners living in EU states. The empirical results confirm that the share of free-riders is relatively high, as reported by previous studies based on revealed data. An obvious conclusion from the paper is the need to design subsidy schemes that minimize free riding behavior.

The following paper keeps the focus on energy efficiency in electricity consumption, particularly on the need to improve the level of efficiency in the use of appliances and to adopt new energy-saving appliances. Blasch et al. (2017) provide information on the potentials for electricity savings in the Swiss residential sector and on the relationship between the level of energy and investment literacy and the level of efficiency. The paper estimates an electricity demand frontier function using panel data and a new econometric approach, the generalized true random effects model (GTREM). This novel approximation allows for the estimation of the persistent as well as the transient part of the level of efficiency in the use of electricity. The empirical results actually show the presence of both types of inefficiencies. Further, the empirical analysis indicates a positive role of energy and investment literacy in reducing household electricity consumption. The authors suggest that policies and measures that target an improvement of energy and investment literacy could help in increasing efficiency in the use of electricity.

A precise computation of price and income elasticities of energy demand is a necessary condition to provide a reliable assessment of the effects of most energy and climate policies. Bakhat et al. (2017) are particularly interested in the effects brought about by the great recession on such elasticities, taking Spain as a relevant case study given the importance of the economic crisis in that country. The authors consider different specifications of a dynamic demand model for transport diesel and gasoline, providing estimations for a panel of Spanish regions in the period 1999-2015. Their results confirm the persistence of very low price elasticities of vehicle fuel demands, both short and long term, but also show that the crisis had a significant impact by increasing the reaction of consumers to variations in the price of transport fuels (particularly diesel) and reducing their reaction to income changes.

References

Bakhat, M., Labandeira, X., Labeaga, J.M., López-Otero, X., 2017. Elasticities of transport fuels at times of economic crisis: An empirical analysis for Spain. Energy Econ. 68 (Suppl. 1), 66–80.

Blasch, J., Boogen, N., Filippini, M., Kumar, N., 2017. Explaining electricity demand and the role of energy and investment literacy on end-use efficiency of Swiss households. Energy Econ. 68 (Suppl. 1), 89–102.
Böhringer, C., Garcia-Muros, X., Gonzalez-Eguino, M., Rey, L., 2017. US climate policy: A critical assessment of intensity standards. Energy Econ. 68 (Suppl. 1), 125–135.
Cohen, F., Glachant, M., Söderberg, M., 2017. The impact of energy prices on product innovation: Evidence from the UK refrigerator market. Energy Econ. 68 (Suppl. 1), 81–88.
De Miguel, C., Pazó, C., 2017. Environmental protection, innovation and price-setting behavior in Spanish manufacturing firms. Energy Econ. 68 (Suppl. 1), 116–124.
De Miguel, C., Labandeira, X., Löschel, A., 2015. Frontiers in the economics of energy efficiency. Energy Econ. 52, S1–S4.
Ghidoni, R., Calzolari, G., Casari, M., 2017. Climate change: Behavioral responses from extreme events and delayed damages. Energy Econ. 68 (Suppl. 1), 103–115.
Kaltenegger, O., Löschel, A., Pothen, F., 2017. The effect of globalisation on energy footprints: Disentangling the links of global value chains. Energy Econ. 68 (Suppl. 1), 148–168.
Landis, F., Rausch, S., 2017. Deep transformations of the energy sector: A model of technology investment choice. Energy Econ. 68 (Suppl. 1), 136–147.
Meunier, G., Montero, J.P., Ponssard, J.P., 2017. Using output-based allocations to manage volatility and leakage in pollution markets. Energy Econ. 68 (Suppl. 1), 57–65.
Olsthoorn, M., Schleich, J., Gassmann, X., Faure, C., 2017. Free riding and rebates for residential energy efficiency upgrades: A multi-country contingent valuation experiment. Energy Econ. 68 (Suppl. 1), 33–44.
Palmer, K., Burtraw, D., Paul, A., Yin, H., 2017. Using production incentives to avoid emissions leakage. Energy Econ. 68 (Suppl. 1), 45–56.
Rezai, A., van del Ploeg, F., 2017. Climate policies under climate model uncertainty: max-min and min-max regret. Energy Econ. 68 (Suppl. 1), 4–16.
Witajewski-Baltvilks, J., Verdolini, E., Tavoni, M., 2017. Induced technological change and energy efficiency improvements. Energy Econ. 68 (Suppl. 1), 17–32.

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