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EDITORIAL

Environmental innovation and socio-economic dynamics in institutional and policy contexts

Simone Borghesi · Valeria Costantini · Francesco Crespi · Massimiliano Mazzanti

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The dynamic analysis of environmental innovation (EI) and of the co-evolving socio-economic, institutional and policy contexts is gaining growing relevancy in the current academic and political debate. Environmental and innovation policies are increasingly jointly investigated in order to understand how to ensure the conditions for fostering economic development while protecting the environment (OECD 2010, 2011a, b). In particular, the ongoing economic and financial crisis has brought increasing attention to a broadly defined transition to the green economy as a

S. Borghesi
Department of Political and International Studies, University of Siena, Siena, Italy
e-mail: simone.borghesi@unisi.it

V. Costantini · F. Crespi
Department of Economics, Roma Tre University, Roma, Italy

V. Costantini
e-mail: valeria.costantini@uniroma3.it

F. Crespi
e-mail: francesco.crespi@uniroma3.it

F. Crespi
BRICK (Bureau of Research in Complexity, Knowledge, Innovation), Collegio Carlo Alberto, Moncalieri, Italy

M. Mazzanti (✉)
Department of Economics and Management, University of Ferrara, Ferrara, Italy
e-mail: mzzmsm@unife.it

M. Mazzanti
url: http://www.sustainability-seeds.org/

M. Mazzanti
CERIS CNR, Milan, Italy

powerful mechanism to escape from the current downturn. A roadmap for the development and diffusion of environmental-friendly technologies combined with a cooperative institutional framework for a coherent environmental regulation seems to be widely acknowledged as necessary in order simultaneously to improve economic and environmental performance (European Commission 2011). Within the environmental policy arena, resource efficiency and climate change, namely, the definition of the post Kyoto framework after 2012, are the hottest issues. In an international policy framework that suffers from lack of coordination, the EU has led the way in setting targets—such as the Lisbon agenda and the recent 20-20-20 strategy on energy efficiency, CO2 emissions and renewable energy sources.

Though such steps are important, the horizon is not clear: the compliance with the Lisbon agenda is poor and although the Kyoto targets have been achieved, this was mainly due to the ongoing crisis (Borghesi 2011). Therefore, one may reasonably wonder whether the 20-20-20 targets will be achieved when the economy eventually recovers from the recession. Moreover, the current crisis that started in 2008 might have undermined investments in energy efficiency and green technologies, especially in the southern European countries where the recession is particularly severe.

Among other EU initiatives, it is worthwhile to note that the Seventh Framework Programme attributed to energy-related research 2,590 million euros, while environment-related research (including climate change) has been assigned 2,240 million euros. In 2004, the Environmental Technologies Action Plan (ETAP) was launched with the aim of defining and promoting the competitive advantages of energy and environmental technologies produced by European firms, and of stimulating initiatives featuring several "crossing points" with EU environmental and innovation policies. To support further the ETAP development, in 2008 the "EU Competitiveness and Innovation Programme" launched a call worth 28 million euros for the development of environmental products and technologies. Environmental innovation is indeed a relevant part of the Competitiveness and Information Programme (CIP), for the 2007–2013 period, featuring a budget of 3,6 billion euros. The objective of such initiative is to fill in the gap between innovation and market development in European industries involved in eco-products, with an emphasis on small and medium sized firms (SMEs). Finally, within the new EU framework programme (Horizon 2020), relevant investment flows will be devoted to address issues related to climate change, the development of sustainable transport and mobility and to improve the affordability of renewable energies.

The huge amount of financial resources devoted to the development and diffusion of EI urges environmental and innovation economics scholars to deepen significantly the analysis of how EI generates, spreads and is adopted across sectors and countries. In this respect, the scientific and policy challenges in research areas such as environmental and ecological economics, innovation studies and evolutionary economics urge the development of an integrated perspective of analysis, in order to extend the breadth of research in new directions. One key necessity is to bring together different research and policy experiences (van den Berg 2007; van den Berg et al. 2007). Evolutionary economics and innovation studies must enrich the dynamic thinking in environmental economics beyond the current state, through methodological and thematic implantations. The development of such an integrated

and dynamic oriented approach allows both (1) the full investigation of the nature and characteristics of the various relationships between environmental innovations, environmental performances and more general economic, trade and technological dynamics (Costantini and Mazzanti 2012), and (2) the assessment of the way in which institutional factors, including market and policy factors, affect environmental innovation trajectories (Crespi 2013). In this analytical context, the study of non-linear economic-environmental dynamics, lock-in and path-dependence effects, as well as the role of innovation complementarities (Antonelli et al. 2012; Mohnen and Röller 2005; Reichstein and Salter 2006) are, among others, possible research directions to be further developed. The investigation of the role of systemic policy action as an institutional factor shaping market behavior is also very relevant in this context (Edquist 2001). Finally, the analysis of adaptive policy making also provides promising research directions which can flourish within environmental economics fields (Metcalfe 1995; Smits et al. 2010).

The introduction and diffusion of EI is the key issue around which the whole reasoning may revolve, and is becoming the conceptual reference point for many domestic and international public policies and management strategies. One recent definition of EI identifies it as the production, application or use of a product, service, production process or management system new to the firm adopting or developing it, and which implies a reduction in environmental impact and resource use (including energy) throughout its life-cycle (Kemp 2010). This definition also includes innovations with positive environmental effects which are not intentional.

Studies on environmental innovation and its relationship with socio-economic performance and institutional and policy settings have originated within the frameworks of environmental economics and management and innovation-related studies. A first research field focuses on the analysis of dynamic efficiency of environmental policy tools, which had been traditionally evaluated in terms of their static efficiency (Requate and Unold 2003). A second research field regards the so called Porter hypothesis which explores the links between well-designed environmental regulation and innovative activities, on the one hand, and the performance/competitiveness of firms and innovation strategies, on the other hand.

On the heels of the works by Porter (Porter and van der Linde 1995; Lanoie et al. 2011), researchers have traditionally looked at the competitiveness effects of regulations in the heavier manufacturing sectors that might be most relevant to the interplay of competition and regulation (Jaffe et al. 1995, 2005; Ambec et al. 2010). In addition, taking a structural change approach, it should be noticed that the shift towards a service economy in advanced economies does not necessarily lead by itself to sustainable growth. The increasing interdependence between services and industry make even immaterial service sectors heavily dependent on resource-intensive inputs. This applies even more to certain material intensive services, such as transport: more extensive production networking and higher role of intermediate goods may involve higher circulation of goods and higher intensity of transportation. The indirect emissions accounted by services have actually increased over time and account now for about 30 % of total emissions, a share that is almost comparable to that of the manufacturing sector (Marin et al. 2012). The increasing role of vertical integration makes it necessary to look at both industry and service innovation dynamics.

In parallel, many studies in the field have focused on the relevance of firms' internal drivers, such as research and development efforts (R&D), and of other external innovative strategic factors, such as networking, spillover effects, industrial relations, and policy stringency, differentiated according to sectors and regions (Horbach 2008; Horbach et al. 2012; Kemp and Pontoglio 2011). Nevertheless, there remain ample opportunities for further analysis, including: (1) research on green patents (Johnstone et al. 2010); (2) integrated studies on environmental and non environmental innovation dynamics, including organizational ones; (3) focus on the meso sector level (e.g. exploiting input output matrixes and NAMEA as in Costantini et al. (2012)) that offers the chance to investigate dynamic co-evolutionary links between measures of economic growth (labor productivity) and indicators of environmental efficiency. In particular, the richness of data at meso level, which is crucial in the evolutionary thinking (Dopfer 2012), allows studying whether our economies achieve a decoupling of economic growth from the production of local and global externalities such as acidification pollutants and greenhouse gases.

The papers published in this Special Issue provide various theoretical and empirical insights into the research directions listed above and use the rich array of methodological tools that can be exploited by adopting a broad multi-perspective analytical framework to the study of eco-innovations. Though the papers are interlinked along many conceptual, policy based and empirical perspectives, they may be divided into three main groups depending on the issues they address and the methodological approach they adopt.

The papers by Antoci, Borghesi and Galeotti and by Safarzynska and van den Bergh build up theoretical frameworks that are tailored to address the dynamics of environmental innovations, such as dynamic social networking, interactions between different social agents and socio-economic sustainability paths, and the analysis of transition to new energy structures. A second topic is addressed by Dijk, Kemp and Valkering where conceptual insights on the diffusion of eco-innovations and competing technological paths are tested with simulation exercises. Finally three papers go directly into the fore of empirics, providing various original evidence on: the investigation upon the main drivers of environmental-friendly R&D decisions as described by Rennings, Markewitz, and Vögele; the dynamic assessment of environmental and labour productivity trade-off or correlations as given by Marin and Mazzanti; the analysis on the role of environmental and technology policies in shaping the export dynamics of energy technologies as provided by Costantini and Crespi.

References

Ambec S, Cohen M, Elgie S, Lanoie P (2010) Chair's paper for the conference 'Porter hypothesis at 20: can environmental regulation enhance innovation and competitiveness?' Montreal, Canada, 27–28 June. Available at www.sustainableprosperity.ca

Antonelli C, Crespi F, Scellato G (2012) Inside innovation persistence: new evidence from Italian micro-data. Struct Chang Econ Dyn 23(4):341–353

Borghesi S (2011) The European emission trading scheme and renewable energy policies: credible targets for incredible results? Int J Sustain Econ 3(3):312–327

Costantini V, Mazzanti M (2012) On the green and innovative side of trade competitiveness? The impact of environmental policies and innovation on EU exports. Res Policy 41(1):132–153
Costantini V, Mazzanti M, Montini A (eds) (2012) Hybrid economic-environmental accounts. Routledge, London
Crespi F (2013) Environmental policy and induced technological change in European industries. In: Costantini V, Mazzanti M (eds) The dynamics of environmental and economic systems. Innovation, environmental policy and competitiveness. Springer, New York, pp 143–157
Dopfer K (2012) The origins of meso economics, schumpeter legacy and beyond. J Evol Econ 22:133–160
European Commission (EC) (2011) Roadmap to a resource efficient Europe, COM(571). Final, Brussels
Edquist C (2001) Innovation policy-a systemic approach. In: Archibugi D, Lundvall B (eds) The globalizing learning economy. Oxford University Press, New York
Horbach J (2008) Determinants of environmental innovations, new evidence from German panel data sources. Res Policy 37(1):163–173
Horbach J, Rammer C, Rennings K (2012) Determinants of eco-innovations by type of environmental impact. The role of regulatory push/pull, technology push and market pull. Ecol Econ 78:112–122
Jaffe AB, Newell RG, Stavins R (2005) A tale of two market failures: technology, and environmental policy. Ecol Econ 54:164–174
Jaffe AB, Peterson SR, Portney PR, Stavins RN (1995) Environmental regulation and the competitiveness of U.S. manufacturing: what does the evidence tell us? J Econ Lit 33:132–163
Johnstone N, Hascic I, Popp D (2010) Renewable energy policies and technological innovation: evidence based on patent counts. Environ Resour Econ 45:133–155
Kemp R (2010) Eco-innovation: definition, measurement and open research issues. Econ Polit 3:397–420
Kemp R, Pontoglio S (2011) The innovation effects of environmental policy instruments—a typical case of the blind men and the elephant. Ecol Econ 72(15):28–36
Lanoie P, Laurent-Lucchetti J, Johnstone N, Ambec S (2011) Environmental policy, innovation and performance: new insights on the porter hypothesis. J Econ Manag Strategy 20(3):803–842
Marin G, Mazzanti M, Montini A (2012) Linking NAMEA and Input output for 'consumption vs. production perspective' analyses evidence on emission efficiency and aggregation biases using the Italian and Spanish environmental accounts. Ecol Econ 74:71–84
Metcalfe JS (1995) Technology systems and technology policy in an evolutionary framework. Camb J Econ 19(1):25–46
Mohnen P, Röller LH (2005) Complementarities in innovation policies. Eur Econ Rev 49:1431–1450
OECD (2010) Taxation, innovation and the environment, OECD green growth studies. OECD Publishing, Paris
OECD (2011a) Better policies to support eco-innovation OECD studies on environmental innovation. OECD Publishing, Paris
OECD (2011b) Fostering innovation for green growth, OECD green growth studies. OECD Publishing, Paris
Porter ME, van der Linde C (1995) Toward a new conception of the environment-competitiveness relationship. J Econ Perspect 9(4):97–118
Requate T, Unold W (2003) Environmental policy incentives to adopt advanced abatement technology: will the true ranking please stand up? Eur Econ Rev 47:125–146
Reichstein T, Salter A (2006) Investigating the sources of process innovation among UK manufacturing firms. Ind Corp Chang 15:653–682
Smits R, Kuhlmann S, Shapira P (eds) (2010) The theory and practice of innovation policy. An international research handbook. Edward Elgar, Cheltenham
van den Berg JCJM (2007) Evolutionary thinking in environmental economics. J Evol Econ 17(5):521–549
van den Berg JCJM, Faber A, Idenburg A, Oosterhuis F (2007) Evolutionary economics and environmental policy survival of the greenest. Edward Elgar, Cheltenham