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On the green and innovative side of trade competitiveness? The impact of environmental policies and innovation on EU exports

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ABSTRACT

This paper aims at exploring how the export competitiveness of the European Union has been affected by environmental regulation and innovation. Starting from the Porter idea that environmental policies may foster international competitiveness by inducing technological innovation. We test both the strong and narrowly strong versions of the Porter hypothesis, in order to understand if such a virtuous cycle is confined into the environmental goods sector (respecting the narrow criterion) or it spreads out through the whole economic system. For this purpose we adopt a theoretically based gravity model applied to the export dynamics of five aggregated manufacturing sectors classified by their technological or environmental content.

When testing the strong version, the overall effect of environmental policies does not seem to be harmful for export competitiveness of the manufacturing sector, whereas specific energy tax policies and innovation efforts positively influence export flows dynamics, revealing a Porter-like mechanism. When testing the narrowly strong version, environmental policies, but more incisively environmental innovation efforts, foster green exports. These results show that public policies and private innovation patterns both trigger higher efficiency in the production process through various complementarity mechanisms, thus turning the perception of environmental protection actions as a production cost into a net benefit.

1. Introduction

The competitiveness and productivity performance of economic systems is a key factor in both economic development and environmental sustainability achievements. This paper deals with policy and innovation driven competitiveness performance in the European Union (EU), with a focus on export dynamics, by bringing together different streams of research. From a conceptual point of view, it matches together the consolidated realms related to the Porter hypotheses (Jaffe et al., 1995; Jaffe and Palmer, 1997; Porter and van der Linde, 1995) and the neo Schumpeterian conceptual framework of technological regimes applied to economic sectors (Breschi et al., 2000; Malerba and Orsenigo, 1997). This integration is in our eyes extremely fruitful given the centrality of the dynamic properties of innovative processes and structural change of economies that are present, not always in explicit forms, in the Porter hypotheses literature.

On a more specific level, the aforementioned perspective is engraved in the wider analysis of the relationship between economic and environmental performance, wherein the relevance of both innovation and environmental policy is crucial to decreasing the use of natural resources. Over dynamic scenarios, joint productivity gains can characterise economic systems, by mitigating or totally compensating the trade off between environmental and economic targets (Mazzanti and Zoboli, 2009). Increasing decoupling of environmental performance with respect to growth depends on scale, composition, technological and trade effects (Levinson, 2010) and on the inducement effect produced by the environmental policy mix on the innovation path (Hemmelskamp, 1997; Hemmelskamp and Leone, 1998; Requate, 2005; Requate and Unold, 2003; Roediger-Schluga, 2004). This inducement effect is also influenced by institutional, economic, trade and policy frameworks which contribute to the creation and diffusion of leading innovations (Rennings and Smidt, 2008) as well as by the timing of innovation adoption and the relative coherence of the regulatory framework with the overall economic system.

Narrowing down the focus, the effect of stringent environmental policy on economic competitiveness is a key point in the rich

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discussion on the effects of an Environmental Tax Reform (ETR), and the related potential double economic-environmental dividends (Andersen et al., 2007; Bosquet, 2000). The capacity of environmental policies to reinforce international competitiveness and resource efficiency, as claimed by the recent revision of the Lisbon Agenda, is even more relevant when the logic on how to move towards new growth scenarios in the current crisis assigns a key role to environmental sustainability. The years 2009–2011 are witnessing the implementation of recovery packages aimed at reassessing economic growth while improving sustainability (Bowen et al., 2009; Edenhofer and Stern, 2009). The greening of economic performance and exports may lead to new and greener structural competitive advantages. However, it needs to be supported by coevolving innovation and environmental policy instruments in the transition towards sustainable pathways (Geels and Schot, 2007).

To some extent, the EU has historically been a leader in the design and adoption of stringent environmental policies and many fears have arisen about the potential negative effects of such unilateral production constraints. Nevertheless, Andersen and Ekins (2009) recently surveyed EU experiences and scrutinized various cases where the implementation of carbon taxes and auctioned permits in the EU has been a fruitful way to reconcile environmental and economic performance. ETR has the potential to be shaped with a proper competitiveness target perspective, if well designed. Accordingly, Barker et al. (2007) and Pollitt and Junankar (2009) provide evidence discarding fears of potential negative effects associated with ETR and climate actions on employment, income distribution, economic growth and export performance.[1]

The themes discussed above lead directly to the potential win–win effects generated by properly designed environmental regulation instruments which help improving both efficiency and product values (Porter, 1991; Porter and van der Linde, 1995; Wagner, 2006). According to this reasoning, economic and environmental performance may go hand in hand without the conflicts generally prescribed by certain neoclassic frameworks.

It is worth noting that all aforementioned issues also touch the relationships between international trade and related environmental effects (Managi et al., 2009) which attracted attention in the 1970s after the oil crisis and witnessed a revival in the 1990s, when environmental policy and trade openness were increasing their pace (Chichilnisky, 1994; Rauscher, 1997). In particular, when the focus is on specific effects generated by environmental regulation on comparative advantages, the two prevailing perspectives are the pollution haven hypothesis (PHH) and the already mentioned Porter hypothesis (PH). As far as the PHH is considered, environmental policy enters a Heckscher–Ohlin theoretical framework as a constraint to factor endowment. Thus, the introduction of more stringent environmental regulations is potentially harmful to international competitiveness of domestic firms facing higher productive costs, leading to delocalization of dirty industries towards countries with a relatively lower burden of environmental regulation (Copeland and Taylor, 2004; Letchumanan and Kodama, 2000; Levinson, 2010; Muradian et al., 2002).

On the contrary, the PH assumes a more comprehensive and dynamic point of view, as the combination of environmental policies with private and public innovation strategies may lead to increasing environmental efficiency combined with productivity gains, if public policies are well-designed in stimulating proper techno-organizational innovation patterns. To this purpose, van den Bergh et al. (2000) stress that "adding a temporal dimension, the question can be raised of which types of behaviour [...] tend to survive under certain policies. This would provide information on the long run stability of environmental policy" (van den Bergh et al., 2000, p. 59).

The aforementioned strands of literature on the effects of environmental policies seem to find a better theoretical framework in the PH rather than in a PHH realm. Hence, this paper's main research question is whether environmental policies in the EU have undermined or created win–win opportunities for the competitiveness of its sectors. More precisely, it aims at focusing on the effects of combined environmental taxation and innovation dimensions on competitive advantages of manufacturing exports by using a theoretically based gravity model for trade analysis.

The rest of the paper is structured as follows: Section 2 provides a literature review on the Porter hypothesis and connected innovation oriented streams of literature and draws out the specific research hypotheses. Section 3 presents theoretical and methodological issues of the gravity model, while Section 4 gives details on the empirical model and the dataset. Section 5 comments on results and Section 6 offers conclusions and options for future research.

2. Shadows and lights of the Porter hypothesis

2.1. The evolution of the debate over the last 20 years

Up until the development of the PH framework, general thought was that the fulfilment of environmental regulations would be likely to reduce the competitiveness of the compliant sectors and increase firm production costs compared with not compliant industries.

On the contrary, the PH seems to test the potential complementarities and private beneficial effects of properly designed environmental regulations, which are likely to emerge in a dynamic context where induced innovation and environmental strategies co-evolve (Wagner, 2007). Since the early 1990s a set of various hypotheses ranging from micro to macro frameworks have emerged under the umbrella of the PH. During the past two decades, we witnessed a hybridization starting from pure managerial business approaches relying on case study analyses (Esty and Porter, 1998, and as examples, articles by Porter in the special issue on 'Greening the economy' of March 2010 on the *Harvard Business Review*) to environmental economics essays dealing with micro and macro issues (Ambec and Barla, 2002, 2006; Ambec and Lanoie, 2008; Ambec et al., 2010; Kriecher and Ziesemer, 2009).

Nonetheless, the early taxonomy proposed by Jaffe and Palmer (1997) and to a somewhat different but complementary extent by Jaffe et al. (1995) seems to be still valid as a general but flexible conceptual framework, where three different versions of the PH were classified.

The strong version starts from a rejection of the profit maximizing behaviour assuming a dynamic evolutionary setting, and it claims that environmental regulation enhances economic performance at least in the medium run for compliant firms, the sector to which they belong and, eventually, the economy as a whole. Regulation shocks could thus be a possible driver of structural change in addition to market related shocks. Heavily changing conditions allow agents considering new opportunities in product and processes, that can fruitfully complement existing innovations, as well as extending the investment perspective over time. Hence, the final effect on economic system as a whole may turn out to be positive through innovation offsets – both through process efficiency and product value enhancement – that may derive from the policy driven early adoption of both technological and organizational

[1] For an extensive review on the innovation effects of ETR, see Salmons (2009).