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Is environmental innovation embedded within high-performance organisational changes? The role of human resource management and complementarity in green business strategies

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ABSTRACT

This paper investigates whether firms' joint implementation of organisational innovation and training may foster their adoption of environmental innovation (EI), and if this correlation falls within Porter Hypothesis (PH) framework. We study the relationship of complementarity between strategies of High Performance Work Practices (HPWP) and Human Resource Management (HRM) when EI adoption is the firms' objective, using an original dataset on 555 Italian industrial firms regarding EI, HPWP and HRM, coherent with the last CIS2006-2008 survey. Results show that sector specificity matter. The only case in which strict complementarity is observed in organisational change concerns CO_2 abatement, a relatively complex type of EI, but this is true only when the sample is restricted to more polluting (and regulated) sectors. This evidence is coherent with the Porter hypothesis: complementarity-related adoption of EI is an element of organisational change in firms that are subject to more stringent environmental regulations. Nevertheless, the fact that strict complementarity is not a diffuse factor behind the adoption of all environmental innovation indeed does not come as a surprise. At this stage in the development of green strategies, the share of eco-firms is still limited, even in advanced countries that are seeking tools for a new competitiveness. The full integration of EIs within the internal capabilities and firm's own assets is far from being reached, even in advanced and competitive industrial settings.

1. Introduction

Do firms' actions in organisation and training foster the adoption of environmental innovation? Are environmental strategies integrated with organisational changes aimed at increasing firms' performances?

These questions, which revolve around the issue of environmental innovation adoption, relate to an exhaustive definition of Environmental Innovation (EI).[1] In the MEI (Measuring EI) research project (Kemp and Pearson, 2007; Kemp, 2010), EI is defined as "the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives"[2] (Kemp, 2010, p. 2).

The definition of EI is not limited to specific technologies; it also includes new organisational methods, products, services and knowledge-oriented innovations. Organisational methods are also closely linked to education and training and then to human capital formation within firms.

It is worth spending some words on the definition of organisational changes as we intend them here. The literature often adopts the term High Performance Workplace Practices (HPWP),[3] to define a set of organisational changes which can be thought of as drivers of

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[1] For further discussion on EI determinants see Mazzanti and Zoboli (2009a) and Kemp and Pontoglio (2011).

[2] Results of the MEI project can be found at http://www.merit.unu.edu/MEI/.

[3] A plethora of names has been assigned to the 'new organisational practices' according to the practices selected and to the perspective adopted in the different studies: e.g. High Performance Work Systems (Ramsay et al., 2000; Osterman,

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superior innovative or economic performances in the firm. Coupled with this set of practices that are related to changes in production organisation (e.g. autonomous or semi-autonomous teams, quality circles) and labour organisation (e.g. job rotation, multitasking, increased workers' responsibility), we take into account Human Resource Management (HRM) practices which are linked to the training activity sphere. The human capital embodied in employees becomes a fundamental resource since "innovating organisation benefits from a strong skill-base" (Leiponen, 2005, p. 304), which is able to sustain and to direct absorptive capacity. The importance of training activities[4] that help generate and accumulate skills and competencies complementary to HPWP becomes clear. HPWP and HRM practices, as intended here, are intertwined firm's components, which, in a process of co-evolution and adaptation (Van den Bergh and Stagl, 2003), influence each other and impact the firm's innovative performance. Indeed, when a firm undergoes organisational changes such as the introduction of HPWP, the employees can be asked to learn how to manage and how to behave in a new organisational environment. Reconfiguring the organisational system in a way that increases workforce involvement and skill base, through the implementation of complementary HPWP/HRM practices, may be functional to the creation of an environment that smoothly absorbs and exploits even more complex types of innovation.

The potential relationship between HPWP/HRM and EIs is focused on as a core issue by the scholars examining the development of the well-known Porter Hypothesis (PH) (Ambec and Barla, 2006; Ambec and Lanoie, 2008; Ambec et al., 2010; Jaffe et al., 1995; Jaffe and Palmer, 1997).

Some recent studies have tried to shed light on this issue in EI-related literature. Among others, we can quote Cole et al. (2008) and Bloom et al. (2010). The first assesses the role of foreign derived training on a sample of African firms' environmental performances, finding that foreign training of a firm's decision maker, not foreign ownership per se, does reduce fuel use. Bloom et al. (2010), instead, survey UK manufacturing firms to assess whether energy efficiency performance is influenced by various forms of HPWP and find mixed evidence: more general proxies of human capital management do not have an impact, while some others seem to decrease energy use. Various other papers find a positive effect of training on EI performances (Horbach, 2008; Horbach et al., 2011; Cainelli et al., 2011). Further, Kesidou and Demirel (2012) show for a sample of UK firms that organisational factors are important in determining eco innovation investment. Horbach et al. (2012) stress how organisational capabilities, among several other factors, have to be included among the determinants of eco innovation.

Notwithstanding the above, integration of environmental innovation studies and the stream of organisational change research is far from being fully satisfactory: research windows are open. In particular, we are not aware of studies that investigate the role of the HPWP/HRM couple in the specific theme of EI adoption[5] (Rennings, 2000).

The aim of the paper is to investigate these somewhat unexplored issues.

We scrutinise whether firms' HPWP and HRM integrated strategies can foster the adoption of EIs. More precisely, our main research focus is to examine if a relationship of complementarity exists among these practices when the adoption of EIs is the objective. We embed this analysis within the Porter Hypothesis framework. We test complementarity between strategies for all manufacturing firms and for the sub-sample of more polluting and consequentially more heavily regulated firms.

We believe that a full integration of EI in firms innovation strategies is possible and needed to evolve EI from 'green washing' or 'ancillary' strategies into a key issue in firms' redefinition of competitive advantages. Fostering green innovation strategies for growth through adequate policy interventions and studying the determinants of eco-innovation, is a central issue in the near future of developed countries (OECD, 2011; EIO, 2011).

Thus, our purpose is to investigate the extent to which environmental innovation is associated to human resource management (HRM) and organisational change (HPWP) implementation, by assessing their impact through the lens of complementarity theory (Milgrom and Roberts, 1990, 1995).

In particular we analyse whether the implementation of joint HRM and HPWP strategies in fostering the adoption of firms' EIs is more evident for manufacturing firms belonging to heavily environmental regulated sectors under many aspects such as CO_2, emissions and waste.[6] In fact, more stringent environmental standards might foster firms' adoption of training and organisational innovation, which in turn could lead to further environmental innovation. The conceptual framework is that of the Porter idea of firm competitive advantages that reside in the firm value chain, within which "Strategy is manifested in the way activities are *configured* and *linked together*" (Porter, 2010).[7] These 'links' are the complementarity we investigate.

To be more precise in terms of the ample Porter-related literature available (Costantini and Mazzanti, 2012), we focus here on the weak aspect of the PH. The weak version predicts that additional innovations induced by regulations present opportunity costs on the one hand, but their gross benefits may be higher. The generation of those net benefits is also coherent with the assumption of initial profit maximising behaviour. Agents will be induced by new constraints to re-engineer and reorganise technology and organisation, to improve activity coordination and to align incentives for the purpose of meeting these constraints at a lower cost, resulting in more efficiency and increased productivity. This view is also compatible with a neo Schumpeterian approach, as the dynamics of innovation are linked and co-evolve with appropriability conditions and the generation of new economic performances (Dosi et al., 2006; Malerba, 2007).

We investigate the issue by using new and original data that covers 555 Italian firms belonging to environmentally regulated manufacturing sectors over the 2006–2008 period, the same time span covered by the last CIS. We thus assure potential comparability of results with CIS studies (see Horbach et al., 2012 for a recent analysis on Germany).[8] CIS based studies surveyed by Mairesse and Mohnen highlight how issues regarding environmental innovation have recently made their appearance (Mairesse and Mohnen, 2010). Moreover, to better explore the complementary

2006); High Involvement Management (Bryson et al., 2005a); High Commitment Management (Dorenbosch et al., 2005; Bryson et al., 2005b).

[4] For empirical evidence on the relations between training and firms' economic performance see Conti (2005) and Zwick (2004).

[5] Recently, only Pekovic (2011) has tried to merge environmental and HPWP/HRM perspectives through a study that exploits an employee-employer dataset on French firms. Environmental innovations are assumed to enhance high commitment HRM practices, encourage employee involvement and reshape work organisation. Results show that greener firms present more labour oriented strategies and this is ultimately beneficial for firm-specific performance.

[6] A few examples of stringent environmental standards are: the EU emission trading 2003 Directive; IPPC 2008 Directive on emissions abatement and environmental technology together with its 2010 revision; the EU waste Packaging Directives of 1994 and 2003.

[7] Taken from Michael Porter's lecture at the Montreal 2010 event 'Porter +20', organised by Sustainable Prosperity (the citation is in slide 4, where the role of HRM in the value chain is stressed).

[8] See, among others, Bocquet et al. (2004), Cozzarin and Percival (2006, 2008), Gomez and Vargas (2009) and Schmiedeberg (2008).