

On the Relationship Between Environmental Management, Environmental Innovation and Patents: Evidence from German Manufacturing Firms.

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This paper analyses empirically the relationship between environmental innovations, environmental management and patenting. In particular it tests a number of propositions on how environmental management systems and the interaction with environmentally more or less concerned stakeholders are associated with whether of firms to pursue innovation in general (measured as patenting behaviour) and specifically environmental innovation (measured as firm self-assessment and based on patent data). The relationship between environmental activities of firms and its association with innovation activities and patenting behaviour merits more detailed analysis to better understand variation between individual firms with regard to such activities and to develop a sound empirical evidence base for any policy-making in this field. More specifically therefore, this paper analyses whether environmental management systems and particular managerial activities to reduce negative environmental impacts have a positive association with environmental innovations and their patenting as well as with patenting in general. In doing so it links important recent fields of environmental policy (namely the promotion of environmental management systems) with the new initiatives on environmental innovations and with industrial policy in particular with regard to patenting and its role in an interaction of environmental and industrial policy. In order to avoid a common issue with empirical studies, namely their limited comparability, care was taken to ensure as much as possible comparability with previous studies. Furthermore, in order to overcome at least some of the limitations of earlier studies, the empirical analyses used to test the hypotheses developed in this paper are based on a questionnaire specifically targeted towards environmental management and innovation aspects which collects data at the firm level and includes firms with environmental management systems as well as those without such a system.

One gap in extant literature on the relationship between environmental management and innovation is the limited use of patent data. Such data has been used successfully in other studies in technology and innovation research to proxy for innovatory activity. Therefore, this study for the first time attempts to use data on patented environmental innovations to address environmental innovations and their determinants. Such an approach could be superior because it only includes innovation that were significant enough to be patentable and therefore would focus on a narrower set of more radical environmental innovations by excluding incremental environmental innovations which only represent very minor inventive steps. It would therefore assist in reducing the uncertainty on the relationship between environmental management and environmental innovation activities of firms. In applying a negative binomial as well as binary discrete choice models the relationship is studied using data on German manufacturing firms. As a novel and important insight, the study finds that environmental innovation can be meaningfully identified using patent data and that environmental innovation defined this way is less ubiquitous than self-reported environmental innovation. It also reveals that the implementation level of environmental management systems has a positive effect exclusively on environmental process innovation, whereas it is negatively associated with the level of a firm's general patenting activities.