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## **The Causal Effect of Trade Secret Protection on Firms' Patenting Strategy: Patent Breadth**

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### **Abstract**

Revisiting the Tradeoff Between Patents and Secrets, and Its Effect on Patent Breadth David Angenendt  
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angenendt.david2@unibo.it The present paper analyses patenting and trade secrecy (TS) strategies in complex product industries. Products here are combinations of several separate components, and the intellectual property contained in each component can often be protected separately as well. Three main contributions will be made. First, this paper regards features of the patent application as the variables to be explained, moving beyond mere counting of patents and seeking instead to understand firms' approach to "designing" patent documents. Second, if features of patent applications---such as the breadth of coverage---indeed are strategic variables, using patent counts alone as proxies for innovative output can severely underestimate (changes to) the amount of knowledge created in complex product industries. Results of this study will give an idea of the magnitude of this underestimation. Third, using patent characteristics enables empirical research on firms' patenting decisions in many more settings and covering a more diverse firm population, since it relies much more on patent data rather than firm data. There is no need for data on firms' R&D efforts, which is commonly not available outside of survey datasets. The main hypothesis is generated by a simple model of a complex product that consists of  $N$  components, each of which can be separately patented or kept secret (Ottoz & Cugno, 2008; Png, 2016b). A firm will optimally choose to patent a share  $n^*$  of the  $N$  components, while keeping the remainder  $N-n^*$  secret. If the level of legal TS protection increases, but the level of patent protection is unaltered, the equilibrium share decreases to  $n'^* < n^*$ , decreasing the chosen breadth of patent protection. Png (2016b) finds that the increase in TS protection caused by the implementation of the Uniform Trade Secret Act (UTSA) in various US States reduced the number of patent applications exclusively in complex product industries. In contrast to Png (2016b), the present study considers that patent breadth can be implemented in different ways. The polar cases are (a) protecting the whole product by a single patent of breadth  $n^*$  and (b) protecting it by  $n^*$  different (narrow) patents. Case (a) is measured by the number of claims and the number of technology classes assigned per patent. Case (b) is measured as the similarity of a firm's patent applications during a certain period, for which several (alternative) variables are suggested, building in different ways on their overlap in technology classes and citations. Data from two different sources are analysed. Part (I) uses US patent applications matched to Compustat firm-level information (Hall et al., 2001) and complemented by

detailed information on amount and location of firms' R&D spending (Png, 2015b), allowing assessment of the hypothesis of non-relevance of R&D effort for patent breadth. Analysis uses the numerical index of TS protection strength across US states developed by Png (2016a) as the treatment variable. Preliminary results show i) a significant reduction in the breadth of patents in reaction to an increase in TS protection strength; and ii) non-significance of all firm-level variables that in contrast have explanatory power in the model of Png (2016b). Part (II) uses European patent applications data matched to Bureau van Dijk's AMADEUS/AIDA firm-level information. These data lack R&D information, but cover a much wider sample of firms. The 2005 introduction of the Italian Industrial Property Code is used as treatment. Estimates of its impact result from comparison of firms both within Italy and to other European countries.