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Patents as quality signals? The implications for financing constraints on R&D

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ABSTRACT

Information about the success of a new technology is usually held asymmetrically between the research and development (R&D)-performing firm and potential lenders and investors. This raises the cost of capital for financing R&D externally, resulting in financing constraints on R&D, especially for firms with limited internal resources. Previous literature provided evidence for start-up firms on the role of patents as signals to investors, in particular to Venture Capitalists. This study adds to previous insights by studying the effects of firms' patenting activity on the degree of financing constraints on R&D for a panel of established firms. The results show that patents do indeed

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Notes

1. See Hubbard ([1998](#)), Hall and Lerner ([2010](#)) and Czarnitzki and Hottenrott ([2010](#)) for surveys of the literature.

2. One might think that this lack of access to debt would lead to firms issuing equity. However, small firms may be particularly reluctant to issue equity, even if this excludes them from certain projects. In Belgium, as in many other European countries, raising equity for financing investment projects generally appears to be disfavored and only relatively few firms are listed at stock exchanges. Particularly small, family-owned firms view issuing of new equity as not particularly desirable, as it dilutes their ownership position. For example, Deloof and Jegers ([1999](#)) point out that there were no public issues of a straight bond by a Belgian company between 1990 and 1995. Borrowing

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argue that European patents are approximately 5–10 times more expensive than US patents. However, this is a controversial area, and there exist dissenters (Christie et al. [2013](#)). Hall, Thoma, and Torrisi ([2007](#)) find that the valuation of US and EPO patents in US and European firms is fairly similar.

5. This argument applies to small producing firms. There is other evidence that small non-producing firms that specialize in acquiring patents litigate more than other firms, at least in the USA. See Lanjouw and Schankerman ([2004](#)), inter alia.

6. These accounts follow the Belgian GAAP on an annual basis.

7. The appropriateness of cash flow as an indicator for financial liquidity and the interpretation of the sensitivity of R&D investment to changes in cash flow has been criticized in the literature (Fazzari and Petersen [1993](#); Hao and Jaffe [1993](#); Kaplan and Zingales [1997](#), [2000](#)). Especially for large firms, cash flow levels may be determined by accounting practice as well as by dividend policies (Jensen and Meckling [1976](#); Jensen [1986](#)).

8. Accounts receivable and accounts payable are termed Trade Debtors and Trade Creditors in the data source. Inventories are called Stocks.

9. We also experimented with a debt measure based on a firm's total liabilities (current plus non-current liabilities), but the results were quite similar, so we do not display them in the paper.

10. Although the model contains a time-invariant firm-specific effect, we also include the time-invariant regressors GROUP and the industry dummies, as the firm-specific effect is treated as a random component in the estimation.

11. Detailed results are available from the authors upon request. The $\chi^2(3)$ for coefficients on GROUP is 10.8 and 75.1 for the patenting and non-patenting firms, respectively.

12. For a small number of firms, the number of patents is zero. This is not surprising, as both sub-groups of firms are heterogeneous. It is important to note that both patenting and non-patenting firms are heterogeneous. The distribution of patents is very similar to the distribution of patents in the sample as a whole. The average number of patents is 1.5, which is very similar to the average number of patents in the sample as a whole. However, that is not the case for all firms. Some firms have a large number of patents, while others have none. This is particularly true for the non-patenting firms, which have a higher number of patents than the patenting firms. However, that is not the case for all firms. Some firms have a large number of patents, while others have none. This is particularly true for the non-patenting firms, which have a higher number of patents than the patenting firms.

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our sample contains firms that are at least active for five years, that is, are not truly nascent firms. The results in the paper also show that the variable age itself is never statistically significant in predicting R&D intensity in the presence of the other variables.

13. We also experimented with using a series of dummies for different levels of average citations per patent, as in Hall, Jaffe, and Trajtenberg ([2005](#)), but without success.

14. Note that the number of citations is always truncated. Moreover, in our case, observations in the years later than 2008 have a shorter citation window than five years. We tested the sensitivity of our results to dropping these observations and found that the coefficients' magnitude and significance is hardly affected.

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