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

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Notes

1. See Hubbard (1998), Hall and Lerner (2010) and Czarnitzki and Hottenrott (2010) for surveys

2. One may argue that this definition of equity excludes public equity, raising issues of equity for public and only relatively owned firms view ownership to public issues of borrowing from bank sources

3. Note t



4. The threshold for patentability in the USA is considered by some observers to be low, especially in IT-related sectors (Jaffe and Lerner [2004](#)), which casts doubts on the signaling value of patents. The threshold is considered to be higher in Europe (Van Pottelsberghe de la Potterie [2011](#)). In addition, Haeussler, Harhoff, and Mueller ([2009](#)) 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](#)).

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sub-groups are sensitive to financing constraints and that this sensitivity is mitigated by patents. Similarly, testing young/small versus old/small, we find again very similar patterns in both groups. These results point to the conclusion that not their age that constrains firms in our sample, but rather their size. It should be noted, however, that 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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