Economics of Innovation and New Technology ›
Volume 25, 2016 - Issue 3: Financing constraints R&D investments and innovation performances

Articles

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

Hanna Hottenrott, Bronwyn H. Hall & Dirk Czarnitzki

Pages 197-217 | Received 15 Feb 2014, Accepted 03 Feb 2015, Published online: 01 Sep 2015

Cite this article https://doi.org/10.1080/10438599.2015.1076200 Check for updates

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 attenuate financing constraints for small firms where information asymmetries may be particularly high and collateral value is low. Larger firms are not only less subject to financing constraints, but also do not seem to benefit from a patent quality signal.

KEYWORDS:

patents quality signal research and development financial constraints innovation policy

JEL CLASSIFICATION:

O31 O32 O38

Acknowledgements

The authors thank Thorsten Doherr for help with retrieving the patent data and participants at the CONCORDi 2013 (Seville, Spain), the DRUID conference 2014 (Copenhagen, Denmark), the IIOC 2014 (Chicago, USA), and the EARIE conference 2014 (Milan, Italy) for helpful comments. This revision has benefitted greatly from comments by Rosemarie Ziedonis and two anonymous referees. Hottenrott appreciated research funding from the Flemish Science Foundation (FWO).

Disclosure statement

No potential conflict of interest was reported by the authors.

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

from banks is the most common form of raising funds for investment besides internal sources such as intra-group loans (see e.g. Deloof 1998).

3. Note that inventions do not always require systematic R&D upfront.

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).

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 coefficient equality across small and large firms is 82.6 for patent applications and 75.1

for the patenting dummy.

12. For a sample split of young versus old firms, where young is defined as age less than or equal to 20 years (results are similar for a cut at 25 years), we find that both 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.