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# Creditor rights and innovation: Evidence from patent collateral

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## ABSTRACT

I show that patents are pledged as collateral to raise significant debt financing, and that the pledgeability of patents contributes to the financing of innovation. In 2013, 38% of US patenting firms had previously pledged patents as collateral, and these firms performed 20% of research and development expense and patenting in Compustat. Employing court decisions as a source of exogenous variation in creditor rights, I show that patenting companies raised more debt, and spent more on R&D, when creditor rights to patents strengthened. Subsequently, these companies exhibited a gradual increase in patenting output and the use of patents as collateral.

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## 1. Introduction

Innovation is critical to economic growth, but its financing is inhibited by problems of moral hazard and adverse selection. These frictions lead to credit rationing, increased costs of capital, and an inefficient level of innovation. In recent years, the use of patent portfolios as collateral for secured debt has become a common mechanism to mitigate these frictions. In this paper, I show the value of patent collateral for financing innovation among public firms. I also ask whether stronger creditor rights to patents primarily encourage or discourage financing and investment among patenting firms. The answer is unclear: strong creditor rights can increase collateral value and thus financing capacity, but they can also discourage risk-taking by allocating more bargaining power to creditors in the event of financial distress.

The link between creditor rights and innovation is important to understand because patents are a growing source of financing for innovative firms. I show that 16% of patents produced by US corporations have been pledged as collateral at some point, and the companies pledging them performed 20% of research and development expense (R&D) and patenting in Compustat in 2013. These facts are surprising, given that innovative firms generally feature low tangibility and are thus often assumed to lack access to collateral. Patent portfolios are evidently an important exception to this rule. This observation suggests in turn that policy initiatives to increase the pledgeability of patents could alleviate financial constraints on innovation.

To investigate this possibility and show the above findings, I employ records from the United States Patent and Trademark Office (USPTO) on the use of patents as collateral. These records are part of the standard Patent Assignment Dataset. I match these records to Compustat, then use this data to examine the characteristics of patents used as collateral. Patents pledged as collateral score highly on

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citation counts and generality. The firms that pledge them feature low tangibility and cluster heavily in a small set of “high-tech” industries that account for most recent growth in aggregate R&D (as shown by Brown et al., 2009). Within firm, total debt rises by roughly 4% of total assets in the quarter when a patent portfolio is pledged, and R&D expense is substantially above the firm’s mean in this and subsequent quarters.

These descriptive findings hint strongly that the collateral value of patents facilitates financing and investment for innovative firms. To establish a causal link, I study a natural experiment that increased patent collateral value via a strengthening of creditor rights.

This natural experiment consists of four court decisions, from 2002, 2003, 2007, and 2009, that clarified the legal status of patents nationwide. Specifically, they limited the extent to which patent law preempts property rights defined by state laws. For the most part, property rights are uniform across states, but one major exception is Delaware’s procreditor Asset-Backed Securities Facilitation Act (ABSFA). The court decisions thus represented a relative strengthening of creditor rights for patenting firms incorporated in Delaware. Because the decisions only concerned patent law, they strengthened creditor rights only to patents, isolating their collateral value. My empirical strategy is a difference-in-difference that examines the evolution of financing and investment for Delaware- relative to non Delaware-incorporated firms around the dates of the four court decisions.

The most important purpose of this natural experiment is to establish the quantitative importance of patent collateral, using quasi-experimental evidence that is more convincing than the descriptive correlations mentioned earlier. The magnitudes of this effect are important because conventional wisdom suggests that intangible assets have little, if any, collateral value. However, the results also serve a secondary purpose. As mentioned above, the optimal degree of creditor rights for innovative firms is an open question. Some prior empirical research (summarized below) argues that a creditor-friendly bankruptcy code discourages innovation. The theoretical arguments behind these findings focus on the challenge of motivating risky innovation. I find the opposite results, suggesting that investment by innovative firms in my sample is constrained more by a lack of collateral value.

I first show that the increase in patent collateral value, via strengthening of creditor rights, led to increased use of external finance in the form of debt. Treated firms’ total debt levels, compared to untreated firms, rose by \$1 on average for every \$100 of total (book) assets in the two years on average following a court decision. Relative to a pre-event average debt-to-assets ratio of 0.27, this represented an increase in credit availability of roughly 4%, or \$25 million given their average book assets of \$2.6 billion. The increase in patent collateral value thus increased access to finance for innovative firms, as lenders evidently became more optimistic about the probability and speed of recovering patent collateral in default.

I next show that this increased borrowing translated into increased investment in innovation, as measured by the firm’s spending on R&D. Treated firms’ quarterly R&D

spending rose by \$0.17 for every \$100 of total assets on average following a court decision. Combined with the financing effects shown above, this magnitude implies a pass-through of \$0.17 of annual R&D spending for each marginal \$1 of total debt. The R&D effect represents a 6.3% increase relative to pre-event average quarterly R&D-to-assets ratio of 0.027. Increasing the collateral value of patents thus alleviated credit constraints for investment in R&D. On the other hand, there was no increase in capital expenditures, a traditional measure of investment that is less important than R&D for innovative firms and is more likely to yield tangible, easily pledged collateral.

These findings stand up to a range of alternative approaches and robustness checks. The estimated effects are large even with fixed effects for the state of headquarters, the state of incorporation, or the interaction of these two. For firms in the high-tech industries mentioned above, the estimated financing effect is 40% larger, and the investment effect more than doubles. In event time, the effects developed shortly after the court decision dates, not as a differential trend beforehand. The estimates are similar for firms headquartered in each of the largest geographic clusters in the sample: the Northeast, California, Texas/Colorado, and Florida/Georgia. The financing effect was absent for companies that had not yet produced patents, but it was particularly strong for those that had previously pledged their patents as collateral or owned patents that had received many citations. Finally, none of this heterogeneity appears when comparing firms based on their trademark portfolios, instead of their patent portfolios, pinning down the legal implication of the court decisions studied.

Furthermore, the effects of the natural experiment were also stronger among firms that appeared, ex-ante, more financially constrained. Dividing firms by their stock of tangible assets, tangibility ratio, payout policy, or profitability, I consistently find that firms with lower values of each measure exhibited larger increases in debt financing and R&D spending in response to the natural experiment. These findings echo the descriptive results earlier, which showed that the same firms were more likely to use patent collateral in the first place. Together, all these results demonstrate that the firms relying on patent collateral face significant financial constraints, and that an increase in the collateral value of their important intangible assets increased their ability to raise capital and invest it.

The increase in treated firms’ investment also led to a subsequent increase in innovation output, as measured by new patent applications filed with the Patent Office. Between 2001 and 2013, treated firms produced about 19% more successful patent applications. This finding is robust to weighting patents by the number of forward citations they receive. I further show that firms in treated states were gradually more likely to pledge their patents as collateral following the court decisions, supporting the interpretation that the collateral value of those patents had increased. As with the financing and investment effects, these findings are not specific to any particular region but rather are robust across the major geographic subdivisions of the sample.

My study contributes to a growing literature on the role of intangible assets in corporate finance. In contempora-

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