Financial dependence and innovation: The case of public versus private firms

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Abstract

In this paper, we examine the relation between innovation and a firm’s financial dependence using a sample of privately held and publicly traded US firms. We find that public firms in external finance dependent industries spend more on research and development and generate a better patent portfolio than their private counterparts. However, public firms in internal finance dependent industries do not have a better innovation profile than private firms. The results are robust to various empirical strategies that address selection bias. The findings indicate that the influence of public listing on innovation depends on the need for external capital.

1. Introduction

While innovation is crucial for businesses to attain a strategic advantage over competitors, financing innovation tends to be difficult because of the uncertainty and information asymmetry associated with innovative activities. Firms with innovation opportunities often lack capital. Stock markets can provide various benefits as a source of external capital by reducing asymmetric information, lowering the cost of capital, and enabling innovation in firms (Rajan, 2012). While firms can gain access to a large pool

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of low-cost capital by going public, they also can be pressured by myopic investors to generate short-term profits (Stein, 1989). Such short-termism could be detrimental to long-term innovation. In this study, we investigate how innovation depends on access to stock markets and the need for external capital.

Innovation is worth studying for several reasons due to its uniqueness, as well as the evidence that economic forces influence innovation and other investments differently. First, Derrien and Keeskes (2013) show that financial analysts enhance capital expenditures because they reduce information asymmetry. However, Benner and Rananganath (2012) and He and Tian (2013) find that analysts hamper innovation by pressuring managers to meet or beat earnings targets, exacerbating the managerial myopia problem. Second, stock liquidity increases capital expenditures by improving price informativeness (Fang, Noe, and Tice, 2009) and reducing the cost of capital (Becker-Blease and Paul, 2006). The effect on innovation is negative as stock liquidity exposes firms to hostile takeovers and attracts short-term institutional investors (Fang, Tian, and Tice, 2014). Third, while short sellers drive stock prices down (Grullon, Michenaud, and Weston, 2015), thereby impeding capital expenditures, they enhance innovation via information production and detection of managerial shirking (He and Tian, 2014). In addition, we use patent data to measure the quality of the investment output, which is difficult to quantify for other investments.

We analyze a large sample of private and public firms to understand the relation between a firm’s financial dependence and innovation. Perhaps the biggest challenge of our empirical design is that a firm’s decision to gain access to stock markets is an endogenous choice driven by other observed and unobserved factors. To overcome this selection bias, we adopt several identification strategies enabled by our large panel data set of private and public firms. While controlling for observable time series and cross-sectional variables that are related to innovation and the choice of going public, we estimate the treatment effect model to isolate unobservable private information that influences a firm’s initial public offering (IPO) decision. Furthermore, we employ a fuzzy regression discontinuity (RD) design to mitigate the concern about the nonrandomness of public and private firms.

In the fuzzy RD design, we explore the discontinuity in the probability of delisting from Nasdaq when observable variables cross the delisting criteria. The fuzzy RD design is an experiment with imperfect compliance when the treatment does not solely depend on one cutoff rule. Identification in a RD design relies on the assumptions of discontinuity in the probability of treatment and the plausibility of agents’ imprecise control over the forcing variable near the known threshold. Internal validity tests are performed to ensure the satisfaction of these assumptions.

To examine the effect of delisting on innovation, we conduct the graphic analyses and formal fuzzy RD estimations for firms in external finance dependent (EFD) and internal finance dependent (IFD) industries. Industries with internal cash flows lower (higher) than their investments are considered EFD (IFD) industries. For firms in EFD industries, delisted firms invest relatively less in innovation and have fewer subsequent innovation outputs compared with listed firms. In contrast, no such effect is observed for firms in IFD industries. The placebo analyses that use artificial Nasdaq delisting requirements and artificial delisting year exhibit no jump in innovation of firms around the threshold.

To understand the differential effects of public listing on the innovation of firms in EFD and IFD industries, we explore several factors that can affect the cost-benefit trade-offs associated with being public. First, the financing benefits from public listing could be stronger for firms in EFD industries than for firms in IFD industries. Second, managers of public firms, under pressure from myopic investors, could have incentives to pursue short-term stock performance (Bolton, Scheinkman, and Xiong, 2006; Stein, 1989). Such agency issues could have differential impacts on firms with distinctive needs for external capital. Third, to the extent that product market competition can impose short-term pressure on managers, public firms in competitive industries could innovate less than private firms with sufficient internal cash flows. Fourth, short-term pressure from financial analysts can impede the innovation activities of public firms. Fifth, firms differ in the efficiency of converting research and development (R&D) into patents. Sixth, public firms can purchase more patents and new technology through mergers and acquisitions (Bena and Li, 2014; Seru, 2014). Our analyses indicate that innovative firms with external financing needs benefit from listing in stock markets, while innovative firms without such needs could be hurt due to exposure to myopic investors.

We also conduct four tests to alleviate concern that the technological innovation in firms in EFD and IFD industries could differ in importance. First, an investigation of the relation between an industry’s external finance dependence and its innovation intensity shows an insignificant correlation of 0.080 (0.075) using patents (R&D) as a measure for industry innovation intensity. Second, we couple each matched pair of private and public firms in IFD industries with a matched pair of firms in EFD industries that are the same in age, year, and closest in size. Third, we couple the industry and size matched pairs of private and public firms in EFD and IFD industries by age, year, and R&D to minimize the influence of differences in R&D investments among these firms. Using these two subsamples of matched pairs, we still observe that public listing has larger positive benefits on firms in EFD industries than firms in IFD industries. Fourth, we restrict our analysis to firms with a minimum of one patent and our results remain intact.

Our study contributes to the nascent literature on identifying various economic factors driving firm innovation. The literature shows that innovation is affected by investors’ tolerance for failure (Tian and Wang, 2014), the

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2 In September 2009, the Aspen Institute, along with 28 business leaders including John Bogle and Warren Buffett, called for an end to value-destroying short-termism in US financial markets and an establishment of public policies that encourage long-term value creation (Aspen Institute, 2009).
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