A Review on Financial Development and Financing Constraints Upon Corporate R&D Investment

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Abstract. Firms face financing constraints when investing in R&D projects. Depending solely on internal finance, firms that face financing constraints are less likely to spend money on high-risk R&D investment that may help them gain advantages over their fellow competitors. This may also hinder innovation and economic growth. Financial development, in forms of upgrading financial structure, intensifying financial reforms and verifying financial functions, can lower the cost of firms’ R&D spending and increase sources for external finance. However, current Chinese financial system cannot perfectly perform its duty of serving real economy and boosting its growth. How to drive domestic financial market toward perfection; how to facilitate the development of banks and non-bank financial intermediaries? This is a substantial and intriguing issue that interests Chinese economics.

A Tentative Approach to the Issue: Financing Constraints and Corporate R&D

Depending on where the money that firms spend on investment comes from, Guariglia (2008) divides financing constraints that firms may face into internal and external sources. Unlike what happens in a perfect market, where these two sources of finance are replaceable, most firms that face financing constraints, tend to have higher cost of external finance than that of internal finance in an imperfect market due to information asymmetric, credit rationing in the banking sector and transection cost. Therefore, firms prefer internal finance to external one.

Fazzari, Hubbard and Peterson (1988) take investment-cash flow sensitivity as the proxy indicator of firm’s financing constraints. Their finding shows that for firms that face higher level of financing constraints, investment may be more sensitive to cash flow, compared to those less financially constrained firms. However, the study of Zingales and Rajan (1997) suggested the opposite. For firms that face lower level of financing constraints, investment may be more sensitive to cash flow. Cleary (1999) supports this conclusion and further discussed investment-cash flow sensitivities of different firm groups using multivariate classification scheme.

Firms that engage in R&D (abbreviation for research and development) usually face higher level of financing constraints. Several reasons may explain why this is the case. First, R&D projects are characterized to have high sunk cost in their research and developing process, for example, training and hiring of proficient research workers, extremely long developing cycle, and the extra cost of prohibiting unfair competition and information leakage. Second, R&D project is risky. These projects lack collateral; their outcomes are highly uncertain; and market reaction of R&D projects is unpredictable. Third, R&D projects are usually clarified and financing R&D projects is far more susceptible to the influence of asymmetrical information than ordinary investment projects, so market prices may not expressly reflect the intrinsic value of R&D projects. These factors contribute massively to the expanding cost of external finance for R&D investment and may even bring adverse selection and moral hazard to the investment market.

The First Solution: Internal Cash Flow

Based on studies of corporate investment and financing constraints, some scholars begin to study financing constraints that firms face when investing on R&D projects. Hall (1992), Himmelberg and
Peterson (1994), respectively, select data from American manufacturing and high-tech industries, and confirm that there is a positive correlation between firms’ R&D spending and internal cash flow; moreover, Benedicte (2004) does an empirical study on over eight hundred American firms and find out firms that face financing constraints show lower level of spending on R&D investment. In 1994, Bond and Meghir [6] constitute a domestic investment model using Euler equation, and this theoretical model was later widely applied by scholars studying firms’ R&D financing constraints. The most recognized application of all, on the topic concerning sensitivity of firms’ R&D spending towards internal cash flow, was by Brown et al. (2009). He and his colleagues, same as HP (1994), select data from American high-tech industry; by using domestic investment model, they conclude that firms’ spending on R&D investment is especially sensitive to internal cash flow. They define firm types and difference between various external financing sources in their later studies. All studies listed above, yet some equally robust empirical studies that share the same results was omitted due to the length of this paper, substantiate financing constraints does limit firms’ capacity to invest on R&D projects. Thus, for firms that face financing constraints, internal finance becomes an essential way to finance corporate R&D investment.

Researches that conduct by academics from countries other than the United States again prove validity of these arguments. Some representative studies are listed below: Harhoff (1998) [7], German, selects data from manufacturing industries; Bougheas (2003), Ireland, also selects data from manufacturing industries; Cincera (2003) form Belgium, uses domestic firm level statistic; Ughetto (2008) from Italy, choose to study data of approximately one thousand manufacturing firms; Guarglia and Liu (2014) using a large database and study over one hundred and twenty thousand Chinese firms.

Yet some studies fail to obtain the same result. Bhagat and Welch’s study (1995) show that there is no significant correlation between internal cash flow and firms’ R&D investment; nevertheless, Czarnitzki (2006), through analyzing the data of firms from east and west Germany, finds out R&D spending of firms in these two regions react distinctively to the change of firms’ internal cash flow.

Besides that, some scholars go a step further and conduct cross-country comparative studies. Hall (1999), as well as Mulkay (2001), discusses the difference between firms’ R&D financing constraints of the United States and France. Result shows that R&D financing constraints of American firms is more sensitive to internal cash flow than that of France. As for Bond’s research (2003) on the United Kingdom and Germany, he finds that internal cash flow doesn’t affect German firms but matters significantly for English firms.

Domestic studies in China support the findings of foreign scholars. Kang (2013) selects firm level data from Chinese manufacturing industry and testifies that financing constraints repress R&D investment of domestic firms [8]. Likewise, Rao (2009) and Wang (2013) use micro-level statistic; they confirm that firms’ R&D spending relying on internal cash flow. Those studies again serve as direct proofs that when internal finance of a firm is constrained, external financing sources are crucial factors that determine the viability of firms R&D projects.

The Second Solution: Financial Development and External Financial Market

From the day financial development theory first came out and up until now, the idea that financial development boosts a country’s economic growth is widely accepted by the academic circle. The three mainstream definitions of financial development are given by Goldsmith (1969), which mainly focuses on the change in financial structure, Mckinno (1973) and Shaw (1973), who come up with the theory of financial deepening, and Levine (1997), which emphasizes on transition in financial function.

Based on three definitions, scholars from China come up with some complementary and modified versions. Following Goldsmith’s theory of financial structure, Dai and Huang (1998) suggest that policymakers should eliminate political factors that inhibit reforms in domestic financial market, especially the change in market structure and financial system. Bai (2003) further defines financial structure, saying improvement in structure requires uniformity in both size and efficiency of the
market. And Cai (2005) emphasizes the need for rationalize market structure, making each part of the financial system serve its purpose. While Chen (2002) hold a much more reserved attitude towards reforms on financial structure, arguing against that focusing solely on structural reform may, in some extant, neglect the importance of resource allocation in developing an efficient financial market. In terms of financial deepening, Hu and Lu (2009) consider financial development as increase in non-monetary asset and development in financial intermediaries; Wu (2010) thinks it is reasonable to use financial efficiency indicator to monitor financial development. As for facilitating multi-function financial intermediaries, Bai and Tan (2006) agree on the idea that financial development is a process, in which the market gain its complexity and diversity of function. While, Zhao and Tan (2010) see financial development as a dynamic process, in which financial sectors are gradually built towards perfection.

Though varies in the definition, financial development indeed facilitates financial market’s evolving towards perfection. It helps to improve financing efficiency and open more channels for investment. Thus, it can alleviate financing constraints, caused by asymmetric information, transaction cost and credit rationing, that firms face when invest in R&D projects. Henry (2000)[9] studies financial markets of developing countries and confirms that financial development may in some extant reduce the cost of financing, which helps firms with their investments. Love (2001) draws the same conclusion but from an opposite angel; his study shows that there is a significantly negative relationship between financial constraints and financial development.

Domestic academics have done some innovative works based on studies of foreign scholars on financial development and its alleviating effect on corporate R&D financing constraints. In terms of innovation in theoretical model, Wang and Zhang (2013), Hu and Ren (2017) add interaction terms, financial development indicator multiplying firms’ internal cash flow and indicator of current developmental state of financial intermediaries multiplying the size of firms, as control variables into FHH investment-cash flow equation. Xie and Fang (2011) add average R&D spending of firms’ in industries that has the same top two number in their industry codes, adjusted by dividing average amount of sales, into Benfratello’s (2008)[10] theoretical model to control for industrial-level inclination to innovation spending. Zhang et al. (2015) add change rate of paid-in capital, as an alternative proxy indicator for internal finance besides internal cash flow, into baseline model of Bond and Meghir and augmented model of Brown et al. As for adjustment in variables, Liu (2014) uses weighted sum of financial market index, financial competition index and credit rationing index, building an indicator that may reflect the provincial financial developmental state in a more comprehensive way. Zhang et al. (2015) standardize the following four indicators, the loan of financial institution divided by GDP, deposit of financial institution divided by GDP, stock market value divided by GDP and volume of transaction of stock market divided by GDP, and use their weighted sum, composing an index that, in his view, better reflects the developmental state of financial market.

Based on all those studies, to understand the micro mechanism between financial factors and corporate R&D investment, on what extant does financial development alleviate firms’ R&D financial constraints, is not only important on theoretical spectrum, but also show great significance for policy-makers. Studies of mainstream domestic scholars are mostly listed below. First, several studies conducted by Chinese scholars concentrate on the heterogeneity of firms. Previous studies divide firms into different categories, age, size, location, structure of ownership, industry and more, and discuss how current state of financial development acts differently on various firm groups. Hitherto, most studies completely or partly draw the conclusion that financial development has better alleviative effect on firms that are normally young, small in size, located in coastal region of China, privately owned and belongs to high-tech industry. Second, other studies take the structure of financial market into consideration and discuss whether financial intermediaries and capital market act differently when financing firms with their R&D projects. Majority of studies tend to support the argument that developing commercial banks and better credit rationing system have a positive effect on increasing firms’ paid-in capital and alleviating corporate R&D financing constraints; while
domestic studies on capital market fall to support the conclusion drawn by foreign scholars that the gradual perfection of capital market may increase corporate R&D investment; and for the function of none-bank financial intermediaries, current researches have not yet arrive at a conclusion. Third, there are a few studies, recently, focus on the heterogeneity of R&D project. Gu and Cui (2014), for example, consider R&D projects with different levels of uncertainty, and divide R&D projects into research projects and developing projects. Research-oriented innovation is usually led by firms that utilize cutting-edge knowledge and technic, making breakthroughs and opening new markets, and is often consider more aggressive; while developing-oriented innovation use knowledge and technic that are still new but more mature, and firms that invest in development projects usually aim at exploiting current market rather than opening new ones.

The Future: Financial Market, Commercial Banks and None-bank Financial Intermediaries

Currently, banking industry dominates Chinese financial system. Compared to state-owned banks with natural advantages in size and resources, small and medium sized bank in the private sector are less competitive, especially in granting jumbo loans and financing state-owned firms. These banks are usually provincial, rooted in one particular region and gradually expanding elsewhere. Thus, they have sufficient information about small and middle size firms that locate in the region. This information advantage helps small and medium sized banks evaluate firms’ capacity to pay and assess risk in their R&D projects. In the end, despite their small size and limit resources, banks in the private sector do better job in choosing qualified local firms to provide loans and finance their R&D projects.

Consisting with this idea, Yao and Dong (2015) think that the dominating power of state-owned banks is detrimental to Chinese banking system, and because banking industry is a crucial part of Chinese financial structure, it is equally harmful to financial development. Hence government should encourage the growth of small and medium sized banks and introduce policies that increase their competitiveness in local regions. Shen (2010) suggests government should pour more money and resources to banks in the private sector; he also mentions the importance of pushing the reform of state-owned banks, promoting their efficiency. State-owned commercial banks in China not only operate in a profit-driving mode, but also shoulder the responsibility of executing national policies. So the firms that they grant loans to and the R&D projects that they choose to finance may suggest what the government and policy-makers encourage or even where our domestic innovative demands probably lie.

The studies on how none-bank financial intermediaries alleviate corporate R&D financing constraints are now scare, especially in domestic literatures. But when talking about the issue of cooperation between banks and other intermediaries and about building a mechanism that increases their business interaction, Hu and Ren (2017) provide some specific policy recommendations. They suggest that Chinese government could follow the example of Silicon Valley, and constitute financial serves directly help with firms’ R&D projects; in the meantime, government may establish an institution like the SBA (abbreviation for Small Business Administration) in the United States that links firms, banks and other credit agencies together in order to come up with distinct financing plans for different R&D projects.

Alleviating firms’ R&D financing constraints is not only a problem that intrigues economists worldwide, but also an issue that concerns policy-makers and country leaders, because of its distinct features and its great contribution to economic growth and social development. It is vital for countries that are eager to promote their innovation capacity to build a mature financial market with well-functioned financial intermediaries and financial serves that finance distinctive R&D projects. With the construction of Chinese capital market and further studies on financing constraints and R&D investment, the future studies will focus more on alternative financing sources, other than banking system that dominates by state-owned banks and follows by small and medium sized banks from the private sector.
References


