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FINANCING OF INNOVATION ACTIVITIES

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Abstract: In this paper, you can see the reviews the theoretical and empirical economic literature on innovation financing and draws some policy conclusions to address some of the challenges. Asymmetric information and moral hazard theories as applied to innovation financing are then reviewed, followed by a summary of empirical evidence on the topic. The final section discusses implications for public policy."

Keywords: entrepreneurs, Asymmetric-information, moral hazard, R&D investment, innovation, finance, ICT industry.

Introduction

Those who create and manage firms in a market economy (entrepreneurs) are not the same individuals as those who usually have means of financing this activity. It means there is truth there is an information gap between those who request funds and those who request them provide them. As discussed in more detail below, economists apply for additional costs arising from problems "Asymmetric-information" and "moral hazard". Both of these are expected increasing the cost of obtaining finance from sources outside the firm. And while this is true to some extent for all firms, the problem is it is especially evident in the activities of new firms and firms undertaking innovative activity. There are three different levels of difficulty can be distinguished: the problems of existing innovative firms in obtaining sufficient funds for their investments, the reluctance of non-innovators to innovate due to high costs, and the problems faced by new start-up firms. Although all of these challenges stem from the same set of ultimate causes, the empirical analysis of each differs significantly, and the range of possible policy solutions differs. In particular, the first case, which most of the econometric literature focuses on, corresponds to marginal analysis, while the second two cases involve overcoming fixed (often significant) costs to innovate.

Methodology

The process for identifying R&D investment formulae is based on a basic supply and demand heuristic, as shown in Figure 1.

Figure 1 - Financially Unconstrained Firm

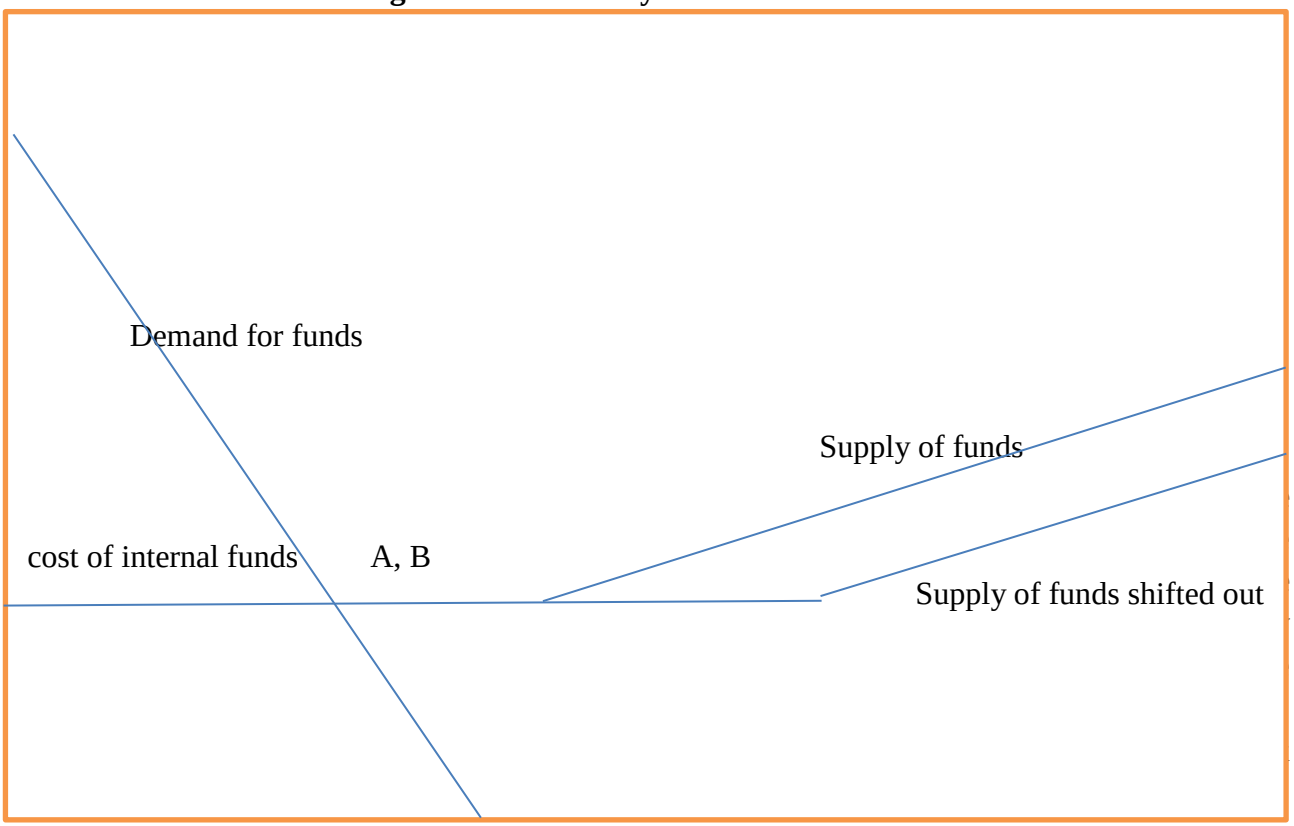
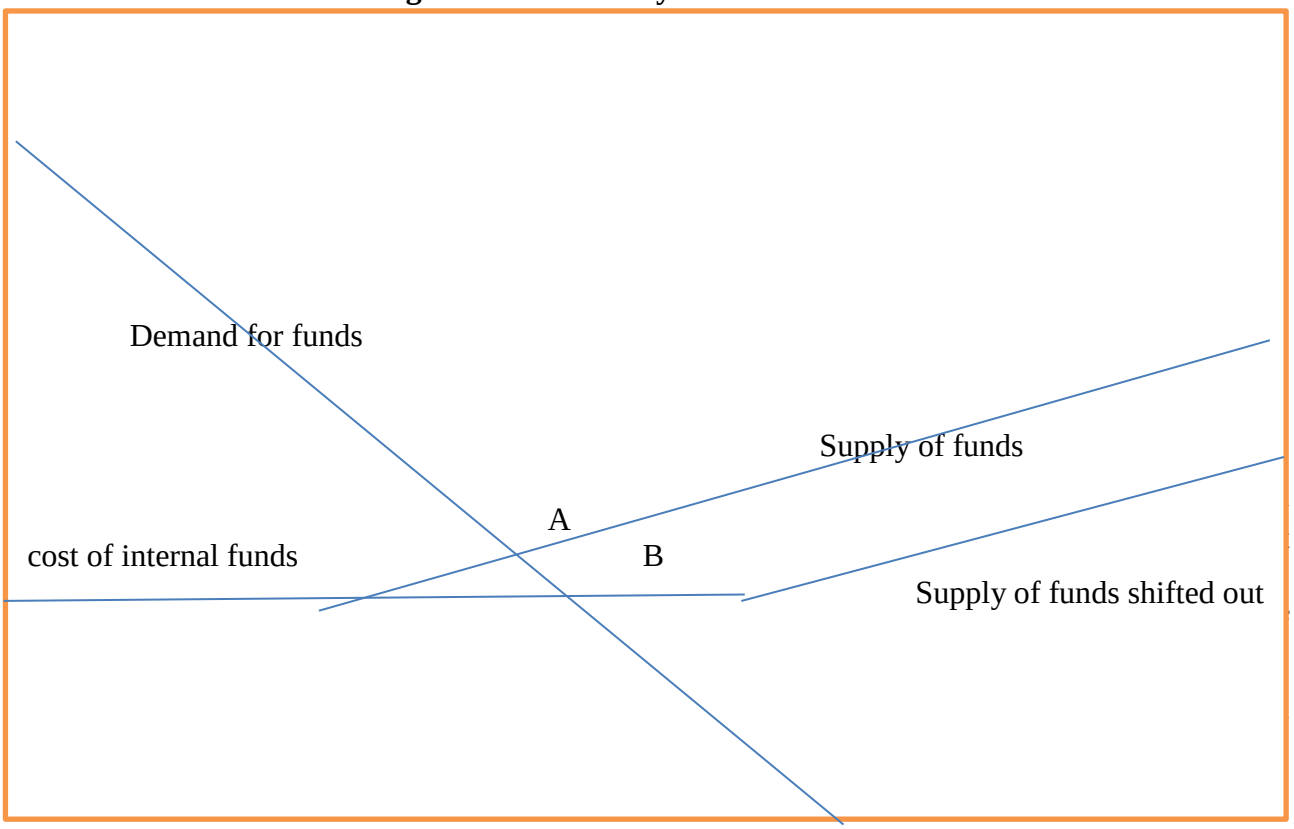


Figure 2 depicts such an example, in which the company moves from point A to point B in reaction to a cash flow shock that has no effect on the demand curve.

Various versions of these methodologies have been applied to data on R&D investment of US, UK, French, German, Irish, and Japanese firms, as well as possibly others, over the last several years. The enterprises under consideration are often the largest and most important manufacturing firms in their respective economies. Hall (1992), for example, discovered a substantial positive elasticity between R&D and cash flow using an accelerator-type model and a large sample of US manufacturing enterprises. Both firm effects and simultaneity were accounted for in this estimating approach. Similarly, Himmelberg and Petersen (1994) examined a panel of 179 US small enterprises in high-tech industries and discovered an economically big and statistically significant association between R&D spending and internal finance using some of the same data. [2]

Figure 2 - Financially Constrained Firm



evidence over the last 50 years that in practice, half or more of the R&D part of this expenditure goes toward compensating highly educated scientists and engineers. Their efforts result in an intangible asset, the firm's knowledge base, from which profits will be generated in future years. This knowledge foundation is supplemented by the unique human capital generated through worker training in new goods and processes, as well as the knowledge generated by design and marketing initiatives. Because all of this knowledge is «tacit» rather than codified, it is embedded in the human capital of the firm's employees and is thus lost if they leave or are fired.

This finding has significant implications for R&D investment and, to a lesser extent, innovation investment in general. The discussion that follows focuses on R&D since it is the standard against which empirical research is normally measured. Because knowledge workers represent a portion of the firm's resource base, firms tend to smooth their R&D spending over time in order to avoid having to lay them off. This indicates that firm-level R&D investment will behave as though it has large adjustment costs, with two repercussions, one substantive and one affecting empirical studies in this field. First, the required rate of return on R&D in equilibrium may be quite high simply to cover the adjustment costs. Second, and linked to the first, empirical research will find it difficult to evaluate the influence of changes in capital costs on such investment, because such impacts might be modest in the short term due to R&D's slow response to any changes in its cost. The above conclusion should be tempered by the observation that, in recent years, the variation of R&D expenditure increases in publicly listed US corporations has grown, for at least two reasons. The first is the rising prominence of the ICT industry, where R&D outputs have a relatively short lifespan, resulting in a decline in incentives to protect human capital (Hall 2006). The second is that technological marketplaces have grown considerably more significant, reducing the necessity to maintain a firm's full expertise in-house. Nonetheless, the variance in R&D investment growth rates is roughly one-quarter to one-fifth that of ordinary investment. The degree of uncertainty

associated with R&D production is a second essential aspect. This uncertainty is highest at the start of a research program or project, implying that an ideal R&D plan should have an options-like nature and should not be studied in a static framework. R&D initiatives with low chances of success in the future may be worth pursuing even if they fail an anticipated rate of return test. The uncertainty in this case might be severe, and it is not as straightforward as a well-defined distribution with a mean and variance. There is evidence, such as that shown in Scherer (1998), that the distribution of gains from innovation can take the shape of a Pareto distribution with no variation. Standard risk-adjustment approaches will not function effectively in this circumstance. According to classic finance theory, the variance of a portfolio created from such assets is unbounded, hence the traditional diversification methodology does not apply. The recent emergence of network, or «winner-take-all» sectors, such as software or Web-based services, has worsened the high unpredictability of returns to innovation. Examples include Microsoft, Google, Yahoo, eBay, and now Facebook, which have very high returns on investment. However, there are a lot of comparable entrants who either fail or never achieve critical mass, settling for a small sector of the market. In truth, the strong profits enjoyed by a few enterprises do attract a number of new entries, but there is no assurance that it is the «right» amount. [3]

The third aspect of R&D as an investment with finance consequences is that the «capital» generated is intangible. Not only is it intangible, but most of it, as previously said, is in the form of human capital entrenched in the minds of employees. Such capital often has a low salvage value since it is idiosyncratic - for example, the fact that the firm possessing the capital goes out of business indicates that its worth was low. There is limited market for troubled intangible assets, except from the kind of effort already undertaken to harvest patents from such corporations. Human capital follows the employee, and any residual value is generally captured in the form of remuneration in future employment. Thus, debt instruments secured by the value of the capital asset are unlikely to be a useful source of funding for R&D. See Harhoff (2009) for a summary of current initiatives to improve this situation through the establishment of patent funds for the economic exploitation of wasted innovations.

To summarize, R&D and other innovation investments have the following characteristics: (i) they must be smoothed in order to retain valuable employees and their knowledge; (ii) they are highly uncertain, with information about success or failure revealed over time; and (iii) they produce unique intangible capital with a limited resale market. The following portion of the study examines investment theory in light of these qualities and explores the theory's implications for funding innovation.

The following analysis focuses on existing innovative enterprises rather than new start-ups. The majority of empirical study has been conducted using data from these types of organizations, partly because they execute the vast majority of R&D and partly owing to data availability. The startup issue will be addressed later in the article. The «neo-classical» marginal profit criterion, appropriately updated to account for the specific aspects of R&D, is the common starting point for any sort of investment finance study. This condition makes the marginal product of capital equal to the rate of return on capital investment. For the time being, ignoring adjustment costs and uncertainty, the discrete time cost-of-capital condition is as follows:

$$MPK = c_t = p_t - \frac{(1-\delta)}{(1-\rho)} p_{t+1}$$

That is, during period t, the marginal product of capital (MPK) is equal to its price minus what the business would earn from selling the capital at t+1 (which is (1-) p_(t+1)), discounted by the needed rate of return. is the return obtained by the investor after paying corporation taxes but

before paying personal or capital gains taxes. The formulation above implicitly includes three factors that will influence R&D financing: the rate at which the knowledge capital created depreciates or becomes obsolete, the required rate of return, and the rate of change of the real R&D price (the price of R&D inputs relative to the price of the firm's output). Higher depreciation rates obviously raise the cost of capital, but lower post-corporate-tax required returns, like in the case of an R&D tax credit, decrease it. Furthermore, if R&D is expected to become relatively more expensive tomorrow (p_(t+1) > p_t), this lowers the cost of capital today, but in practice, this effect is relatively small. [4,5,6]

In the equation above, the needed rate of return is the return after corporation taxes have been paid. However, as Auerbach (1984) and others have demonstrated, the firm's marginal source of financing has an impact on the required rate of return that a prospective investor perceives. He looked at the US scenario, where interest expenses are deductible by corporations and capital gains taxes are often lower than dividend taxes. The same logic would apply if profits from longer holding periods were taxed at a lower rate than those from shorter holding periods.

The table below indicates the cost of financing dependent on the source of funding he obtained; in general, tax considerations indicate that debt financing will be the lowest, followed by retained earnings, and finally by fresh share issuance.

Table 1 – Tax - Adjusted Financing Cost[1]

Source of finance	Cost of finance	Assumptions
Debt	$\rho(1-\tau)$	Interest is deductible at the corporate level
Retained earnings	$\rho(1-\tau\rho)/(1-\tau c)$	Avoids personal tax on dividends in favor of eventual capital gains tax
New share issues	$\rho/(1-\tau c)$	Eventual capital gains tax paid
$\rho = required\ return;\ \tau = corporate\ tax;\ \tau\rho = personal\ tax\ rate;\ \tau c = capital-gains\ tax\ rate$		

The narrative obviously does not stop here. In producing this chart, I implicitly assumed that there is a single risk-adjusted rate of return accessible, which we have already established is improbable given the degree of uncertainty faced by innovative enterprises. That is, certain innovations are so dangerous that a straightforward risk-adjustment based on return variance is unavailable. Furthermore, different types of investors are likely to prefer various risk profiles. Bondholders will be more concerned with salvage value (which favors tangible over intangible assets), but equity holders may perceive an unlimited upside to profits and hence prefer risk.

Asymmetric knowledge and moral hazard are two other key explanations for variances in the needed rate of return across funding sources that have piqued the interest of both industrial organization and corporate finance economists. These considerations are often seen as driving a wedge between the costs of internal and external sources of funding, a wedge that is likely to be higher in the case of innovation investment than it is in the case of conventional investment. [7,8]

One of the implications of the well-known Modigliani-Miller theorem (1958, 1961) was that a firm choosing optimal levels of investment should be agnostic to its capital structure, and should face the same price on the margin for all types of investment (including investments in developing new products and processes). The final dollar invested should have the same expected rate of return (after adjusting for non-diversifiable risk). A significant theoretical and empirical literature has questioned the foundations of this thesis, yet it remains a helpful starting point.

[1] Source: Auerbach (1984)

Of course, the theory might fail to hold in practice for a variety of reasons. First, the combination of uncertain returns and incomplete markets implies that insurance against all outcomes is unavailable. Second, the cost of capital may differ depending on the source of money, either for nontax or tax reasons. Finally, the cost of capital may differ depending on the type of investment (tangible or intangible), both for tax and other reasons.

To summarize, economic theory advances a plethora of reasons why there might be a gap between the external and internal costs of capital; these can be divided into three major types, the first two of which arise from market failures: (i) asymmetric information between innovator and investor; (ii) moral-hazard arising from the separation of ownership and management; and (iii) tax considerations driving a wedge between external and internal costs of capital. The three parts that follow address each of these in turn. [9,10]

The asymmetric-knowledge problem in R&D refers to the reality that an innovator or entrepreneur typically has more information about the nature of the intended innovation endeavor and its probability of success than possible investors. As a result, the marketplace for financing the development of new ideas resembles Akerlof's (1970) «lemons» market. In his model, good (used) cars are sold at a lower price to compensate the buyer for the possibility that the vehicle is a lemon. In this case, the seller of future R&D or innovation returns gives a larger return (lower price) to compensate the buyer for the likelihood that the project is not as good as advertised. Because investors have more difficulty distinguishing good projects from bad when the projects are long-term R&D investments rather than short-term or low-risk projects, the lemons' premium for R&D or innovation will be higher than that for ordinary investment (Leland and Pyle, 1977).

If the asymmetric-information problem is extremely strong, the market for R&D initiatives may collapse totally in the most extreme variant of the lemons' scenario. According to informal evidence, several prospective innovators feel this is the case in practice. Due to the ease with which original ideas may be imitated, reducing information asymmetry through greater disclosure has minimal value in this sector. Firms are hesitant to divulge their new ideas to the market, and the fact that providing information to rivals may incur significant costs decreases the quality of the signal they may send about a possible project (Bhattacharya and Ritter, 1983; Anton and Yao, 1998). As a result of asymmetric knowledge and the high cost of mitigating the problem, enterprises and inventors will face a greater cost of external than internal capital for R&D due to the lemons' premium. When the level of R&D expenditure is a visible signal susceptible to external scrutiny, as it is under present accounting regulations in numerous countries, we may anticipate the lemon problem to be lessened but not eradicated.

Reputations formed via frequent contacts may sometimes reduce asymmetric-information difficulties, and this context is no exception. Several types of reputation-building have been observed. Specialized Venture Capital (VC) funds play an important role in providing informed monitoring of early-stage technology startups, but experienced VCs will also have developed a reputation for honoring nondisclosure agreements, allowing them to gather better information about projects being proposed. On the other hand, serial entrepreneurs frequently have less trouble securing finance for new businesses, probably because they have established a reputation in previous start-ups. [11]

Moral hazard in R&D spending manifests itself in the usual way: contemporary industrial enterprises often have ownership and management separated. When the aims of the two clashes, this creates a principal-agent dilemma, which can result in investment plans that are not maximizing share value and hence can lead to under or over-investment. Two scenarios may coexist: the first is managers' usual tendency to spend on activities that benefit them but not

necessarily their firm (growing the firm beyond efficient scale, nicer offices, etc.), and the second is risk-averse managers' reluctance to invest in uncertain R&D projects.

The first sort of agency costs may be avoided by lowering the amount of free cash flow available to managers via leveraging the business, but this requires them to seek higher-cost external capital to finance R&D (Jensen and Meckling, 1976). Empirical evidence suggests that the leveraging method has limits in R&D-intensive industries. See Hall (1990, 1994) for evidence that the 1980s leveraged-buyout (LBO) and restructuring wave, viewed by most researchers as driven by the need to reduce free cash flow in sectors with limited investment opportunities, was almost entirely confined to industries and firms where R&D was unimportant. One reason for this might be that over-investment in R&D and innovation is typically not a serious issue for ongoing management organizations, therefore the discipline of cash-flow restricting leverage is unneeded for constraining this type of investment.

Managers, according to the second kind of principal-agent conflict, are more risk adverse than shareholders and shun innovation initiatives that enhance the firm's riskiness. If bankruptcy is a possibility, managers whose next best prospect is a position with lesser pay than their current job, as well as possible bondholders, may choose to reject variance-increasing initiatives that shareholders would prefer to execute. The idea contends that long-term investments may suffer in this circumstance. Rather of cutting free cash flow, the best response to this sort of agency cost would be to boost the manager's long-term incentives. For this reason, many creative organizations heavily rely on stock option compensation, despite the fact that this approach has its own set of incentive issues.

In the case of new businesses, there is frequently a third sort of main agent conflict, including the entrepreneur's overconfidence. When there is uncertainty and the probability of innovation success is disclosed progressively over time, the prospect of asymmetric information and moral hazard in the investor-innovator connection complicates attaining the ideal contract. For example, it is frequently observed that entrepreneurs or R&D managers wish to continue projects that investors would like to terminate (Cornelli and Yosha, 2003), presumably because the possibility of an ultimate benefit to the entrepreneurs looms large and they do not face the investment cost in the case of failure. If they are also overconfident (which is common), they will be much more inclined to continue. Asymmetric information regarding the project implies that the investor will have a more difficult time estimating the likelihood of success than the inventor. The combination of information rents and agency costs will result in inefficient project funding over time (waiting too long to terminate or canceling too soon), as well as inefficiently low funding levels. [12,13]

Bergemann and Hege (2005) examined these tradeoffs in a multi-stage investment financing choice under shifting uncertainty, with renegotiation possible, in a recent work. They examine the distinction between relationship financing (in which the investor can correctly monitor the progress of the project) and arm's length financing (in which the investor must rely on the innovator for information). Depending on the development of the project and their expectations of success, investors might accelerate or reduce the rate of funding. In general, Bergemann and Hege discover that agency fees result in non-optimal project ending criteria, with projects being terminated too soon on average. Surprisingly, arm's length contracts can result in greater project valuations because the investor can agree in advance to a stopping rule, removing any profit to the entrepreneur from attempting to extend the project.

A third crucial conclusion from the preceding hypothesis is that any challenges asymmetric information and moral hazard cause for funding creative enterprises are likely to be magnified in the case of young firms and start-ups. These enterprises are frequently the most reliant on external

sources of capital, and they have not yet acquired reputations that would allow them to appropriately indicate their quality.

Results and Analysis

Almost all of the empirical data mentioned in this section concerning the presence of a wedge between internal and external financing, and the resulting underinvestment in innovation, employs R&D investment as a proxy for long-term expenditure or investment in creative activities. There are excellent reasons for this: R&D is typically the only indicator of firm-level innovation that has been seen over extended periods of time, and it is strongly associated to inventive activities, at least in the manufacturing sector. The latest wave of innovation surveys in Europe and abroad is providing us with other metrics, albeit it appears that R&D still has more predictive ability for business success than the newer measures, at least where it is observed (Mairesse et al., 2006). The findings of the innovation surveys will be published later in this section. [14]

The empirical studies in this area are divided into two groups in the discussion below: those based on variations of an investment equation derived from economic theory, and other studies based on stock-price announcement effects on the impact of various corporate-governance settings on the financing of innovation. The section finishes with a study of the evidence on innovative enterprises' consequent capital structure.

The presence of «liquidity» constraints on a firm's investment (both ordinary and innovation and R&D investment) implies that they are unable to obtain funds from external sources to finance all of the investment that they would undertake if sufficient funds were available within the firm. As a result, estimating is the most common approach to analyze the empirical significance of the reasoning in the preceding section.

R&D investment models to see whether there are any liquidity limitations or extra susceptibility to cash-flow shocks, which may be more acute than in regular investment. This method extends the extensive literature on testing ordinary investment equations for liquidity constraints (Fazzari et al., 1988; Arellano and Bond, 1991). It faces many of the same challenges as estimates in the investment literature (lack of good instruments to isolate supply shocks, measurement error, unobserved differences across firms, and so on), plus one additional issue caused by firms' proclivity to smooth R&D spending over time. Giving enterprises more cash exogenously and seeing whether they pass it on to shareholders or use it for investment and/or R&D is the ideal experiment for determining the impact of liquidity restrictions on investment. If they pick the first option, either the firm's cost of capital has not decreased, or it has decreased but there are still no viable investment prospects. If they chose the second option, the company must have had some untapped investment potential that were not lucrative with more expensive external financing. If it is discovered that investment is sensitive to cash flow shocks that are not indications of future demand increases, the premise that the cost of external funds is the same as the cost of internal funds can be rejected. However, due to a lack of true experiments of this type, researchers are forced to use econometric techniques such as instrumental variables to control for demand shocks when estimating the investment demand equation, with varying degrees of success. [15]

The issue for direct studies of the link between management and ownership structures and business investment plans is that the two have co-evolved to be suited to one another in any given organization, and therefore observable correlations do not accept much of a causal narrative. Any attempt to examine differences in performance caused by changes in strategy and governance will be hampered by the fact that selection for «fitness» tends to remove some of the trials that may be interesting. The conventional approach to this problem is to search for announcement effects, or market reactions to information surprises or news that businesses have not yet responded to. The

computed returns are «abnormal» that is, they are adjusted for the overall market returns during the same time period. When the business is more R&D-intensive, both Alam and Walton (1995) and Zantout (1997) show greater abnormal returns on firm shares following fresh loan issuance. The notion is that acquiring additional sources of finance is beneficial when the corporation faces an asymmetric-information problem as a result of its R&D strategy. Similarly, Szewczyk et al. (1996) discover that investment opportunities (as measured by Tobin's q) explain R&D-related anomalous returns, and that these returns are larger when the business is heavily leveraged, reflecting a higher necessary rate of return for debt finance in equilibrium. Of course, the evidence in each of these examples is non-experimental, and the connections between theory and actual testing are fragile, but the results are intriguing. Evidence for the role of agency costs in R&D comes in numerous sources. Several researchers have investigated the impact of antitakeover amendments on R&D investment and firm value (which arguably increase managerial security and willingness to take on risk while decreasing managerial discipline). According to Johnston and Rao (1997), such modifications do not result in R&D cuts, however Pugh et al. (1999) discover that the implementation of an Employee Stock Ownership Plan (ESOP), a type of anti-takeover protection, results in R&D increases. Czarnitzki and Kraft (2009) employ patent data as a measure of inventive activity in a study of German manufacturing enterprises and find the opposite outcome. Patent filings show that companies with dispersed ownership are more active in innovation, although patenting diminishes as leverage grows. They take this finding to mean that leverage functions as a disciplinary device, preventing managers from overinvesting. Although they use instrumental variables to control for the endogeneity of leverage, the instruments (lagged cash flow and tangible asset intensity) are arguably related to unobserved determinants of innovative activity; in the absence of independent measures of over- or under-investment, it is difficult to know whether leverage is a discipline device or merely an indicator that the firm is not as innovative as others. In overall, the data presented above is quite clear, indicating that long-term incentives for managers can boost R&D and that institutional ownership does not always hinder R&D investment. It is, however, rather silent on the scale of these benefits, as well as whether these governance elements genuinely reduce the agency cost-induced gap between the cost of capital.

Discussion

Another technique to investigate the finance-innovation nexus is to evaluate the capital structure that comes from R&D intensive enterprises' financing decisions. The evidence why debt is disliked is fairly evident here. Friend and Lang (1988) and Hall (1992) found a clear negative association between R&D effort and leverage using US data. The same is true for unpublished European business data (Hall et al., 2009). Although leverage can be useful for reducing agency costs within a company, it has limited utility for R&D-intensive companies. As previously discussed, because the knowledge asset created by R&D investment is intangible, partly embedded in human capital, and typically very specialized to the specific firm in which it resides, the capital structure of R&D-intensive firms typically exhibits significantly less leverage than that of other firms. Banks and other debt holders prefer to secure loans with physical assets and are hesitant to lend when the project requires significant R&D expenditure rather than investment in plant and equipment. According to Williamson (1988), «redeployable» assets (assets whose value in an alternative use is almost as high as in their current use) are better suited to debt governance arrangements. Alderson and Betker (1996) give more empirical evidence for this hypothesis, finding that liquidation costs and R&D are positively associated across enterprises. The consequence is that the sunk costs associated with R&D expenditure are greater than those connected with conventional investment. Furthermore, debt servicing typically necessitates a consistent source of cash flow, making it more

difficult to find funds for an R&D investment program that must be sustained at a certain level in order to be productive. Firms are either unable or unwilling to employ debt funding for R&D investment for these reasons, which may raise the cost of capital depending on the particular tax treatment of debt vs equity. Chung and Wright (1998) provide empirical evidence that limiting free cash flow in R&D firms by issuing debt is a less desirable method of reducing agency costs, finding that financial slack and R&D spending are positively correlated with the value of growth firms but not with the value of other firms. Czarnitzki and Kraft (2009) discover that highly indebted German enterprises have poorer innovation output (as measured by patents), particularly when company ownership is distributed. According to some analysts, the 1980s LBO boom in the United States and the United Kingdom originated in part because high real interest rates created tremendous incentives to remove free cash flow within corporations (Blair and Litan, 1990). The need for internal funds to undertake such investment should have reduced such pressure for firms in industries where R&D is an important form of investment, and indeed Hall (1993, 1994) and Opler and Titman (1993) find that firms with high R&D intensity were much less likely to do an LBO. Opler and Titman (1994) discover that leveraged R&D enterprises suffered more than other firms in times of economic difficulty, probably because leverage meant they were unable to continue R&D initiatives in the face of reduced cash flow. Blass and Yosha (2003) indicate in similar study using data on Israeli enterprises that R&D-intensive firms listed on US stock markets employ primarily equity-based methods of financing, whereas those listed solely in Israel rely more on bank financing and government investment. The former is more lucrative and quicker expanding, implying that the decision on where to list the shares and whether to finance with fresh stock is indeed affected by the predicted rate of return on R&D. That is, investors who provide arms-length financing demand greater returns to compensate for the risk of a «lemon». [16]

Before I leave this topic, I'd want to go through the research on the funding of new creative enterprises and start-ups. A number of studies, beginning with Rajan and Zingales (1998), have linked a country's overall financial development level to metrics such as the entry of new enterprises. Aghion et al. (2007) show that the level of financial development in a country (private credit and the size of market capitalization) strongly influences entry and post-entry growth of small firms but has little impact on large-firm growth using a set of 16 countries including the US, Europe, and mid-level developing countries in Eastern Europe and Latin America. These writers stress the disparities in market capitalization between the United States, the United Kingdom, and a few Nordic nations on the one hand, and continental Europe on the other. Although the growth of small firms and stock markets are endogenously related in the sense that they grow together, Rajan-Zingales and Aghion et al.'s methodologies are designed to minimize the identification problem that results, making their results robust. This work does not directly relate to innovative enterprises, but it is suggestive, as they are frequently prominent among new firms, particularly in the industrial industries researched by these writers. Holtz-Eakin et al. (1994) took a completely different strategy, focusing on the cash flow impact on entrepreneurial enterprises. Using tax data on US entrepreneurs (sole proprietors), some of whom received inheritances, they were able to demonstrate that receiving funds from inheritance increased entrepreneurial survival and that those who survived grew faster, implying that such firms were financially constrained prior to the cash infusion. Turning to R&D and creative small enterprises in particular, most of the study discussed in section 2.1 indicated stronger financial restrictions for smaller firms than for the bigger firms in their samples when the authors looked. Himmelberg and Petersen (1994) and Brown et al. (2009) are two instances. Of course, looking at smaller enterprises that have successfully entered the market but are constrained by financial limitations is just half of the tale. We would also like to

know about non-entry or inability to innovate owing to restrictions. In this case, innovation surveys can be useful, especially if they thoroughly poll non-innovative enterprises. Canepa and Stoneman (2008), for example, discovered that funding was notably important for smaller creative enterprises in their UK sample, as does Magri (2008) for Italian firms. Audretsch and Lehmann (2004) investigated the financing of emerging innovative enterprises on Germany's Neuer Markt and discovered a negative association between bank debt and venture capital financing. They also demonstrate that VC-backed enterprises expand at a considerably faster pace. They suggest that these two outcomes demonstrate the need of financiers ready to risk money for the development of emerging creative enterprises, particularly in countries where bank financing dominates, such as Germany.

Conclusion

If I say with my words the conclusion for financing innovation activities is that firms must find and acquire money for their creative ideas. This is due to the fact that innovation is essential for staying competitive in today's fast-paced industry and may assist generate growth and profitability. Securing finance for innovation, on the other hand, can be difficult and may necessitate imaginative and unique tactics such as crowdsourcing, venture capital, government grants or loans, or partnerships and collaborations. Finally, having a clear and complete understanding of the potential risks and returns of the innovation, as well as a solid business plan and strategy to execute the innovation effectively, is the key to successful financing of innovation activities.

In addition to this, the most and main thing for the financing innovation activities is increasing the adoption of innovative finance will need a collaborative effort from public and commercial stakeholders. This concerted effort will need to promote knowledge and openness on the achievements and failures of innovative finance, show scalable solutions to allow creative finance, and develop a worldwide network of investors and entrepreneurs to expand the industry. The international community may leverage creative funding to address global economic, social, and environmental concerns by combining private sector techniques to attaining risk-adjusted returns with a philanthropic commitment to delivering social impact.

In order to finance innovative activities, it is necessary to stabilize and develop the following financial innovations in this area. That is, these include cardless ATM services, weather derivatives, central bank digital currency, QR code payment, hedge funds, and exchange-traded funds. In this way, it will be possible to finance and develop innovation activities in any region.

This set of theoretical and empirical work has yielded a number of results that are pretty consistent across the many samples and methodological variants. It's worth noting that the market failures listed and investigated here are limited to those caused by the separation of owner and management, or financier and entrepreneur. The primary public policy case for financing innovative enterprises, on the other hand, may be different, as it is focused on the societal advantages to be received from such firms' unpriced knowledge spillovers.

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