

1. Introduction

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The conditions for successful manufacturing have changed considerably in recent years. The allocation of industrial investment in plant, equipment and intangibles is changing markedly and new products and processes encompass a greater number of different technologies. These trends involve different investment needs. The main distinction is between 'core technological investment' (comprising the bulk of technological investment) and 'complementary investment' (which guarantees the efficiency of the 'core investment'). Another dimension is the distinction between tangible and intangible investment, with the understanding that the latter comprises the bulk of technological investment. The decision to invest in new technologies is constrained by uncertainty and information costs. Uncertainty is particularly high when technologies are new and still changing rapidly and investments are considerable.

Because liquidity risk is positively related to firm size and because barriers to credit increase the risk of doing business, entrepreneurs unable to insure themselves against large risks may prefer to remain small and to diversify their activities in whatever way they can. For instance they may start a new firm instead of expanding the one they currently operate. Barriers to credit also affect technology choices. If access to credit is partly determined by the collateral value of the investment, purchases of land, buildings and vehicles are facilitated while the building up of stocks, wage fund and credit to customers are not. This may result in the adoption by large firms of capital-intensive methods of production and in an emphasis on production instead of marketing and product improvement, even though labour-intensive methods may be more efficient and an improvement in marketing much needed. Moreover, in areas of fast-changing technologies, small firms and start-ups may be unable to afford the best available technique of production. Risk also makes firms reluctant to experiment with the unknown. They may reduce risk by opting for a flexible organization of their business. For instance, investors may prefer multi-purpose technologies that can easily be applied to new tasks, even if it means bypassing state-of-the-art specialized equipment. They may avoid investments in equipment and technology not because they could not get a bank to finance it but

because rigid loan repayment obligations would put the firm at risk. In all these cases, some of the gains from specialization and learning by doing are not captured and the size distribution of firms remains inefficient.

A large body of empirical literature has investigated the impact of information problems in financial markets on investment decisions of firms in developing countries. The increased availability of panel data has resulted in a growing volume of empirical work in recent years. Despite the intense debate, evidence on the effects of different financial systems is still sparse. The range of factors which bear on cross-firm or cross-country variations in performance is considerable. This does not stop many from equating differences in economic performance between countries with their different types of financial systems. What is more realistic than trying to provide a general typology at the aggregate level is to consider the way in which financial systems can bear important aspects of the performance of the corporate sector.

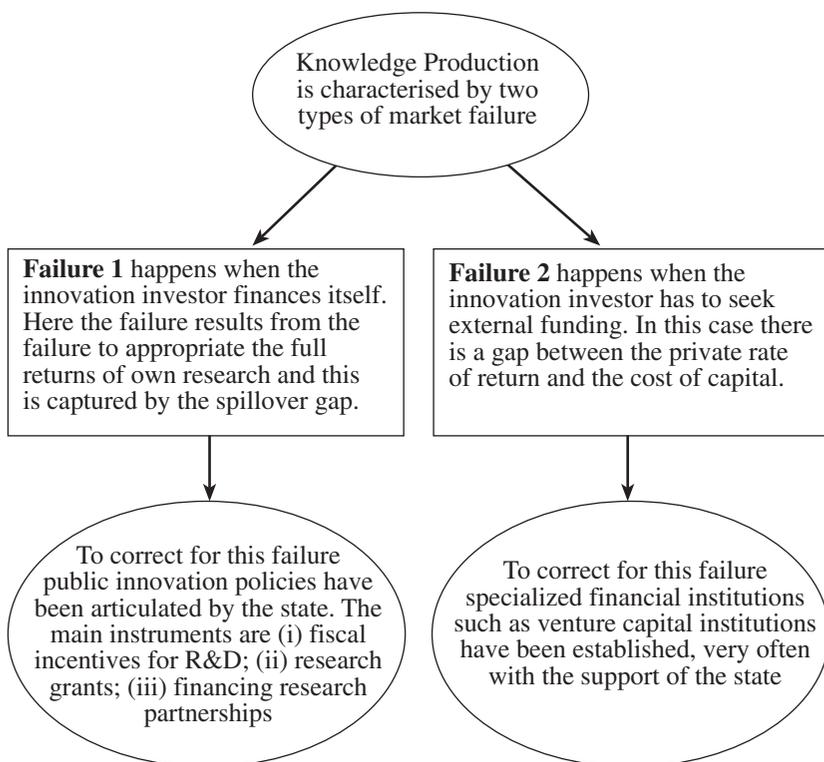
Financing of knowledge production is characterized by at least two types of failures. The first has been very well articulated in the so-called 'appropriability argument'. This argument runs as follows: R&D investments result in the production of new knowledge and this is non-rival in its use. Despite the existence of intellectual property right (IPR) mechanisms, given its non-rival nature, it can be copied or imitated by competitor firms at costs which are less than the cost of creating it from scratch. Economists have attempted to capture this by computing the spillover gap or the gap between private and social rates of returns for samples of innovation. The existence of this gap justified various public policy measures to combat possible underinvestment in R&D by private sector agents. These public policy measures range from various fiscal incentives for R&D, research grants, strengthening of the IPR regime, financing of research partnerships and so on. The major assumption in this line of argument is that the firm or the agent which performs the R&D is also its financier.

The second type of failure exists when the innovation investor and the financier are two different entities. Under such circumstances a second gap exists between the private rate of return and the cost of capital. This implies that the conventional capital market, whether based on debt or on equity, would eschew projects that result in innovations as the output of these projects are uncertain or the projects are such that one cannot even attach probabilities to their potential outcomes. Hall (Chapter 2 in this volume) has identified three main types of reason for the existence of a gap between external and internal costs of capital:

1. asymmetric information between inventor and investor;
2. moral hazard on the part of the investor, or arising from the separation of ownership and management; and

3. tax considerations that drive a wedge between external finance and finance by retained earnings.

The response to this has come from the private sector itself but very often supported by state funds, namely the establishment of specialized financial agencies such as venture capital institutions. In short knowledge production is characterised by two types of market failure and state intervention is required to offset for the consequent shortfalls in investment. Figure 1.1 summarizes this point.



Source: Own compilation.

Figure 1.1 Rationale for state intervention in knowledge generation

Venture capital is a key component of the development of high-technology industry, and an essential element for policies to develop such industries in all countries, developed as well as developing. This book is a first attempt to analyse the link between the corporate sector and local

financial systems in developing countries. The hypothesis we put forward in this book is that recent trends in the corporate sector, with increasing competition and structural adjustment and the deregulation of financial institutions in advanced developing countries, are increasingly creating new channels of interaction with profound implications for investment decisions and patterns of corporate development. So far, the innovation studies perspective has paid limited attention to these issues. It has been implicitly assumed that, in the context of a heavily regulated financial system, the provision of credit and the availability of other financial instruments are being driven by the internal dynamics of manufacturing industry and to a lesser extent by government policy.

The empirical contributions included in this volume reconsider some of these assumptions with a proper mapping of technological and organizational changes in the two main poles of interaction, that is, financial institutions and industry in the current context of industrial restructuring and services deregulation. In chapter 6, Mani and Bartzokas highlight these issues in detail. A first set of contributors present analytical essays on the linkages between finance and corporate innovation, while a series of country case studies report on the development of venture capital in China, India, Israel, Hungary and Singapore.

The country case studies have focused on careful mapping of technological and organizational changes in the two main poles of interaction: new forms of financial intermediation and industry in the current context of industrial restructuring and services deregulation. In doing so, they produced the following insights:

- Venture capital is an important source of institutional support for new-technology-based ventures especially in their early stage. Unless emphasis is placed on financing technology-based small and medium enterprises at their seed and start-up stages, venture capital will be less of an incentive to innovation.
- Venture capital firms require strong public policy support in terms of tax and other financial incentives. They also require proper exiting mechanisms such as a well developed stock market and an adequate supply of well trained professionals especially at the 'due diligence' stage.
- A distinguishing feature of venture capital finance is the additional support and knowledge transfer provided by the investing firms to the firm they invest in.

In addition to these general points the country case studies demonstrate that (a) there is increasing importance of government backing for the

setting-up of venture capital industries, virtually in all countries with an innovation policy; and (b) there is a trend towards globalization of venture capital, through the incorporation of venture capital funds in global portfolio management structures.

Barriers to credit generate allocative inefficiencies and pull resources away from manufacturing. These problems are being generated because the investment projects that are financed may not be those with the highest return. This is true whenever there is not a perfect match between investment opportunities and the allocation of credit. If firms that have long been in existence find it easier to gain access to credit while new firms cannot do so, certain firms will outlive their usefulness and competition through firm entry will be thwarted. The sectoral allocation of investment is affected because lost investment opportunities and inefficient production choices reduce aggregate returns to industrial capital. As a result, funds are channelled to uses other than manufacturing: commerce, government bonds and capital flight. This process is reinforced if, to reduce their exposure to risk, investors are drawn towards operations with a rapid turnover, such as commerce, or to financial investments with a safe return. That the influence of global capital markets, the local circumstances and the diversity of configurations of venture capital should be the three main pillars of policy using venture capital to promote investment in high technology and innovation is one of the main conclusions of the case studies.

If financial markets are underdeveloped, people will choose poorly productive, but flexible, technologies. Given these technologies, producers do not experience much risk, and hence there is little incentive to develop financial markets. Conversely, if financial markets are developed, technology will be more specialized and risky, thereby creating the need for financial (and assets) markets. A particular resource (capital) can be specialized into a narrow range of tasks without being harmed through the increase of risk because financial institutions are used in order to deal with it. Thus financial markets contribute to growth by facilitating a greater division of labour. In the absence of financial markets, diversification is taking place at the firm level through technology 'options'. Firms will choose technologies that are less risky, with many applications, but less productive. Firms are reluctant to engage in sophisticated technologies as long as they cannot share the risk they incur with financial markets. Indeed, there is a strategic complementarity between financial markets and technology, because both are instruments that can be used for diversification and technological upgrading.

As governments invest more in venture capital, what are the challenges they face in their policy designs and evaluations? The globalization of venture capital poses questions about the ability of local policy makers to

harness venture capital for the development of local technological capabilities. In that context, this volume clearly demonstrates the great diversity of venture capital structures and roles in innovation processes. For example, Singaporean venture capital and Chinese venture capital organizations are very different in structure, aspirations, financial power and ways in which they receive support from their respective governments. Both, however, invest heavily in innovative companies in mainland China. Somewhat paradoxically, globalization has increased the importance of local conditions in every attempt to attract international investment and channelling these resources into the development of sustainable businesses in the high-tech sector.