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World Institute for Development Economics Research

Discussion Paper No. 2001/4

Financing the New Economy

Financial Institutions and Corporate
Governance

Colin Mayer *

May 2001

Abstract

This paper examines the financial sector preconditions for the successful development of a high technology sector. It argues that there is a close relation between types of activities undertaken in different countries and their institutional structures. A distinguishing characteristic of the financing of high technology firms is their evolving pattern of control by different investor groups. While stock markets are an important component of the development of the most successful firms, they are not the most common. Regulation is a significant influence on institutional structure. The degree of risk taking by financial institutions and the diversity of their investments are affected by trade-offs between competition and stability and the emphasis placed on minority investor protection. For the most part, Europe has opted for high levels of investor protection and low levels of diversity; if it wishes to stimulate high technology sectors, it may have to change this balance.

Keywords: high technology finance, venture capital, financial systems, financial regulation

JEL classification: G2, G3, O3

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* Saïd Business School, University of Oxford

This study has been prepared within the UNU/WIDER project on Production, Employment and Income Distribution in the Global Digital Economy, which is directed by Professor Matti Pohjola.

UNU/WIDER gratefully acknowledges the financial contribution to the project by the Ministry for Foreign Affairs of Finland.

Acknowledgement

I am very grateful to Matti Pohjola, Rune Stenbacka and other participants at the UNU/WIDER conference on The New Economy in a Global Perspective for very helpful comments on an earlier draft of this paper.

1 Introduction

What are the financial sector preconditions for the successful development of a high technology sector? The conventional answer is straightforward: an active venture capital industry combined with a liquid domestic stock market. The development of venture capital firms and stock markets is regarded as a priority for the growth of high tech industries in Europe. Is this correct? How do high tech firms finance themselves and what role do stock markets play in their development?

There is accumulating evidence of a relationship between financial development and economic growth. Several studies report a relation between the size of financial systems at the start of a period and subsequent economic growth. Controlling for other considerations, financial development appears to contribute to growth. A range of measures of financial development are relevant—the volume of monetary assets, the size of banking systems and the size of stock markets.

To the extent that it is possible to establish the channel by which financial development contributes to growth, it appears to be through the external financing of firms. Comparing the growth of different industries across countries or different companies suggests that there is an inter-relationship between their growth rates, the extent to which they are dependent on external finance and the development of financial systems in which they are operating. In other words, financial development confers particular advantages on industries and companies that are especially dependent on external finance.

These results are consistent with the view that a primary function of financial institutions is to improve allocation of funds within an economy. Corporate, industrial and economic growth are assisted by institutions that direct financing to activities that are most dependent on external finance. The studies therefore provide empirical confirmation at an aggregate or industry level of the theoretical underpinning of financial institutions.

However, the question that these studies leave unanswered is which institutions are particularly well suited to performing these functions. Do all institutions serve companies equally well and are some institutions particularly well suited to the financing of high technology?

The second set of issues concerns the policies that can be used to influence the development of institutions. Over the last few years a literature has emerged emphasizing the important role that legal and regulatory structures play in influencing institutional development. This literature has emphasized the protection of investors as being a crucial determinant of the development of financial systems. Since, as noted above, the development of financial systems is in turn related to the external financing of firms, this points to a key role for investor protection in promoting the external financing and growth of firms. The policy message that appears to emerge from these studies is clear: improve investor, in particular minority investor, protection, and financial development, investment and growth will follow.

This raises the question of what precisely is the relation between legal systems, regulation and the structure of financial institutions. Is there, as the above literature suggests, a straightforward relation between regulation and the development of

institutions? In particular, are certain regulatory rules suited to the financing of high technology activities?

Section 2 of this paper reviews evidence on comparative financial systems. Section 3 discusses ownership and control. Section 4 describes emerging theories that point to a comparative advantage of different financial and governance systems in promoting particular types of activities. The paper then turns to an illustration of this in the context of high technology industries. Section 5 discusses the pre-initial public offering (IPO) stage, and section 6 post-IPOs. Section 7 considers policy implications and section 8 concludes the article.

2 Comparative financial systems

There has been extensive comparison of the performance of different financial systems.¹ These analyses have focused on the contrast between bank oriented and market oriented systems. Most of the studies compare a small number of countries, focusing in particular on the UK and US on the one hand, and Germany and Japan on the other.²

The criteria by which systems are categorized include corporate financing, bank ownership of corporate equity and the exercise of corporate control by banks. Bank oriented systems are thought to display high levels of bank finance, equity holding by banks, long-term relations, close monitoring and active corporate governance by banks.

In practice, the distinction between bank and market oriented systems is fragile.³ While bank lending to corporations has been high in Japan in comparison to the UK and US, it has not in Germany. Bank holdings of corporate equity are modest in most countries. While banks are thought to have been actively involved in corporate activity and in particular restructurings in Japan, they have not in Germany. In addition, although early studies of Japan pointed to the advantages of close bank-firm relations in Japan, more recent ones have noted their defects in displaying excessive conservatism in corporate lending and inhibiting restructuring.⁴

The influence of financial systems on measures of corporate governance is also unclear. Close relations between financial institutions and companies might have been thought to influence incentives and disciplining of management. Systems with close relations have better information flows and thus a firmer basis on which to reward and discipline management. But they might lack the powerful incentive and disciplining devices of stock markets. In fact, to the extent that there is evidence on this, it does not point to a

¹ For surveys, see Carlin and Mayer (2000) and Levine (1997).

² See, for example, Edwards and Fischer (1994).

³ See, for example, Mayer (1988) and Rajan and Zingales (1995).

⁴ See, for example, Kang and Stulz (2000) and Weinstein and Yafeh (1998).

clear difference in either incentive arrangements or disciplining across financial systems.⁵

3 Ownership and control

The standard bank-market orientation distinction is neither particularly robust nor insightful. In contrast, there are striking differences in the ownership and control of companies that do bear close scrutiny.⁶ This is normally discussed in terms of comparisons of concentration of ownership in the UK and US on the one hand, and Continental Europe and the Far East on the other. For example, in France and Germany, in more than 80 per cent of the largest 170 listed companies, there is a single shareholder owning more than 25 per cent of shares and in more than 50 per cent of these companies, there is a single majority shareholder. In contrast in the UK, in only 16 per cent of the largest 170 listed companies is there a single shareholder owning more than 25 per cent of shares and in only 6 per cent is there a single majority shareholder. Concentration of ownership is appreciably higher on the Continent of Europe than in the UK. High levels of ownership concentration have also been reported for the Far East and South America and ownership is as dispersed in the US as in the UK.

Not only does the level of ownership differ appreciably between the UK and US and most of the rest of the world but so too does the nature of that ownership. In the UK and US, the shares of listed companies are primarily held by institutions, such as pension funds, life insurance firms and mutual funds, and individual investors. Ownership is dispersed in the sense that no one institution or individual holds a large stake in a single company. This is described as an ‘outsider system’.⁷

On the Continent, the large share blocks are primarily held by families (or family holding companies) and other firms. Inter-corporate holdings of large blocks of shares are commonplace, frequently in the form of pyramids of shareholdings, cross-shareholdings or complex webs. As noted above, in most countries, bank holdings of shares are modest and holdings by the government vary appreciably across countries. This is described as an ‘insider system’.

4 Comparative institutional advantage

A theoretical literature is emerging suggesting a relation between the institutional structure of countries and the *types* of activities that are undertaken in those countries. There are several strands of theory pointing in that direction. These can be classified under the headings of information, commitment and control. In the information theories (see, for example, Allen 1993) new technologies, where there are legitimate grounds for diverse expectations, benefit from securities markets; more traditional investments,

⁵ See Kaplan (1994).

⁶ See Barca and Becht (2001) and La Porta, Lopez-de-Silanes and Shleifer (1999).

⁷ See Franks and Mayer (1995).

which are prone to asymmetries of information between borrower and lender benefit from the economies of monitoring that banks can provide. In commitment theories (see, for example, Franks and Mayer 1995), concentrated ownership, as is widely observed on the Continent in Europe, is associated with activities that involve investments by other stakeholders and dispersed ownership with the adoption of new technologies that would be resisted by other stakeholders. In the control theories (see, for example, Dewatripont and Maskin 1995), fragmented banking systems are associated with short-term investments and concentrated banking systems with long-term investments. Similarly, dispersed ownership systems are associated with high-risk R&D investments and concentrated ownership systems with lower risk, more imitative investments.

All of the above observations and theory therefore suggest a relation between financial systems and the ownership and control of companies and the types of activities that they undertake. As Carlin and Mayer (2001) argue, they point to a thesis of comparative institutional advantage: institutional endowment of a country confers comparative advantage on activities that are relatively dependent on the institutional input in which the country is well endowed. Carlin and Mayer (2001) provide a first empirical assessment of this thesis. They examine the relation between growth and investment in 27 industries in 14 OECD countries over the period 1970 to 1995 with the interaction of the institutional structure of the countries and the characteristics of the industries. They find a close relation between growth and investment of different industries in different countries and the interaction of the structure of countries' financial institutions with the dependence of industries on a variety of financial and other inputs. The relation is particularly significant in the case of R&D. Investment in R&D is closely related to the dependence of industries on equity finance and highly skilled labour and is large in countries with good information disclosure, as measured by accounting standards. The relation between R&D and a high level of skills is particularly pronounced, pointing to the significance of human capital in R&D activities.

The case of high tech and the financing of new economy illustrates how this relation between financial systems, governance arrangements, legal systems and investment and growth might operate. Germany has a large banking system, a two-tier board structure and a civil law code. The USA has a large stock market, a unitary board and a common law system. The rankings of industries by the intensity of patent registrations for Germany (relative to a twelve-country average) are almost inversely related to those for the USA. Information technology, semi-conductors and biotechnology, for example, are in the top six (of 30) industries by patent registrations for the USA and in the bottom four for Germany. Germany's patent specialization is highest in civil engineering and transport equipment, which are in the bottom three industries for the USA.⁸ The question that this raises is whether the difference in patent activity in the two countries is related to institutional differences between Germany and the USA. Does the concentration of patent activity in 'science based' industries reflect the advantage of, for example, funding these activities through stock markets and does the more production oriented patenting activity in Germany relate to its highly concentrated ownership and large banking system? Similarly, Koski, Rouvinen and Ylä-Anttila (2001) observe that European countries specialize in different areas of information and communication

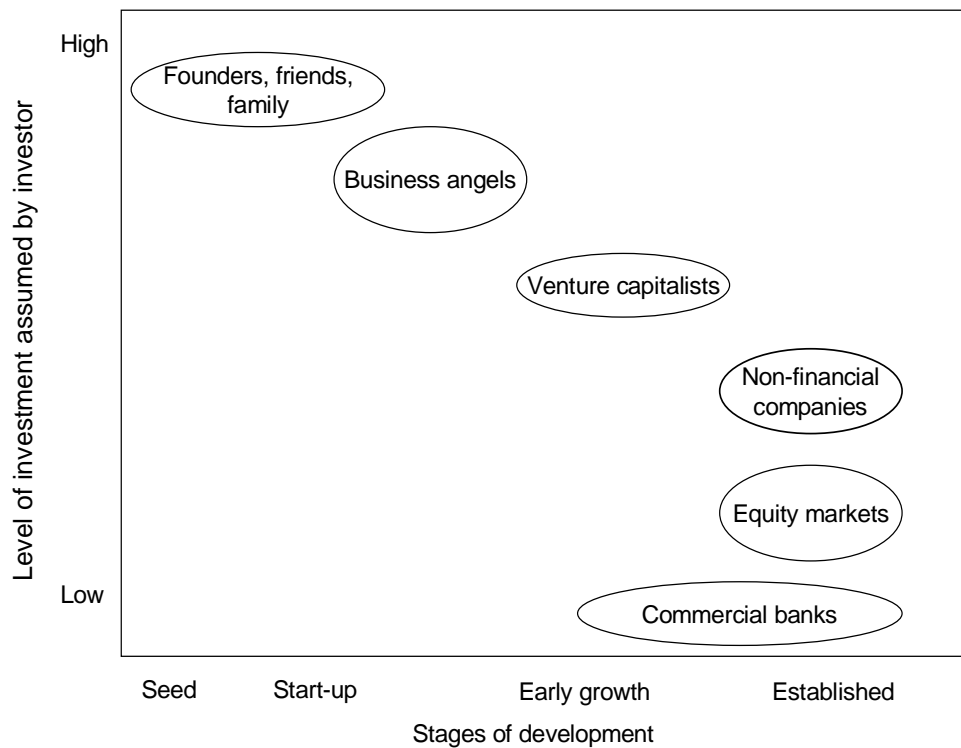
⁸ Patent specialization indices for 30 industries are calculated from patents registered at the European Patent Office. The correlation between the German and US indices is -0.78 (Cusack and Soskice 2000).

technology: Ireland and the United Kingdom are most active in information technology, whereas Finland and Sweden are concentrated in communication technology. The question that this raises is whether there is an association between these differences in technological activity and the structure of countries' financial institutions. A detailed consideration of the way in which high tech firms are financed and governed provides some evidence on this.

5 The financing of high technology industries: The pre-IPO stage

The development of high tech firms involves several phases (see Figure 1). The first is the seed stage when a concept has still to be proven and developed. The second is the start-up phase when products are developed and initial marketing takes place. The firm may be a year old or younger at this stage. The third is the early stage development when the firm is expanding and producing but may well remain unprofitable; it is often less than five years old at this stage. During the fourth stage of expansion it might go public after six months or a year.

Figure 1
The development and financing of entrepreneurial firms



Source: Van Osnabrugge and Robinson (2000).

The initial development almost invariably comes from savings and relatives. Initial external equity financing does not generally come from venture capital firms but from business angels. In the US it is estimated that the venture capital industry invested

around \$5 billion in 1998 in 1,000 early stage firms. In comparison, business angels (wealthy or reasonably wealthy private investors) are estimated to invest \$15 billion annually in 60,000 early stage firms. In the UK, it is estimated that about 5 per cent of small firms receive business angel support as against 1 per cent receiving venture capital finance (quoted in Osnabrugge 1998).

What accounts for the different contribution of business angels and venture capitalists to start-up financing? One of my former doctoral students, Mark van Osnabrugge, undertook a detailed comparison of the way in which venture capitalists and business angels operate. He compared the initial screening, due diligence, investment criteria, contracts, monitoring and exit routes employed by the different types of investor.

The results were striking. Venture capitalists are highly rule based using careful screening of applicants and due diligence. Business angels place more emphasis on ex post involvement in investments to reduce risks, such as their ability to contribute to the management of the business. Venture capitalists therefore act like institutions following principal-agent relations of limiting risks through monitoring. Indeed, since in the UK they are frequently subsidiaries of institutions, such as pension funds, that is not surprising. Business angels are more actively involved in the subsequent management of activities, exerting more direct control.

From the outset, venture capitalists are focused on exit, business angels much less so. Venture capitalists in general look for rates of return of between 30-40 per cent, business angels in the UK between 20 and 30 per cent. Initial public offerings are the preferred route of exit for investors, since they yield the highest return, but they are not the most common. It is estimated that fewer than one in a thousand new ventures have an IPO. However, entrepreneurs are much more optimistic than this record would warrant. One study estimated that 70 per cent of new technology firms believed that a public stock offering was 'highly likely' or 'probable'. Trade sales are the most common exit route of business angels, accounting for over 40 per cent of exits, followed by sales of shares to other shareholders and sales to third parties. IPOs account for just over 10 per cent of business angel exits.

In the US, around 25 per cent of venture capital funds are invested in early stage firms. In the UK, start-up and early stage investments also accounted for around a quarter of venture capital investments in 1984 but this has fallen to a figure of around 4 per cent at present. MBOs and MBIs have substituted for start-up financing increasing from 20 per cent to 70 per cent of UK funds' investment.

An important reason for the greater success of US venture capital in funding start-up businesses is the structure of the US industry. Venture capital comprises two parties (see Figure 2)—the limited partners which are the institutional and individual investors and the general partners which are the venture capital firms investing in individual companies and entrepreneurs. The general partners manage portfolios of companies and are frequently successful entrepreneurs themselves who want to manage larger portfolios of investments. They therefore provide intermediate technical expertise between the investing institutions on the one hand and the entrepreneurs on the other. Venture capital industries in other countries, including the UK, frequently lack the pool of entrepreneurial scientists on which to draw to provide this intermediary function.

Figure 2
The structure of the US venture capital industry

Limited partners

Pension funds

Corporations

Insurance companies

Individuals

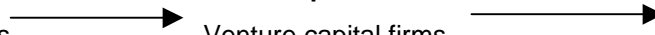
Foundations

Foreign investors

General partners

Venture capital firms

Entrepreneurs



The picture that emerges is that the financing of new high tech firms is highly reliant on own funds, families and friends. Once these are exhausted, external equity initially comes from private investors who are actively involved in the management of the investment. Venture capitalists come in at a later stage, acting at more arms-length than business angels and seeking higher returns over short periods. A small fraction of the most successful firms are floated on stock markets; most are sold as trade sales and sales to other investors. Much venture capital finance in particular in the UK is not associated with funding new investments but management buy-outs.

To understand high tech finance, it is therefore important to appreciate it as being intimately connected to the control of firms (Figure 3). The transition from personal to business angel to venture capital to stock market finance involves a gradual broadening of the investor base. This moves rapidly from the entrepreneur to single outside investors who are active managers, to financial institutions who use intermediary venture capital firms to screen and manage their investments, to stock markets with largely passive investors.

Figure 3
Stages of entrepreneurial finance

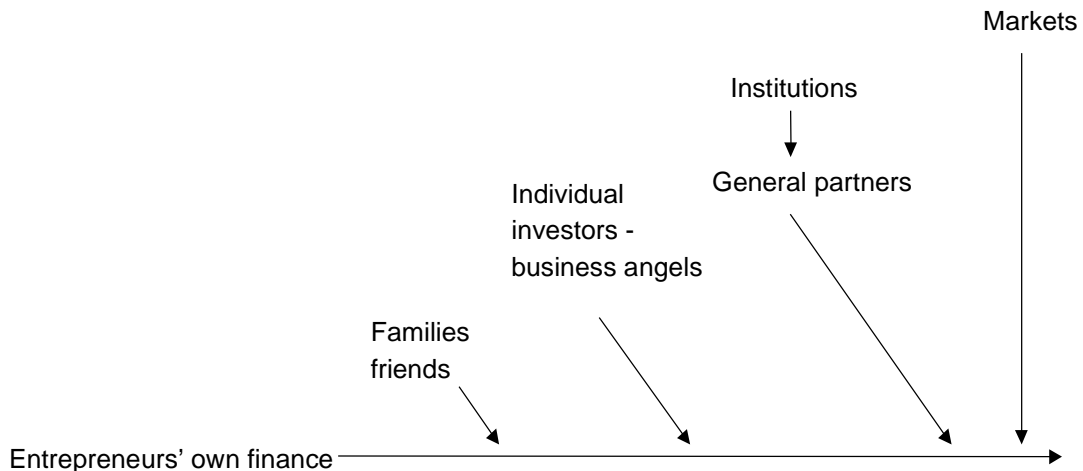


Figure 4
The financing of Amazon.com (1994-99)

Time line	Price/share	Sources of funds
1994 - July to Nov	\$.001	<i>Founder:</i> Jeff Bezos starts Amazon. Com with \$10,000, borrows \$44,000.
1995 - Feb to July	\$.1717	<i>Family:</i> Founder's father and mother invest \$245,500.
1995 - Aug to Dec	\$.1287-.3333	<i>Business Angels:</i> 2 angels invest \$54,408.
1995/6 - Dec to May	\$.3333	<i>Business Angels:</i> 20 angels invest \$937,000
1996 - May	\$.3333	<i>Family:</i> Founder's siblings invest \$20,000.
1996 - June	\$2.3417	<i>Venture Capitalists:</i> 2 venture capital funds invest \$8 million.
1997 - May	\$18	<i>IPO:</i> 3 million shares issued raising \$49.1 million
1997/8 - Dec to May	\$52.11	<i>Bond issue:</i> \$326 million bond issue.

Source: Smith and Kiholm (2000).

The financing of Amazon.com illustrates this (see Figure 4). The firm was initially funded out of Jeff Bezos' own savings and some borrowings. The family then invested a quarter of a million dollars. Two business angels then came in followed by a larger business angel syndicate. There was a further small family investment followed by a substantial venture capital injection of \$8 million. A year later the firm went public with an IPO of \$49 million.

The last few years have seen a rapid rise in venture capital finance and initial public offerings in many European countries as well as the US. Bottazzi and Da Rin (2001) report that funds raised in Europe trebled over the two years 1997 to 1999 from €8 billion to €25 billion. Some of the fastest growth has occurred on Continental Europe. Bottazzi and Da Rin (2001) report that by the end of the 1990's venture capital investments in Belgium and Sweden represented approximately the same share of GDP as those in the UK, having started from much lower bases at the beginning of the 1990's. Vitols (2000) reports that venture capital in Germany has more than doubled since 1996 from DM 6.1 billion to DM 13.8 billion in 1999. Early stage financing has more than doubled as a proportion of total venture capital from 14 per cent in 1996 to 31 per cent in 1999. Following the establishment of the Neuer Markt in 1997, initial public offerings have increased from 20 in 1996 to 167 in 1999. However, this growth followed an extended period of abortive attempts to stimulate a venture capital market in Germany. Throughout the 1960's there was a perception that the German economy was suffering from an 'equity gap'. The response of the German government was to encourage the formation of a new institution, the Deutsche Wagnisfinanzierungsgesellschaft (WFG), in 1975 devoted to the financing of young enterprises. In an excellent study, Becker and Hellmann (1999) document the development and performance of the WFG. We summarize the ownership, investment strategy, performance and subsequent developments of the WFG.

Ownership. 29 German banks founded the WFG with a government guarantee of 75 per cent of any losses that the banks might incur. The board of the WFG comprised representatives from industry and government, and scientists and consultants.

Investment strategy. The WFG initially focused on early stage investment in particular in manufacturing and information technology. The criteria for selecting investments were the degree of innovation of products and processes, their potential markets, the quality of entrepreneurs and the shortage of alternative sources of finance. The WFG took minority equity stakes, granted the entrepreneur a buy-back right over the equity and took no control rights. It offered entrepreneurs standardized contracts with essentially uniformity of pricing.

Performance. The performance of the WFG was disastrous. It made losses in each of its first 9 years. Most of the firms it supported recorded net losses at exit and bankruptcies accounted for a high proportion of exits. In contrast to evidence from US venture capital backed firms, entrepreneurs were ashamed to admit that the WFG had a stake in their firm.

Subsequent developments. In 1984, the WFG underwent a fundamental transformation involving a liquidation of the old firm and the creation of a new one. The government exited and the government representatives resigned from the board. The WFG refocused its attention away from start-ups to later stage financing and shifted its hiring policy away from people with technological to business experience. In 1988, the new WFG was in turn disbanded and the portfolio was taken over by Deutsche Bank and one small bank.

It is interesting to contrast this case with a similar British organization, the Industrial and Finance Corporation (ICFC).⁹

Ownership. ICFC was set up in the UK in 1945 to fill what was known as the Macmillan gap (the failure of the City to supply long-term finance to small and medium-sized firms). It was owned by the UK clearing banks and the Bank of England but created in the face of considerable opposition from the banks, which regarded it as a competitive threat rather than a complementary institution.

Investment strategy. ICFC focused on small manufacturing companies in their early development stage. It undertook active screening and monitoring of borrowers. Unusually for British clearing banks, its loan officers had a high degree of technical competence and displayed a high degree of commitment to long-term lending. ICFC took equity stakes but did not have direct representation on the boards of firms.

Performance. Following losses in its first three years to 1948, ICFC made substantial profits in every year subsequently. The number of its investments went up by a factor of ten between 1954 and 1984 and investments by ICFC were regarded as signals of quality certification.

Subsequent developments. In 1983 ICFC was consolidated in the *3i* group. Its investments became increasingly concentrated on venture capital. Initially it focused on

⁹ For an excellent history of the firm and its successor organization, see Coopey and Clarke (1995).

start-ups, early-stage and development capital. By the beginning of the 1990s, it became by far the largest provider of venture capital in the UK. Increasingly, however, its investments focused on management buy-outs and buy-ins and the repositioning of its activities contributed significantly to the switch in aggregate UK venture capital from early stage in the mid-1980s to MBOs and MBIs by the end of the 1990s.

The markedly different performance of the WFG and ICFC cannot be readily attributed to their origins or ownership structure. Both were formed in response to a financing gap and both had (reluctant) banks as their owners. Neither can the supply of entrepreneurs be cited as a fundamental difference between the UK and Germany. The post-war British culture has been regarded as being particularly anti-commercial. The UK has a creditor oriented bankruptcy system and a strong bankruptcy stigma. For much of the period there were prohibitively high rates of personal taxation in the UK. However, where the two institutions differed was in the involvement of the banks and the government. In many respects ICFC had the characteristics of a US venture capital partnership: lenders with technical expertise intermediating between investors on one side and companies on the other. The banks were kept at a distance by the presence of the Bank of England and there was no government involvement in ICFC or 3i. In contrast, the WFG could not disentangle itself from the banks or the government.

6 The post IPO stage

What happens after the IPO? Another former doctoral student of mine, Marc Goergen, has undertaken a very interesting comparison of the changing pattern of control of UK and German firms after they have gone public. Goergen notes that historically the average age of a firm coming to the German stock market has been 50 years. In the UK it is around 12 and in the US around 6 years. German firms have typically been about twice as large as UK firms on coming to the stock market. At the time of the IPO in general there is either no change in control in Germany with the original investors retaining control or control is transferred as a block to a new investor. Even six years after the IPO, families hold majority stakes in nearly 50 per cent of German firms. In the UK families control a majority of votes in only 11 per cent of firms; most are either taken over or become widely held.

This difference even persists in the Neuer Markt firms. As Vittols (2000) documents, the typical Neuer Markt firm adheres to what is described as the 'Herr im Hause' ('master of the house') model where the founder/CEO has a controlling stake in the firm and dominates the company board. The innovation strategy is the incremental development of existing products in contrast to that of a venture capital dominated 'Silicon Valley' firm, which seeks the development of a block buster product.

This further emphasizes the important control differences not only between old and new economy firms but also between different types of new economy firms. There is a much more rapidly changing control structure in new than old economy firms. Dominant control structures in old economy firms are concentrated and slowly evolving. Dominant control structures of new economy firms shift rapidly between entrepreneurs and different investor groups as the production process and financing needs of firms change.

Examining what happens once firms are established on the stock market further reinforces this observation. Work that I have been doing with Marc Goergen has compared the characteristics of companies listed on the UK stock market with equivalent sized firms that are privately owned. Consistent with the above observations on the importance of stock markets for high tech firms, listed firms are concentrated in R&D intensive sectors of the economy. Listed firms obviously raise much more equity finance but this is not used to fund internal investment. Instead, what clearly distinguishes listed from unlisted firms is the extent to which they engage in acquisitions. Access to stock markets primarily provides firms with the opportunity to expand through acquisition. Stock market listings and dispersed share ownership are important not only in making firms subject to the discipline of the takeover market but in providing them with the opportunity of expanding through acquisitions themselves. Again it is the potential for rapidly evolving patterns of control that mark out the new economy firms.

7 Policy implications

What are the policy implications of this? Is there, as the literature in the introduction suggests, a straightforward relation between regulation and the development of institutions? Becht and Mayer (2000) have recently argued in the context of an analysis of the ownership and control of European corporations that regulation affects the structure of financial and corporate systems. There is evidence that regulatory differences across European countries and between the UK and US bias institutional arrangements in particular directions.

The regulation of the high tech sector illustrates this well. One of the important contributors to the development of venture capital in the United States was the elimination of the 'prudent man' rule on pension funds at the end of the 1970s. This stimulated a substantial expansion in investment in venture capital activities during the 1980s. In the UK, pensions have been dominated by defined benefit schemes that impose low risk-return relations on investing institutions. In addition to protect pensioners from the types of losses that were incurred in the Maxwell pension fund scandal, minimum funding requirements have been required of pension funds. Their main effect has been to bias pension fund portfolios in the direction of holdings of UK government securities and away from more risky investments such as venture capital funds.

The way in which other financial institutions are regulated can bear heavily on risk taking. Another example is the regulation of UK banks. Since the 1840s, Britain has opted progressively for protection of depositors over competition. In the first half of the nineteenth century, Britain was populated with a large number of local banks. However, the existence of 800 small, private banks, empowered to engage in note issuance, caused serious stability problems. Over the period 1809 to 1830 there were 311 bankruptcies of country banks. Large banks are less exposed to local disturbances and have more resources available to them than small, local banks. In response, banks withdrew from the illiquid investments in which they had been engaged and began to spread their activities geographically. A convenient relation between the Bank of England and the banks therefore gradually emerged by which the clearing banks faced little competition and the Bank of England faced little failure. As a consequence, there is an absence of

local banking in Britain and higher levels of concentration in lending to small and mediums companies than in most countries. On the other hand, there has been much less failure than, for example, in the US. The critical question that this raises and has not been adequately addressed is how should an appropriate point on the trade-off be determined.

But it is not just the balance between investor protection and competition that affects the composition of financial institution investments. The type of regulation is also important. The regulation of investment management illustrates this. Continental Europe for the most part regards investment managers as parts of banks. They have large amounts of capital and are integrated into large financial groups. The UK has a large number of small investment management firms but imposes detailed conduct of business rules on them. In the US, there are few capital requirements, little prescriptive regulation but extensive disclosure requirements and active auditing and enforcement. In other words, for a given level of investor protection, the US permits the greatest diversity in types of firms and activities, Continental Europe encourages the least diversity and the UK is somewhere in between. A thriving economy in new technologies requires a high degree of diversity in institutions, investments and forms of control. The US system of regulation of investment managers encourages this; the European systems do not.

8 Conclusions

This paper has argued that there is a close relation between the types of activities undertaken in different countries and their institutional structures. Certain types of institutional arrangement, in particular information disclosure, appear to be related to growth of R&D activities. More generally, there is a relation between the structure of institutions and the types of high tech activities undertaken. The contrast between German and US patenting is illustrative of this. So too is the greater success of the general-limited partnership arrangements in the US than the captive funds in the UK in funding start-up activities.

A distinguishing characteristic of the financing of new economy firms is its evolving pattern of control by different investor groups. Participation in successful firms moves rapidly from own investments, to families, individual investors, small groups of investors and to venture capitalists funded by financial institutions. While stock markets are an important component of the development of the most successful firms, they are not by any means the most common. Where initial public offerings occur they involve rapid changes in control from original to new investors and dispersed ownership. Stock market finance is important in allowing control of and by high tech firms to alter.

Regulation is a significant influence on institutional structure. The degree of risk taking by financial institutions and the diversity of their investments are affected by the way in which competition and stability in financial systems are traded off and the form in which investor protection is provided. Risk taking by institutional investors is affected by the emphasis placed by regulation on, in particular minority, investor protection. In addition, for a given level of investor protection, the nature of regulation may influence the degree of competition and diversity in financial systems. For the most part, Europe

has opted for high levels of investor protection and low levels of diversity. If it wishes to stimulate a new economy, it may have to change this balance.

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UNU World Institute for Development Economics Research (UNU/WIDER)
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

Camera-ready typescript prepared by Liisa Roponen at UNU/WIDER
Printed at UNU/WIDER, Helsinki

The views expressed in this publication are those of the author(s). Publication does not imply endorsement by the Institute or the United Nations University, nor by the programme/project sponsors, of any of the views expressed.

ISSN 1609-5774
ISBN 952-455-132-2 (printed publication)
ISBN 952-455-133-0 (internet publication)