Institutions and Venture Capital

A Cross Country analysis on OECD countries

Master Thesis

Date: 8th August'2013

Author: Karan Singh
Student Number: 4185064
Study Programme: MSc Engineering and Policy Analysis

Chairman: Alfred Kleinknecht [Economics of Innovation]
1st Supervisor: Servaas Storm [Economics of Innovation]
2nd Supervisor: Bert Enserink [Policy Analysis]

University: Delft University of Technology
Faculty: Technology, Policy and Management
Section: Economics of Innovation

Duration: 01/02/2013- 08/08/2013

Acknowledgement

This report is the final product of my graduation project for Master Thesis in Engineering and Policy Analysis program at the Faculty of Technology, Policy and Management, TU Delft.

I would take the opportunity to express my sincere gratitude to a number of people without whom this project wouldn't have been possible. First off all, I would like to thank my graduation committee for their guidance and support throughout the process. **Dr. Servaas Storm**, I was indeed lucky to have you as my supervisor. I am really grateful for your guidance in helping me chose my thesis topic as well as for providing me valuable advice whenever I needed it. The weekly meetings, your feedbacks, the harmonious mentorship and most importantly, the interesting conversations, both on and off the topic, made working on this thesis project a smooth sailing and a delightful experience. Prof. **Dr. Alfred Kleinknecht**, you were always very easily approachable and very polite. As the chairman of my committee, you provided me with some very useful insights and links to resources directly relevant to my project. **Dr. Bert Enserink**, even though you were not familiar with my topic, you tried your best to understand my thesis and help me with some critical aspects such as how to communicate my ideas in a better way. I would also like to thank Dr. Petra Heijnen who helped me with the statistical analysis despite major time-constraints.

Lastly, I would like to thank my mother, **Ms. Meena Singh** (who is herself an Associate Professor in Economics) for motivating me through this demanding period. We share a common love for the subject of economics and for everything good life has got to offer.

Executive Summary

Small and Medium enterprises (SMEs) form the backbone of any economy. However, access to finance remains a key constraint to SME development and thus economic development. Numerous studies have shown that SMEs are financially more constrained than large firms and are less likely to have access to formal finance. Venture Capital (VC) industry has proved to be a good alternative source of financing in some countries to promote innovation and entrepreneurship. Having originated in the USA (a market based economy), it is catching up in Europe particularly in Scandinavian countries through numerous policy initiatives taken by the national governments. However, most continental European economies are traditionally bank based and the venture capital industry has not been as successful (at least in the last couple of decades) compared to USA.

Past research in the field attributes this difference in performance to numerous factors but none (to my knowledge) that provides a detailed and in-depth institutional basis to it. The aim of this thesis is to find out if the venture capital industry is more successful in a particular institutional environment or more specifically, in a particular kind of an economic system.

The countries under analysis are mostly OECD countries with similar levels of overall wealth and have been broadly classified into Anglo-Saxon economies and Continental European economies. The research was then implemented in three main parts: a) literature research and fact finding, b) theoretical analysis and c) empirical analysis.

The outcome of the research is a better understanding of the conditions required for successful working of the venture capital industry to promote innovation through start-ups as well as a list of recommendations to create such conditions.

"The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man." -George Bernard Shaw

List of Tables

List of Figures

Table of Contents

1. Introduction

1.1 Innovation and Economic Growth

A theoretical link between innovation and economic growth has been hypothesized since as early as Adam Smith (1776). The famous classical economist talked about the productivity gains from specialization through the division of labor as well as technological improvements to capital equipment and processes. He even recognized an early version of technology transfer from suppliers to users and the role of R&D function operating in the economy.

"All the improvements in machinery, however, have by no means been the inventions of those who had occasion to use the machines. Many improvements have been made by the ingenuity of the makers of the machines, when to make them became the business of a peculiar trade; and some by that of those who are called philosophers or men of speculation, whose trade it is not to do anything, but to observe everything; and who, upon that account, are often capable of combining together the powers of the most distant and dissimilar objects. In the progress of society, philosophy or speculation becomes, like every other employment, the principal or sole trade and occupation of a particular class of citizens… and the quantity of science is considerably increased by it. " (Smith, 1776)

The relationship between innovation and growth has also been articulated in a formal economic model by Solow (1957) who attributed the majority share (or residual growth) of economic growth to "technical change", a term that incorporates innovation.

More recently, Carl Schramm, who heads one of America's top entrepreneurial think tank, the Kauffman Foundation provides a great insight into what causes an economy to grow. Growth, according to him, is directly correlated to the number of start-ups that get big. Schramm, the head of the Kauffman foundation, quoted in Forbes (2010):

> *"The single most important contributor to a nation's economic growth is the number of startups that grow to a billion dollars in revenue within 20 years."*
> *(Forbes, 2010)*

Innovation has taken center-stage importance in the new "knowledge based economy" (KBE) with high-tech start-ups playing a major role in generating employment especially in the developed countries. This also resulted in such start-ups attracting unprecedented amount of capital until the recent financial crisis in 1997. The positive effect of such innovative start-ups has been mostly felt in the United States, the country most successful in creating favorable conditions for growth-oriented enterprises. Such an innovative and growth-oriented environment has been highlighted to be a major factor accounting for the difference in performance between the US and European economies (Andersson & Napier, 2007).

Undoubtedly, large established companies are also important for promoting

economic growth since they have the resources for R&D, have better access to export markets and have long-term stability. Contrary to that, life in small and medium enterprises (SMEs) can be more turbulent and jobs less secure. The performance of SMEs is, nevertheless, greatly important for the long-term vitality of any economy. Cross-country studies have, for instance, observed a positive link between the SMEs.' share of total economic activity and economic growth (T. Beck, Demirgüç-Kunt, & Levine, 2003). While there is substantial evidence that SMEs account for the bulk of employment generation, most evidence shows that they also dominate net creation of new jobs (Davidsson, Lindmark, & Olofsson, 1998; OECD, 2005).

Small companies have also been found to be more flexible in grasping opportunities in a dynamic market. Their activities have been shown to be greatly important for the degree of competition and for an economy's ability to restructure and innovate and spread risks in the general business environment (Jovanovic & Nyarko, 1994).

Former EU commissioner for enterprise Erkki Liikanen emphasized the importance of these companies in a web news article by European Commission as follows:

"Small and medium-sized enterprises form the backbone of the European economy. They are key to entrepreneurial spirit and innovation in the EU and thus crucial to ensure EU competitiveness. A proper definition of which enterprises are SMEs makes it easier to identify their needs and to develop efficient policies to compensate for the specific problems linked to their small size. This is vital for the competitiveness of an enlarged European Union, its growth and employment." (European Commission, 2003)

However, not all SMEs maybe vital for an economy and it is important to distinguish between growth and non-growth oriented companies. According to the Global Entrepreneurship Monitor (GEM), companies that build their business on new and innovative concepts are more likely to spur economic growth, as already pointed out before. In contrast with opportunity-based entrepreneurship, entrepreneurship based on necessity does not correlate with economic growth in developed countries (Global Entrepreneurship Monitor, 2004).

Summing up, why SMEs are so important based on other sources such as OECD, one can list numerous reasons as listed below:

- SMEs account for a significant share of employment and GDP around the world, especially when taking into account the informal sector (T. Beck & Demirguc-Kunt, 2006).
- The sector forms the backbone of the economy in high-income countries but is relatively less developed in low-income countries (OECD, 2005).
- The Organization for Economic Cooperation and Development (OECD) reports that more than 'more than 95% of the enterprises in OECD area are SMEs' (OECD, 2005, p. 16). 'These enterprises account for 60% of private

sector employment, make a large contribution to innovation, support regional development and social cohesion' (OECD, 2005, p. 19).

- Technology-based small firms play a fundamental role in promoting innovation in advanced economies, which is often the most important source of productivity and hence growth in these countries given limited supply of physical and labor capital (Revest & Sapio, 2010).

Why then do SMEs, despite their importance, face severe obstacles to financing?

Various data sources and studies indicate that small firms rely on internal financing much more than large firms do (International Financial Corporation, 2010). When asked to name the most severe obstacles to growth, SMEs worldwide have listed financing constraints as the second most severe obstacle (See figure 1) while large firms place it only fourth (International Financial Corporation, n.d.). It is also widely recognized that the sensitivity of company growth to cash flow is higher the smaller the company (T Beck, Demirguckunt, & Maksimovic, 2008; Wagenvoort, 2003).
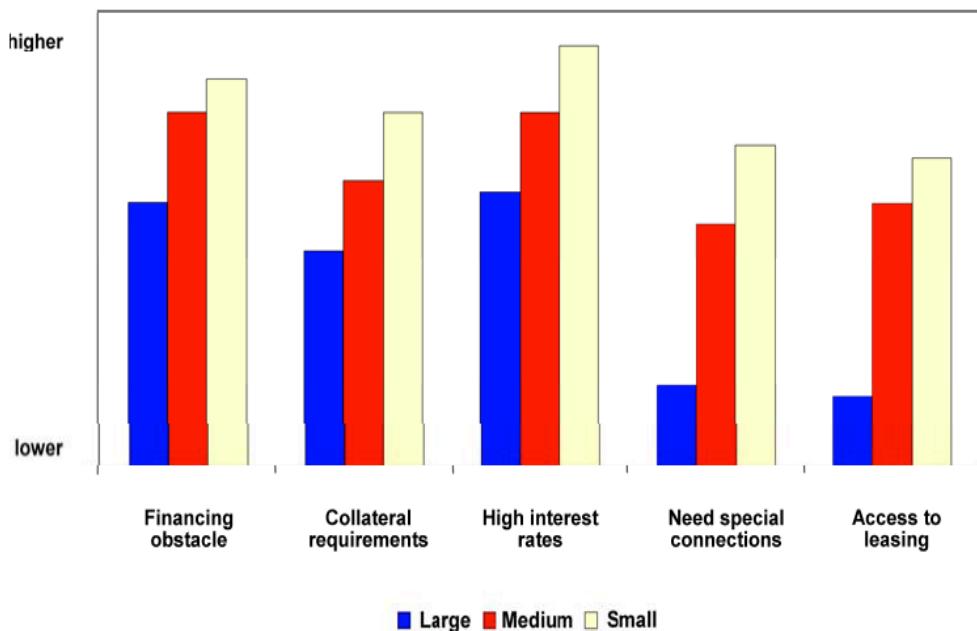
Figure 1: Financing obstacles preventing business growth by size
Source: (World Bank, 2002)[1]

The problem is essentially due to lack of adequate information (or information asymmetry) with the financing bodies due to the absence of track record of the firm. Banks consider two factors while giving out credit: interest rate on the loan and credit risk of the loan. Stiglitz & Weiss (1981, p. 393) argue that the "the interest rate on the loan itself affects the riskiness of the loan by either the adverse selection effect or the incentive effect". In case of adverse selection, only more risky projects would come for loans at higher interest rates, as the expected probability of a default is high. Under the incentive effect, the borrower who has been given loan at higher interest rate would undertake a more risky

---

[1] World Bank 2002 cited in Andersson & Napier 2007

project to earn greater expected returns. Thus the interest rate is not determined by the supply and demand in such a situation and the loan market is determined by credit rationing (Stiglitz & Weiss, 1981).

Moreover, in the case of technology-based firms, there are sufficient intangible assets like scientific know-how but absence of hard and collateralizable assets (Revest & Sapio, 2010). Another reason can be attributed to scale factor. The smaller the firm, the more reluctant the bank is to give out loans to the firm because investing in small businesses introduces significant transaction costs which are due to the fixed cost element of the due diligence process (Titman & Wessels, 1988). In the case of technology firms, the traditional sources of funding such as the entrepreneur's friends and families followed by collateral based bank debt may not even be sufficient to fully exploit the rapid growth potential of an attractive and novel technological product or service (Moore, 1993; Westhead & Storey, 1997).

Thus in the absence of conventional financing of any sort, the entrepreneur has to resort to equity financing, more specifically venture capital (Koenders, 2013).

The Role of Venture Capital

Turning new knowledge into commercial achievements represents a major challenge for most entrepreneurs or start-ups. Bringing together different kinds of expertise, managing risk as well as planning for future all require attention. There is no single form of funding that holds the key to successful financing of businesses. Yet, venture capital has the potential to stand out as a factor capable of playing a crucial role in all these aspects. It can prove to be a great alternative to conventional sources of financing especially for technology-based businesses. Venture capital becomes an obvious choice for firms that have the potential to generate high returns but at higher risks. These firms don't have enough capital to test their idea in the market and thus have to appeal to risk-taking investors to take their idea forward (Eisinger, 1991).

 VC has been the driving force behind some of the most vibrant sectors of the US economy in the last couple of decades. Jeng & Wells (2000, p. 242) state that "while the contributions venture capital makes to the economy overall are underexplored, there exists a widespread belief that venture capital is instrumental in bringing innovations to market at a rapid pace, thereby creating economic growth". VC according to Andersson & Napier (2007, p. 18) is "..vital in fortifying innovative activity and entrepreneurial talent and serves as an important tool for overcoming some of the inherent barriers to growth caused by prevailing industrial and institutional structures."
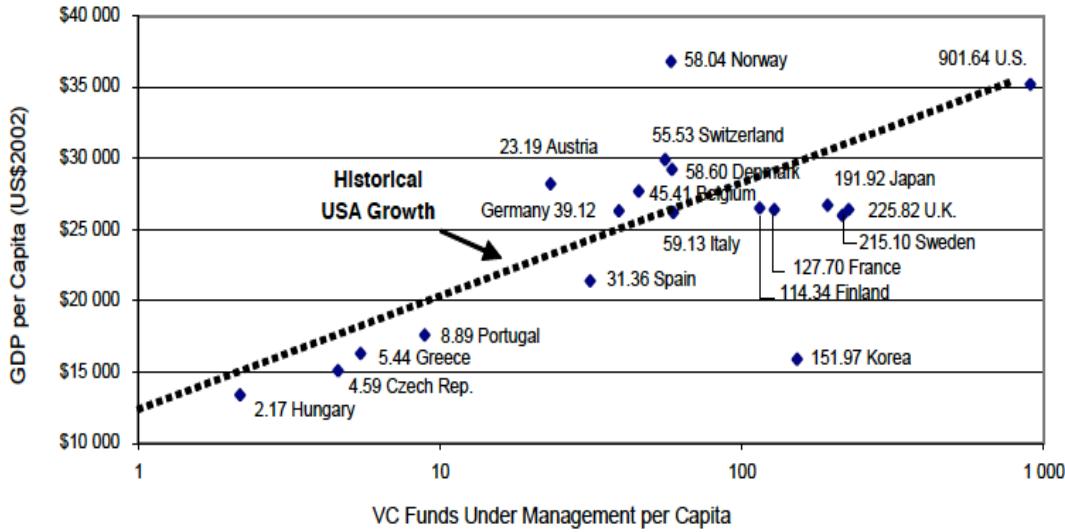
Figure 2: VC funds per capita versus GDP per capita
Source: (Andersson & Napier, 2007)

As shown in Figure 2, countries such as the US, UK, Sweden and Norway, which have high levels of funds under management, tend to have comparably higher levels of GDP per capita too. This might indicate that concentrated venture capital helps to spur macroeconomic growth. However, it is difficult to make this inference since higher GDP per capita could also lead to higher VC funds under management per capita implying a reverse causality. Nevertheless, it is safe to assume that higher GDP is associated with higher levels of VC activity.

Some great examples of companies backed by venture capital in the past are Apple, Microsoft and Google. These companies have redefined business and have provided the much-needed boost in the backdrop of current economic recession. And it is innovative companies like these are expected to provide the necessary push forward through the global slowdown.

Having stressed the importance of SMEs and venture capital, I now move on to my research problem description and definition in the next section, which this thesis will endeavor to answer. But before that, I briefly lay down the structure of my thesis report.

The thesis report is structured as follows. Followed by a small introduction on innovation, economic growth, SMEs and the role of venture capital towards SME financing, the background, problem description and definition are described in chapter 1. This chapter sets a coherent story on what is preventing European venture capital to perform well and why is it less successful compared to US. It introduces the institutional environment of an economy as a plausible explanation behind differences in performance of venture capital industry. Chapter 1 ends with the research objective and research question based on problem description and background. Chapter 2 provides detailed literature research on venture capital, its definition, why is it important, differences in the contracting arrangements between US and Europe and ends with introducing the link between institutions and venture capital thus setting the stage for chapter 3.

Chapter 3 is dedicated to the study of institutional theory as forming the theoretical background for understanding venture capital performance. It explores the different types of economic systems and how they are particularly suited to solve their coordination problems as well as promote a particular innovation style based on inherent intuitional advantages. Chapter 4 discusses the determinants of venture capital in detail and help in understanding how certain institutions influence the market structure of the economy and hence the venture capital performance. It concludes with a detailed conceptual model on theoretical studies. This is then tested empirically through econometric and statistical tests in chapter 5 followed by summary of findings, recommendations for policy and further research in chapter 6.

1.2 Background, Problem Description and Definition

Background

Although there is sufficient amount of theoretical work done on venture capital, which presents several causality problems in establishing a link between venture capital investments and economic growth, there have been ample studies done that indicate there indeed is a positive correlation between venture capital investment and economic growth. Kortum and Lerner (2000) investigate the effect of VC on innovations by looking at 20 US economic sectors for the period 1983-1992. They conclude that "increase in VC lead to higher patenting rates and that VC spurred 8% of all industrial innovations" (Kortum & Lerner 2000, p. 674). Mann & Sager (2007) have a similar conclusion considering VC investments in U.S software firms. Bygrave and Timmons (1992) emphasize that VC is an important element of entrepreneurship and that this has been particularly important for the semi-conductor, computer and biotechnology industries. Moreover, VC played a crucial role in the creation of innovative, young firms in Silicon Valley (Ferrary & Granovetter, 2009). The starting point of my research is the belief that venture capital is indeed a promoter of innovation and thus economic growth in an economy.

Problem Description

The venture capital industry originated in USA, which is a market based economy. The US venture capital sector is considered as a role model that efficiently channels financing to innovative projects, and is envied by many other countries. But is it possible to export this model and what are the conditions for successful imitation? Even though the European venture capital industry has caught up with that of the USA (Figure 4 and Figure 5) in terms of investment amounts, this is mainly the outcome of fast growth of UK venture investments (Revest & Sapio, 2010).

Box1: Types of financial systems

Financial systems will be frequently mentioned in the thesis report. So a brief description on them is provided. Financial systems can broadly be distinguished into **bank-based** and **market based** systems. There are fundamental differences between bank credit, on the one hand, and venture capital or equity on the other hand. An overview of the two types of systems can be seen in Figure 3 below. The former are typically dominated by bank financing and characterized by concentrated ownership (notably in Japan and continental Europe), whereas the latter are marked by the provision of financing through capital markets and dispersed ownership (notably in the US and UK).

	Market based systems (USA and UK)	Controlling owner system (Continental Europe)
Ownership structure	Dispersed ownership	One controlling owner
Board independence	Independent (possible)	Close to controlling owner
Management	Independent and strong	Close to controlling owner
Banking relations	Diversified /no ownership	Concentrated /possible ownership
Managerial incentives	Strong	Weak
Capital structure	Relatively low debt-equity ratio	Relatively high debt-equity ratio
Market for corporate control	Hostile bids common	Hostile bids rare
Minority protection	Strong	Weak

Figure 3: Market versus bank-based systems
Source**:** (Söderström et al., 2003)[2]

Note: A financial system where capital/stock markets dominate in financing shall be refereed to as a **more "market based" financial system** throughout the thesis report.
Also, **market structure** shall be used synonymously with **financial structure/system.**

---

[2] Söderström et al., 2003 cited in Andersson and Napier, 2007
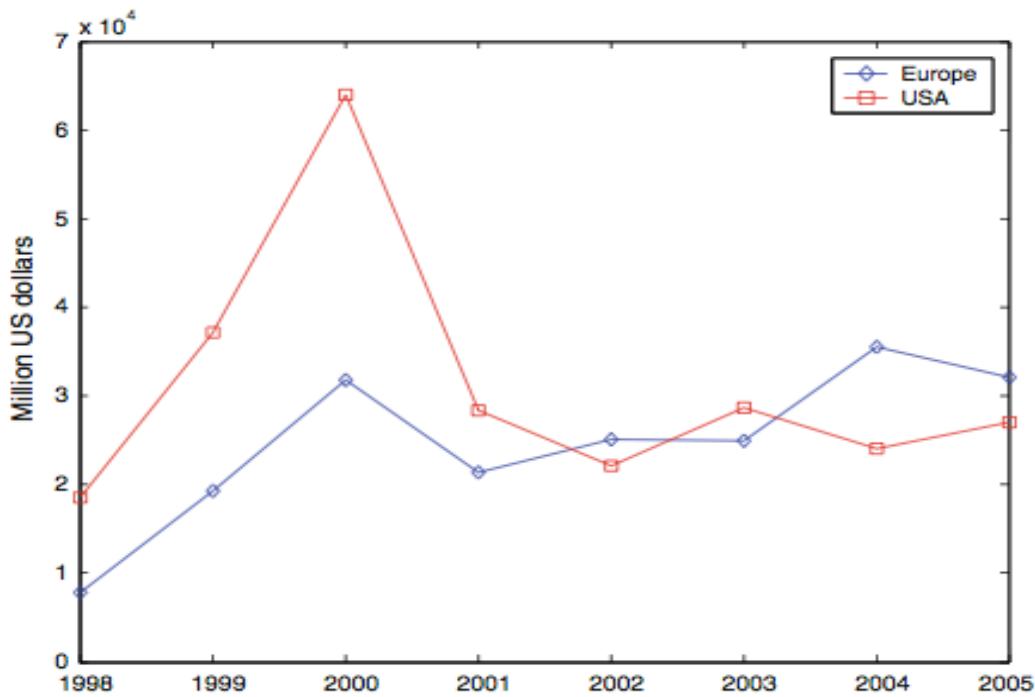
Figure 4: Venture capital funds disbursed in the USA and in European countries from 1998-2005.
Source: (Oehler, Pukthuanthong, Rummer, & Thomas, 2007)[3]
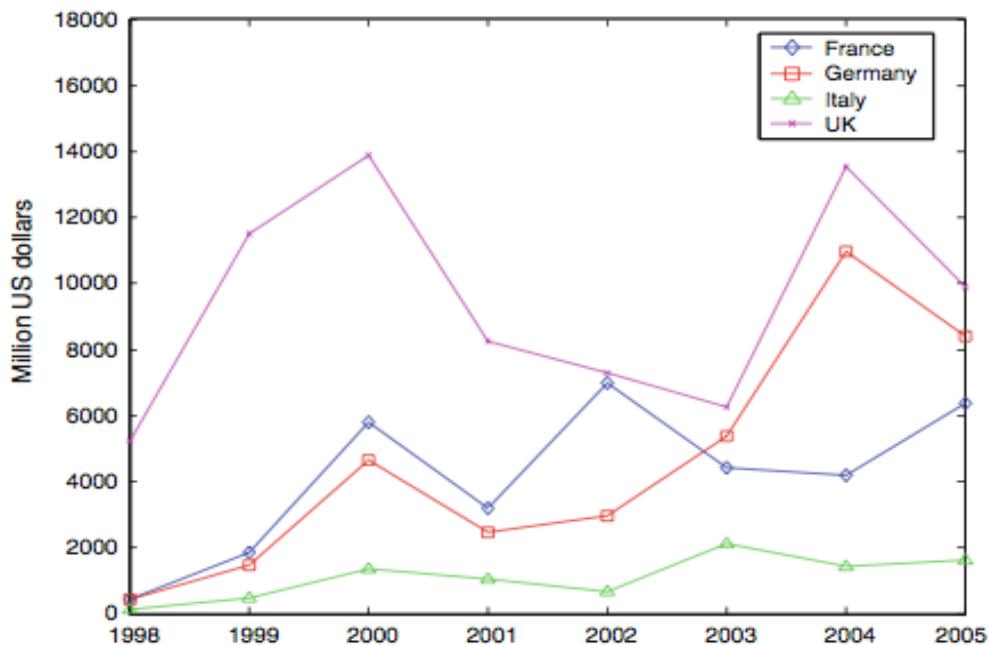
Figure 5: Venture capital funds disbursed in France, Germany, Italy and the UK:1998-2005.
Source: (Oehler et al., 2007)[4]

The continental European VC industry is as such lagging behind despite numerous policy initiatives. Moreover the performance of European VC funds lags far behind that of their American counterparts. Hege, Palomino and Schwienbacher (2009) investigate the performance gap of venture capital funds

---

[3] Oehler et al. 2007 cited in Revest & Sapio, 2010, p. 186
[4] Oehler et al. 2007 cited in Revest & Sapio, 2010, p. 186

between USA and Europe in the period after 1997.They found a "statistically significant gap in performance between US venture capital firms and their European counterparts when measured by internal rates of return" (Hege et al., 2009, p. 10). Calculations by Venture Economics Database also indicate that from the beginning of the VC industry in Europe in the early 1980s until 2007, the average European VC fund had an annual return of minus 4 percent versus 16 percent for the average U. S. venture capital fund.[5]

At the same time Hege et al. (2009) find that US venture funds investing in Europe do not outperform their European based peers ruling out differences in the ability between the fund managers as a possible explanation for performance gap.

A natural inference from this observation would be to think that the natural habitat of the VC industry is a market based system. Studies by Dosi (1990) have pointed out that the finance-innovation nexus is not independent of the features of a financial system . From the work of Demirguc-Kunt & Levine (1999), it seems that the degree to which an economy is "market based" or "bank based" conveys information of the potential role VC might play. This is because in a bank based system, banks play a leading role in mobilizing savings, allocating capital, overseeing the investment decisions of corporate managers, and providing risk management vehicles. In market based systems securities market share center stage with banks in getting society's savings to firms, exerting corporate control and easing risk management.

Thus one finds smaller stock markets in a bank based system and closer relationship of individuals and companies with the banks that provide advisory and managerial roles thereby reducing the information asymmetry problems and hence the demand for venture capitalists. Liquid stock markets are also a feature of market-based systems, which, as shall be discussed later is essential for VC industry to develop.

Finally, the law and finance literature links the development of effective market-based means of supporting high-tech finance developed in common law countries with the existing institutional environment highlighting the importance of institutions in promoting venture capital (R. Levine, 1997; Rajan & Zingales, 2001).

Yet, if one looks at the VC investments in the last couple of decades, Europe has experienced significant growth, with the Scandinavian region (Sweden, Norway and Denmark) doing particularly well in promoting a thriving VC industry by adopting a series of policies thereby creating a space or a niche in an otherwise bank based economic system. Sweden follows closely behind USA and UK in terms of average venture capital investments over the last decade (see figure 6).

---

[5] Lerner, op. cit., p. 123.

Average VC Investment as % of GDP (2001-10)
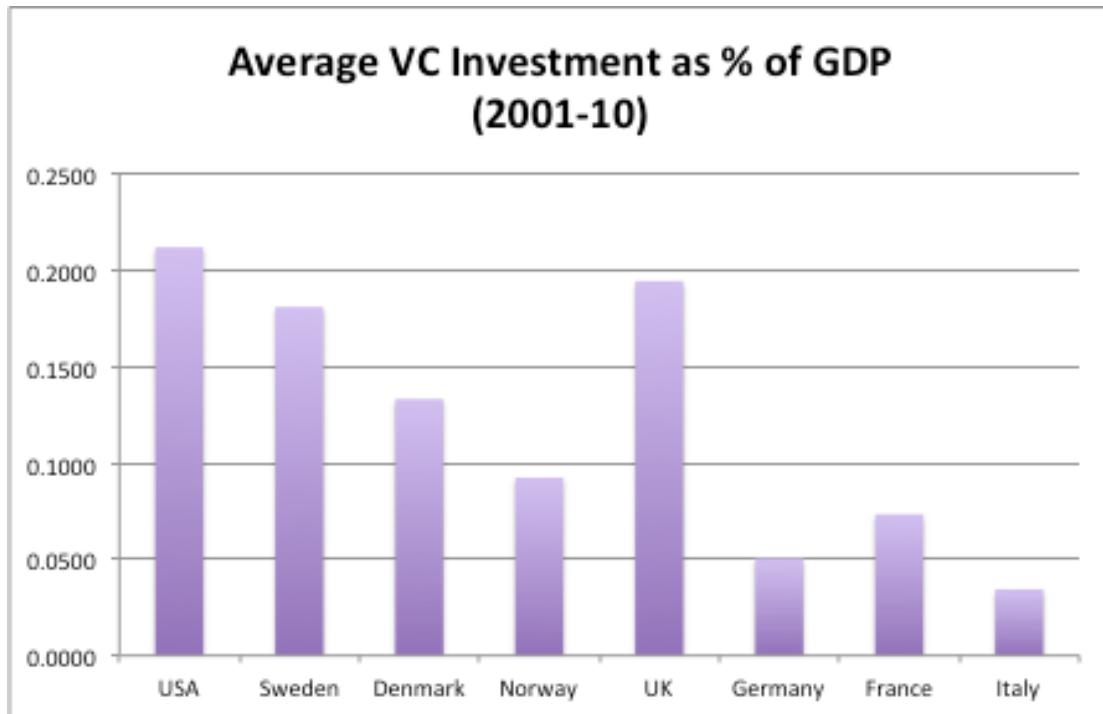
Figure 6: Venture Capital investment as percentage of GDP
(Chart generated based on own calculations using data from EVCA, NVCA and World Bank)

Why have increasing amounts of money been poured into European VC funds despite their dismal performance? The short answer could be that European VC firms are striving to emulate the success of their American counterparts in creating new wealth, and European governments are keen to duplicate American VC success in creating new industries and new jobs. Why then have the European VC funds performed badly compared to their American counterparts? While the European venture capital industry closely follows the U.S. model, differences in the institutional environment and in the tax and securities laws governing VC investments have caused the European VC market to develop very differently from that in the U.SA (Manigart, 1994). The nature of the institutional structure of the country, that is, the legal systems, type of governance systems, owner identities and stakes etc. in turn affects the financial system of an economy (Gugler, Mueller, & Yurtoglu, 2004).

If it's indeed true that the institutional environment of an economy affects VC growth and performance, is there then an upper limit to the effectiveness of the VC industry in promoting SMEs in Europe? And if yes, then why are European governments actively supporting the industry? These are some of the questions that I shall endeavor to explore and answer through my thesis.

Problem Definition

Past performance of the European Venture capital industry has been dismal compared to American VC industry. Yet, Europe has witnessed increasing VC investments both from the private and public sector over the last couple of decades. Thus continental Europe is trying to support and develop an industry

(VC) that is apparently more successful in the institutional environment of Anglo-Saxon countries (more market based financial structures). To what extent is this true?

1.3. MSc Thesis Rational

1.3.a Research Objective

The primary objective of the research is to find out how institutional environment might affect Venture Capital industry (in high-tech start-ups) performance by influencing the financial structure of an economy.

The objective will be carried out by an analysis along the following lines:
- Studying the role of venture capital in innovation and economic growth
- Analyzing the institutional characteristics of more market-based economies like USA and UK and more bank-based economies like Sweden, Germany etc. and studying how the institutional structure of the country (legal systems, labor markets, corporate governance etc.) affect its financial system.
- Investigating appropriate indicators to define the financial structure of an economy
- Finding if a relationship exists between a) VC performance and b) financial structure of an economy

This research will involve **quantitative and statistical analysis** and would thus require data from various databases and primary sources.

1.3.b Research Question

The objective above can be translated into the following research question.

Principal Question

How does a country's institutional environment affect Venture Capital (in high-tech SMEs) performance by influencing the financial structure of an economy?

Sub-questions:

1) How does venture capital promote economic growth?
2) How is financial structure of a country defined (in the context of this thesis)?
3) How do institutions determine the financial structure of a country?
4) What kind of a financial structure is conducive for better Venture Capital performance?
   a. Is a market-based economic system more conducive than a bank-based economic system to VC performance?

    b.   What indicators can be used to define the financial characteristics of an economy and define the degree of market-basedness or bank-basedness

The basic conceptual framework and focus has been highlighted in the following diagram:

Institutions → Financial Structure → Venture Capital Performance

Figure 7: Basic conceptual model

2. Venture Capital

This chapter will discuss venture capital in more detail. It will provide justification on why it is important, what is the nature of contracting involved between the entrepreneur and a venture capitalist and it will set the stage for the next chapter by giving a brief introduction on the link between venture capital and institutions in the last section.

2.1 What is venture capitalism?

Eisinger (1991, p.64) defines venture capitalism as "…equity investment in small, often new, growth-oriented businesses, typically at the gestation or seed, start-up, and early expansion stages. Tykvova, Borell, and Kroencke (2012, p.15) indicate that VC "is typically defined as the investment of long-term, unquoted, risk equity finance by professional investors in young firms". Venture capital thus refers to the financing of enterprises that are particularly risky. These enterprises are young, have a high profit potential but are surrounded by uncertainty and hence risk. They thus provide an opportunity to (venture) investors to earn above average returns with greater volatility by investing in them.

The venture capital cycle starts with an individual or a group of individuals also called the entrepreneurs or the potential investees, having an idea with potential commercial value, which needs further development and is eventually to be put into practice. The idea could be a new product, a new business model, a technical or technological breakthrough, basically anything that is new and profit generating. However the problem facing the entrepreneurs is that it is only an idea that is yet to be tested in the market and for which they often lack the resources to carry it out. The future profits are also highly uncertain. Without

any additional external capital, it becomes difficult for most start-ups to cross what is known as the "Valley of Death", a term used in venture capital terminology to refer to the period of time from when a startup firm receives an initial capital contribution to when it begins generating revenues.

The first and most important thing for the entrepreneur in order to attract venture capital funding **is to convince the venture capitalist, an individual or a firm, of the profit potential of the idea**. This is normally done out by delivering a pitch, a practice getting more and more popular in universities. The funding could be needed to just start developing the product (initial stage funding or seed funding) or simply used to expand (later stage funding or expansion funding) an already established business. The detailed definitions of funding by stage are covered in section 5.1. It is important for fund seekers to realize for what stage they need funding since different amounts of capital are associated with different amounts of risk in different stages.

2.2 Why is it important?

The most frequently cited reason **why VC is important is that it fosters innovation.** VC enables bright young minds to develop their ideas and bring them to the market. This has partly been discussed in the introductory chapter and partly in previous sub-section. Innovation is considered to be "intrinsically" good and thus desirable. Greenhalgh and Rogers (2010, p.4) acknowledge this in their definition of innovation

"..as the application of new ideas to the products, processes, or other aspects of the activities of a firm that lead to increased "value'. This 'value' is defined in a broad way to include higher value added for the firm and also benefits to consumers or other firms."

Innovation is also said to lead to positive externalities. Some theories hold that innovation is indispensible to achieving long-term, sustainable economic growth in a systematic way. In neo-classical growth models, the state of the technology codetermines the rate of growth. The famous Solow equation includes the *total factor productivity* coefficient "A" (also called technological change) that determines the long run growth rate of an economy.

$$Y = Af(1, \frac{K}{L})$$

Joseph Schumpeter (one of the early famous writers on innovation) had a different view on innovation from neo-classical economists. Schumpeter (1942) coined the term creative destruction, which Howitt (2007, p.6) defines as "the process whereby each innovation creates some new technological knowledge that advances our material possibilities, while rendering obsolete some of the technical knowledge that was created by previous innovations." This view on innovation differs for neoclassical views in that it its disruptive and painful

nature; every new innovation creates new opportunities but in time its use is bound to be destroyed by future innovations. [6]

In sum, innovations lead to increased productivity whether one follows the neo-classical approach or Schumpeterian approach. And VC can stimulate innovation, which in turn fosters long-term economic growth and thus enhanced employment. The effect can be properly gauged through a study conducted by Wasmer and Weil (2004). They econometrically investigated panel data of 20 OECD countries over the years 1986-1995. They found that an increase in the GNP share of VC by 0.075 would reduce the short-run unemployment rate by 0.25 percentage points while the long-run effect would amount to a reduction of 0.9 to 2.5 percentage points.[7]

The above literature can be summarized in the following diagram (figure 8)

Figure 8: Positive societal effects of VC through innovation

Not everyone is convinced of the societal benefits of venture capital though. There is plenty of literature dealing with the adverse effects of venture capital as well. One of the reasons being that venture capital is only accessible to highly educated people and thus increases inequality between the educated and the lower skilled/educated workers. Moreover, the nature of innovation that is promoted by venture capital is mostly related to ICT or internet and is benefitting the educated people or those employed in the service sector more than the less educated or those in the manufacturing sector. Howitt (2007, p.12) adds to this observation when he states that the "recent wave of information technology innovations has been especially rewarding for people with the

---

[6] See Gantner, Gaffard and Nesta (2009)

[7] The value of 0.075 corresponds to one standard deviation of the GNP share of VC. In Europe, this would amount to an increase in the GNP share of VC from 0.38 percent to 0.46 percent.

mobility, adaptability, and creativity to profit from rapid change." This way, "the adaptable –who are already likely to be in the upper end of the wage distribution-find their wages rising relative to other workers".[8]

Hall (2002, p.17) also doubts whether venture capitalism can always be the solution for innovative firms to find funding. According to him, VC tends to focus "only on few sectors at a time and to make investment with a minimum size that is too large for start-ups in some fields". Florida and Kenney (1988, p. 119) criticize VC on the grounds that it can "cause disruption of established research organizations and the establishment of strong incentives for 'breakthroughs' as opposed to other types of innovation."

Lastly, it is important to note that venture capital might have different implications for different countries. Just because it has been successful in driving innovation in the US doesn't provide any evidence that it can repeat the success in other countries.

2.3 Venture Capital Contracting

This section is useful in understanding the contractual arrangements that exist between the entrepreneur and the VCs. It also explains possible differences in venture capital performance between Europe and USA. Hege et al. (2009, p. 10) find " several important differences in contractual relationship between venture capitalists and entrepreneurial teams, such as staging frequency and syndication, that indicate a more active role of US VCs and sophisticated cooperation between them. US venture capitalists organize themselves in larger syndicates, tend to involve corporate venture capital more frequently and tend to be more specialized." They find evidence that these differences in contracting behavior help to explain observed performance gap between US and Europe.

"*Notably, the amount invested in the first round as well as the presence of corporate venture capital (dimensions where the US clearly dominates) have a significant positive impact on returns*" [9]

Some of the most important contract instruments are briefly discussed below:

Monitoring, advising and management assistance: In exchange for funding, VCs generally get equity in the company in the form of shares. They receive strong control levers disproportionate to the size of their investment. This gives them strong incentives to monitor the entrepreneur's performance. They take a dual role as advisors and as monitors (Casamatta, 2003) and provide consulting to the management team and frequently replace the founding entrepreneurial team in case of poor performance (Hellmann, 1998). It is found that US VCs are more actively involved in monitoring and advising compared to their European counterparts as already pointed in the previous paragraph.

---

[8] Howitt (2007, p. 12)

[9] Hege et al. (2009, p.10)

Stage Financing: Another important control lever that VCs get is from the staged timing of their investments. The initial investment is usually insufficient for a start-up to carry on with its activities (Gompers, 1995). The venture capitalist makes prior arrangements with the entrepreneur to provide funding at different stages depending on achieving certain performance benchmarks. The company's or entrepreneur's reduced information rent (Elitzur & Gavious, 2003) and need for additional funds provides strong incentives for the entrepreneur or the management to improve performance. Hege et al. (2009) find more frequent staging on investments in US compared to Europe.

Syndication and corporate venture funding: Venture capitalists form large syndicates and tend to involve corporate funding. Major reasons apart from risk diversification in the literature range from "... (i) improved screening through a second hand opinion (ii) complementarities in the monitoring and advising of companies (iii) Sharing of information and pooling of contacts in the exit phase"[10] Hochberg, Ljungqvist and Yang (2005) indeed find evidence that VC firms with better connections through networking in syndicates have significantly improved performance. Hege et al. (2009) find that US venture capitalists tend to organize themselves in larger syndicates and involve greater number of corporate investors compared to European counterparts.

Availability to exit through an IPO: IPO exits provide an implicit contracting over future control and may be the most efficient form of exit for a venture capitalist (Black & Gilson, 1998). Other forms of exits include selling off the portfolio company to a larger company or leveraging the portfolio company so that it can repurchase the venture capitalist's stake. Black and Gilson (1998) link the importance of **stock market centered financial system** to the successful development of a venture capital market since an active stock market allows successful exits through IPOs. They also identified the lack of IPOs as the main reason why venture financing lacked in countries like Germany and Japan. Historically, US has seen many IPO exits while Europe offered little opportunity for high-tech firms to go public. However, the creation of technology-oriented stock markets in Europe in the late 1990's has enabled it to compete better with US.

The nature of financial systems (bank versus market oriented) is inextricably linked to a countries institutional structure and the link is explored in greater detail in Chapters 3 and 4. But before that, the link between venture capital and institutions is briefly discussed in the next section to set the stage for the next chapter.

2.4 Venture Capital and Institutions

Hall & Soskice (2001) have done seminal work in the field of institutional theory

---

[10] (Hege et al., 2009, p.15)

called the ***Varieties of Capitalism***. Their approach/work also forms the theoretical background in analyzing institutions in my study as shall be explained in the next chapter.

The authors distinguish between two kinds of economies: Liberal market economy (LME) and coordinated market economy (CME). These economies differ in terms of how they coordinate the economic activities along different spheres. The authors provide great insight into how a particular economy by virtue of its institutional advantage is better suited for developing particular institutions or industries. For example, **venture capital is better suited to thrive in the institutional environment of a liberal market economy**. One of the reasons they offer is the ability of a LME to encourage radical innovation. Venture capital is particularly important for innovations that have a "breakthrough" nature. Such innovations are typically radical, come as a surprise and destroy existing production bases. Incremental innovation on the other hand are less radical, often the result of targeted R&D (of existing companies) and enhance rather than destroy existing production bases. [11] Other reasons cited are presence of fluid labor markets enabling easy exchange of ideas, an education or training system more suited to imbibing generic skills and extensive equity markets with dispersed shareholders.
This is the subject of greater exploration and is covered in-depth in the next chapter.

3. Theoretical Background: Institutions and Comparative Advantage

This chapter lays down the theoretical background for understanding how different economies operate (that is coordinate their activities), how they can be classified on the basis of their institutional environment and goes on to make a claim that Venture capital is more successful in certain types of economic systems. This claim shall then be tested through empirical and quantitative analysis in the next Chapter. I first begin with the definition of institutions and a description of the approach that would be used to analyze them in the following subsections.

3.1 What are institutions

 Hall & Soskice (2001) define "Institutions as a set of rules, formal or informal, that actors generally follow, whether for normative, cognitive, or material reasons, and organizations as durable entities with formally recognized members, whose rules also contribute to the institutions of the political economy." Their definition is based on the work by North (1991).

---

[11] See e.g. Cromer, Clay and Craig (2011) and Hellman and Puri (2000; 2002)

3.2 Actor-Centered approach to Institutions

The basis of the approach to analyze the different institutions affecting economic behavior is derived from the book by Hall and Soskice (2001) called *Varieties of Capitalism*. The varieties of capitalism (VOC) approach to the political economy is *actor-centered*, which is to say that the political economy is seen as a "terrain populated by multiple actors, each of whom seeks to advance his interests in a rational way in strategic interaction with others" (Scharpf, 1997)[12]. The actors could be firms, consumers or governments etc. who interact strategically with each other as per their own incentives. **The importance of strategic interaction is increasingly appreciated by economists** and thus looking at different institutions from this perspective would enable a better understanding of the functioning of an economy.

The firm is considered as the central actor in the political economy. How firms respond to technological change and international competition affects the overall levels of economic performance and makes them the most crucial actors in a capitalist economy. They are seen as actors seeking to develop and exploit core competencies and dynamic capabilities that are vital for developing, producing and distributing goods and services profitably (Teece, 1986). In order to achieve this goal, they have to establish relationships with many actors both internally, with their own employees an well as externally with actors such as clients, trade unions, suppliers, consumers, stakeholders and governments (Figure 9). It is crucial to understand that these actors have different and sometimes conflicting interests and thus the success of a firm essentially depends on its ability to effectively coordinate with a wide variety of actors.

Figure 9: External and Internal relations of a firm
(Chart generated based on actors identified by Hall and Soskice (2001))

---

[12] Scharpf, 1997 cited in Hall and Soskice, 2001, p. 6

Following table (Table 1) describes how different actors have different interests as well as how a firm is dependent on other actors to carry out its objectives, which is to stay in business.

Actor	Interests	Dependency
Firm	Profit, Brand image, Market Share	
Trade Union	Better Wages, Good Working conditions, Minimal working hours	Firm is dependent for labor to produce goods/services
Government	Revenue through taxation, employee protection, regulations	Firm is dependent for infrastructural support, contractual enforcement,
Stakeholder	Return on investment, Increased earnings	Firm is dependent for accessing funds
Collaborator	Profit, Brand image, Market share	Firm is dependent for executing its business
Supplier	Profit, Secure Business, Market share	Firm is dependent for access to raw-materials
Client	Consumption of goods and services	Firm is dependent for selling its goods/services

Table 1: Actors, Interests and dependencies in the economic system
(Own Table generated based on general knowledge)

3.3 Spheres of coordination

The previous sub-section concludes that a firm needs to coordinate its activities with different actors in order achieve its goals. Hall and Soskice (2001) identify 5 spheres of coordination in which firms must develop relationships. They are as follows (see figure 10):

1) *Industrial Relations*: The problem facing companies is how to coordinate bargaining over wages and working conditions with their labor force, the organizations that represent labor, and other employers. At stake here are wage and productivity levels that condition the success of the firm and rates of unemployment or inflation in the economy as a whole.

2) *Vocational Training and Education*: Firms face the problem of securing a workforce with suitable skills, while workers face the problem of deciding how much to invest in what skills. On the outcomes of this coordination problem turn not only the fortunes of individual companies and workers but the skill levels and competitiveness of the overall economy

3) *Corporate Governance*: Firms turn for access to finance and in which investors seek assurances of returns on their investments. The solutions devised to these problems affect both the availability of finance for particular types of projects and the terms on which firms can secure funds.

Figure 10: Spheres of Coordination
(Chart generated based on Hall and Soskice (2001))

4) *Inter-firm relations*: Firms form relationships with other enterprises, and notably their suppliers or clients, with a view to securing a stable demand for their products, appropriate supplies of inputs, and access to technology. These are endeavors that may entail standard-setting, technology transfer, and collaborative research and development

5) *Firm-employee relations*: Their central problem is to ensure that employees have the requisite competencies and cooperate well with others to advance the objectives of the firm. In this context, familiar problems of adverse selection and moral hazard arise, and issues of information sharing become important[13]. Workers develop reservoirs of specialized information about the firm's operations that can be of value to management, but they also have the capacity to withhold information or effort. The relationships firms develop to resolve these problems condition their own competencies and the character of an economy's production regime.

On the basis of how firms solve their coordination problems, Hall and Soskice distinguish between two main types of economies: **Liberal market economies (LMEs) and coordinated market economies (CMEs)**. LMEs coordinate their activities primarily through hierarchies and competitive market arrangements, which is fundamentally different from how CMEs coordinate their activities. CMEs rely more on non-market relationships to coordinate their activities. These non-market modes generally involve "more extensive relational or incomplete contracting, network monitoring based on the exchange of private information inside networks, and more reliance on collaborative, as opposed to competitive, relationships to build the competencies of the firm" [14]. **LMEs are thus generally**

---

[13] See also (Milgrom & Roberts, 1990)

[14] Hall and Soskice (2001, p. 8)

more "market-based" while CMEs are seen to be gravitating towards a "bank-based" type of system.

3.4 Institutional Complementarities and Comparative advantage

The concept of institutional complementarity suggests that certain institutions are more favorable or conducive to the development of particular institutions. It suggests that firms located within any political economy face a set of coordinating institutions whose character is not fully under their control. These institutions offer firms a particular set of opportunities or in other words an **institutional comparative advantage** and companies can be expected to gravitate toward strategies that take advantage of these opportunities. For example, Aoki (1994) has argued that long-term employment is more feasible where the financial system provides capital on terms that are not sensitive to current profitability. Conversely, fluid labor markets may be more effective at sustaining employment in the presence of financial markets that transfer resources readily among endeavors thereby maintaining a demand for labor (Caballero & Hammour, 1996). If this is correct, then one can expect a clustering of nations along the dimensions distinguishing LMEs from CMEs.

Figure 11 for example presents some support for these propositions. It locates OECD nations on two axes that provide indicators of institutions in the spheres of corporate finance and labor markets respectively. A highly developed stock market indicates greater reliance on market modes of coordination in the financial sphere, and high levels of employment protection tend to reflect higher levels of non-market coordination in the sphere of industrial relations. One can find a pronounced clustering of countries along the two axes despite some variations. Nations with liberal market economies tend to rely on markets to coordinate endeavors in both the financial and industrial relations systems, while those with coordinated market economies have institutions in both spheres that reflect higher levels of non-market coordination.
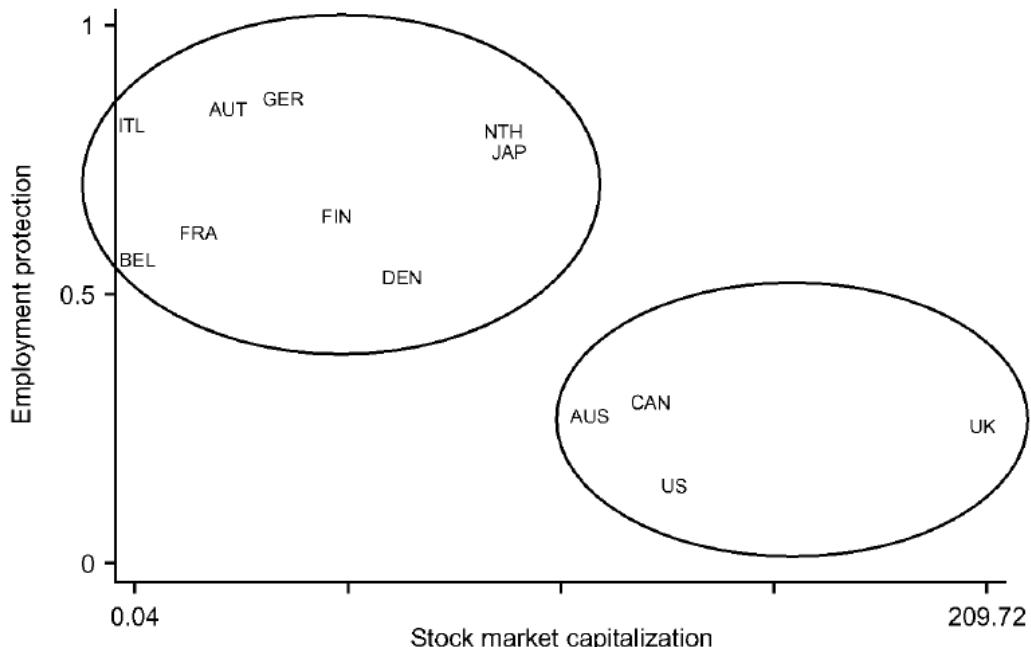
Figure 11: Employment Protection and Stock Market Capitalization
Source: (Hall and Soskice, 2001, p. 19)

This point about institutional complementarities has special relevance for comparing the two kinds of economies and shall be used to explain *why Venture Capital as an institution benefits from the institutional complementariness present in the market systems (LMES)*. In other words, LMEs have an inherent institutional comparative advantage when it comes to promoting SMEs through venture capital due to the institutional support they provide. The institutional support is found to be more conducive to *promoting a particular kind of innovation (discussed in the following section) as well as making the economic system more market-oriented/market based*, conditions that are important for a thriving venture capital market (The latter condition-market oriented financial systems- is discussed in detail in the next chapter).

3.5 Economic systems and complementarities

This section distinguishes between the two kinds of economies, LME and CME, on the basis of how they solve their coordination problems. The existing institutional complementarities in each economic system shall be discussed based on literature. Thereafter, the implications of institutional complementarity and advantage on an economy's capacity to innovate shall also be discussed.

3.5.a LME versus CME

In order to understand how the different institutions function and interact above in the two types of economies, a comparison is done along 5 different spheres of coordination.

Sphere	LME	CME
Corporate Governance	Access to finance depends on their valuation in equity markets; dispersed investors rely on publicly available information about the company that affects its share price	Access to finance is dependent more on financier's knowledge of 'private' or 'inside' information about the operation of the company than publicly available data
Industrial Relations	Rely on market relationships between individual worker and employer to organize relations with their labor force.	Wage-setting through industry-level bargains between trade-unions and employer associations.
Vocational Training and Education	Vocational training and education invest in general skills rather than company/industry specific skills	Rely on a highly skilled labor force; companies provide firm-specific apprenticeship programs
Inter-firm Relations	Based on standard market relationships and enforceable contracts	Access to private information available to business associations. Business associations promote the diffusion of new technologies by working with public officials to determine where firm competencies can be improved.
Firm-employee relations	Top management has unilateral control over the firm including freedom to hire and fire.	Employers secure agreement for major decisions from supervisory boards, which include employee representatives as well as major shareholders, and from other managers with entrenched positions.

Table 2: Comparison of LME with CME along 5 spheres of coordination
(My summary based on Hall and Soskice (2001))

Note: Above information is gathered taking the American case for LME and German case for CME but the features are representative in general.

The complementarities existing in the two economies along these 5 spheres can be visualized in the following pictorial representations. Figure 12 shows the complementarities across sub-systems in the American LME. Figure 13 shows complementarities across sub-systems in the German CME.
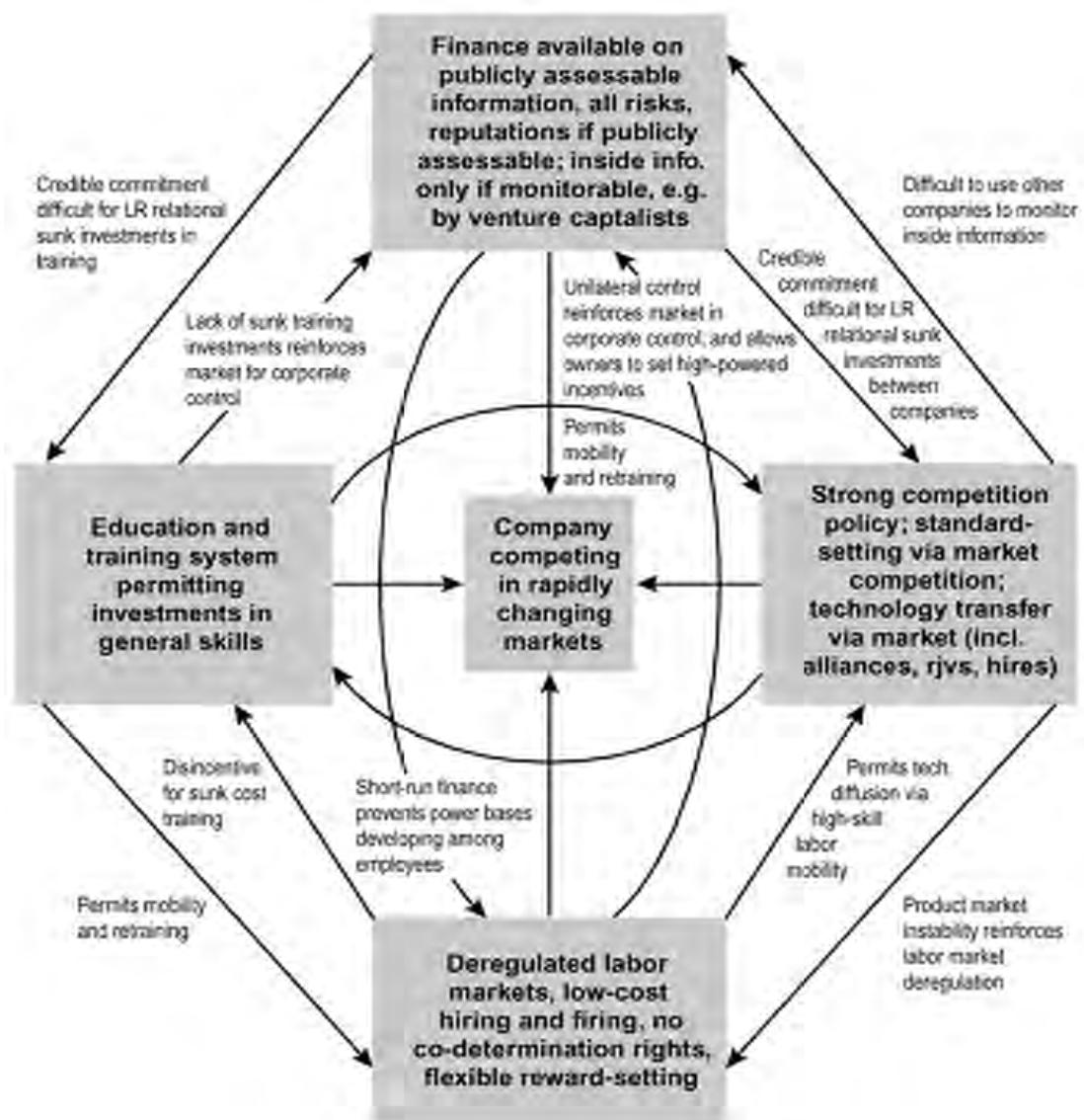
Figure 12: Complementarities across sub-systems in the American liberal market economies
Source: Hall and Soskice (2001, p. 32)

From the above figure, one can see how the different institutions interact to produce a corporate governance system where access to finance depends to a large extent on publicly available information and thus encourage firms to be attentive to current earnings and the price of their shares in equity markets. However, there are certain exceptions to these generalizations. New firms in high technology fields that do not have collateral in form of physical assets and have an innovative product in the pipeline can secure funds form venture capital companies. (It is good to point here that the financing system or the corporate governance system does not directly support venture capital flows in the economy but does so indirectly by encouraging the development of an active stock market in LMEs. This is discussed in detail in the next chapter). The short run finance prevents power bases from developing in the industrial relations sphere that is characterized by a largely deregulated and fluid labor market. The nature of the labor markets enables low cost hiring and firing as well as flexible wage setting as per market conditions, a condition necessary to main short-term profitability. However, this very fluid nature of labor market also promotes

technology diffusion in the sphere of inter-firm relations via high skilled labor (scientists and engineers) mobility. Since relational commitments are not so strong in LMEs, collective standard setting is rarely feasible. Instead standards are set using market races whose winners profit by licensing their technology to many users. This pronounces the importance of licensing as well as the presence of venture capital firms that try to capitalize on one standard-setting by suffering many failed investments (Borrus & Zysman, 1997). Finally, the education and training system is complementary to fluid labor markets and emphasizes on providing general skills to workforce since firms have no incentive to invest in industry-specific skills or apprenticeship programs because of the poaching of employees by other firms.
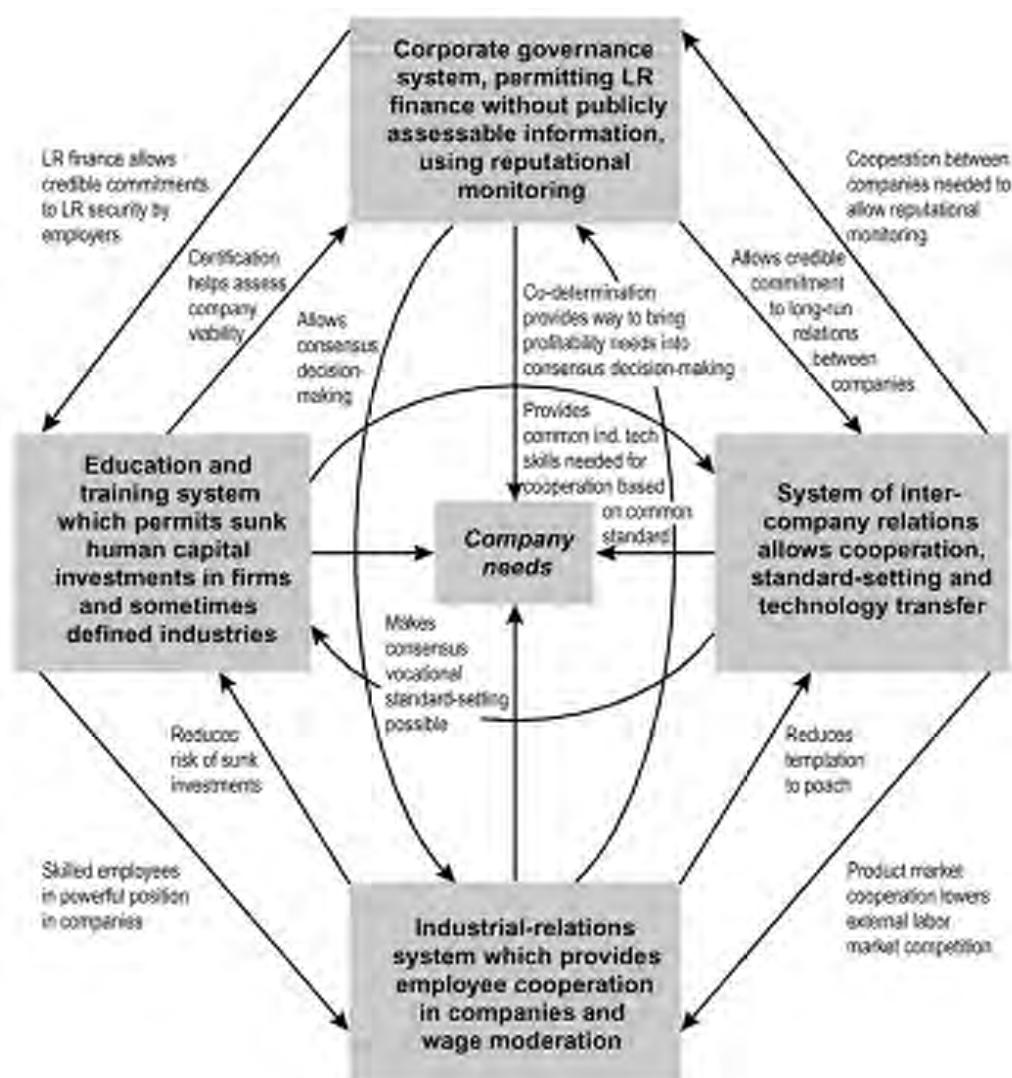

Figure 13: Complementarities across sub-systems in the German coordinated market economy
Source: Hall and Soskice (2001, p. 28)

From the figure above, once can see how the different institutions interact to produce a corporate governance system where the access to finance is not totally dependent on publicly available financial data or current returns. This

complements the industrial relations system of maintaining and retaining a workforce for the long run irrespective of the current economic situations. The nature of the industrial relations system (requiring long term labor force) reduces the risk of sunk investments and requires the education and training system in firms to make long term investments in human capital. The industrial relations system that encourages development of firm specific skills also reduces the temptation for other firms to poach employees from a particular firm and hence complements a system of inter-company relations that allows cooperation, standard-setting and technology transfer. The system of inter-company relations also allows for credible commitments to long run relations between companies, a condition vital for long run access to finance for a firm.

3.5.b. Innovation Styles

The institutional complementarity existing in the two types of economic systems has implications on the kind of innovation style that is encouraged.

Hall and Soskice (2001, p. 21) argue that "the two types of economies have quite different capacities for innovation". According to them,

"the institutional framework of liberal market economies is highly supportive of *radical innovation*. Labor markets with few restrictions on layoffs and high rates of labor mobility mean that companies interested in developing an entirely new product line can hire in personnel with the requisite expertise, knowing they can release them if the project proves unprofitable. Extensive equity markets with dispersed shareholders and few restrictions on mergers or acquisitions allow firms seeking access to new or radically different technologies to do so by acquiring other companies with relative ease, and the presence of venture capital allows scientists and engineers to bring their own ideas to market."[15]

Box 2: **Radical versus Incremental innovation**

Radical innovation: Innovation that involves substantial shift in product lines, the development of entirely new goods, or major changes to the production process.

Incremental Innovation: Innovation that involves continuous but small-scale improvements to existing product lines and production processes.

They further expect CMEs to be better at supporting *incremental innovation*.

"This follows from the emphasis we have put on the relational requirements of company endeavors. It will be easier to secure incremental innovation where the workforce (extending all the way down to the shop floor) is skilled enough to come up with such innovations, secure enough to risk suggesting changes to

---

[15] Hall and Soskice (2001, p.40)

products or process that might alter their job situation, and endowed with enough work autonomy to see these kinds of improvements as a dimension of their job. Thus, incremental innovation should be most feasible where corporate organization provides workers with secure employment, autonomy from close monitoring, and opportunities to influence the decisions of the firm, where the skill system provides workers with more than task-specific skills and, ideally, high levels of industry-specific technical skills, and where close inter-firm collaboration encourages clients and suppliers to suggest incremental improvements to products or production processes." Hall and Soskice (2001, p. 39).

The claims made by Hall and Soskice (2001), however, are subject to contention and were criticized first by Taylor (2004) and elaborated upon by Akkermans, Castaldi, & Los (2009). Akkermans et al. (2009) state that the analysis by Hall and Soskice on innovation is fundamentally flawed by pointing out to the fact that they compare the innovation patterns of only two countries (US and Germany) and then generalize it for a larger group of countries, a hypothesis subject to contention. Secondly, Hall and Soskice identify radical innovations with certain technological sectors like biotechnology, semiconductors and telecommunications while incremental innovations are identified with industries like transport and mechanical engineering. The fact that Germany has a well-developed transport sector leads to clustering of such (incremental) innovations in the country the same as clustering of radical innovations takes place in certain regions of US. So the explanation may be attributed to geography and clustering rather than the nature of economic mechanisms. Thirdly, the stage and life cycles of these innovations are not taken into account by Hall and Soskice. Radical innovations occur during the early stages of a technology while incremental innovations are more common in the latter stages and it is quite possible that the radical nature of the innovation early on would give away to incremental nature in the life cycle in the same industry.

However, it is important to bear in mind that although Hall and Soskice's hypothesis on innovation cannot be upheld as a general rule, it does provide a basis to compare them across substantial number of industries and countries with reasonable validity.

4. Determinants of Venture Capital

In this chapter, I present the insights obtained from the previous chapter into how Venture Capital stands to benefit from the institutional complementarity existing in the LMEs. ***The main point of argument is that an active stock market present in an LME is central to facilitating VC investments (and flows) and other institutions like legal systems, labor market systems, education systems and corporate governance systems are complementary to stock market development*** (This shall also be tested empirically in the next chapter). But before that, I shall discuss in greater detail the most important factors that affect Venture capital investments.

4.1 Factors affecting Venture Capital Investments

Many authors such as Jeng and Wells (2000), Schertler (2003), Romain & Pottelsberghe (2004), Da Rin, Nicodano, & Sembenelli (2006) have already investigated the determinants of Venture Capital using a panel data approach. Jeng and Wells (2000) consider the importance of initial public offerings (IPO's), GDP, market capitalization, labor market rigidities, accounting standards, pension funds and government programs in determining venture capital investments. According to their findings, *IPOs* are the strongest driver of venture capital investing. Surprisingly, they don't find *GDP* and *Stock Market Capitalization* to be significant factors in determining VC investments. Romain and Van Pottelsberghe (2004) study the effects of factors related to macro-economic conditions, research efforts, the technological opportunity and the entrepreneurial environment. Their analysis shows that *VC intensity* is highly pro-cyclical that is, it reacts positively and significantly to *GDP growth*. "Indicators of technological opportunity such as the *growth rate of R&D investment, the stock of knowledge and the number of triadic patents* affect positively and significantly the relative level of VC."[16] They also find *corporate tax* and *labor market rigidities* (indicators of entrepreneurial environment) to be negatively correlated to VC intensity. An important inference from their paper is that VC cannot be stimulated by providing money by decision makers. Rather what is required is an environment that stimulates knowledge and entrepreneurial spirit. Schertler (2003) too identifies the *Stock Market Capitalization* (an indicator of size of stock markets), *human capital endowment* and *labor market rigidities* to be significant contributing factors to VC investments.

The focus of my research is on institutional factors (corresponding to spheres of coordination of a firm) affecting venture capital **and not on macro-economic conditions, regulatory (taxation) or technological factors**. I shall therefore elaborate on some important determinants of VC success namely a ***well-developed stock market (and accompanying legal system), a fluid labor market (complementary to radical innovation system and entrepreneurial behavior), well-endowed human capital (complementary to radical innovation) and favorable Cultural factors (responsible for influencing entrepreneurial behavior***). Cultural factors are also included as they are inextricably linked to a country's institution (Hall and Soskice, 2001).

---

[16] (Romain & Pottelsberghe, 2004, p.1)

4.2 Factors under analysis

1) Well-Developed Stock Market

Many authors suggest that a well-developed financial sector and stock market (which implies more **market-basedness**) are crucial for a VC market to flourish.[17] This is because they permit venture capitalists to exit through an **IPO** (initial public offering), which is crucial to the existence of a vibrant venture capital market. The exit mechanism is also crucial to entrepreneurs for two reasons. First, it provides a financial incentive for equity-compensated managers to make effort. Second, it gives the managers a call option on control of the firm, since venture capitalists relinquish control at the time of the IPO (Black and Gilson, 1998). Jeng and Wells (2000) have analyzed the determinants of Venture capital. They consider the importance of initial public offerings (IPO's), GDP, market capitalization, labor market rigidities, accounting standards, pension funds and government programs. According to their analysis, "IPOs are the strongest driver of Venture Capital investing"[18]

Summing up, Black and Gilson (1998, p. 246) explain the importance of an IPO as well as the supporting mechanism of Stock Markets:

"The potential to exit through an IPO allows the entrepreneur and Venture capital fund to enter into a self-enforcing implicit contract over control, in which the VC fund agrees to return control to a successful entrepreneur by exiting through an IPO. This implicit contract cannot readily be duplicated in a bank-centered capital market."

---

[17] Becker and Hellman (2003), Black and Gilson (1998), and Hall (2002)

[18] Jeng and Wells, 2000, p.266
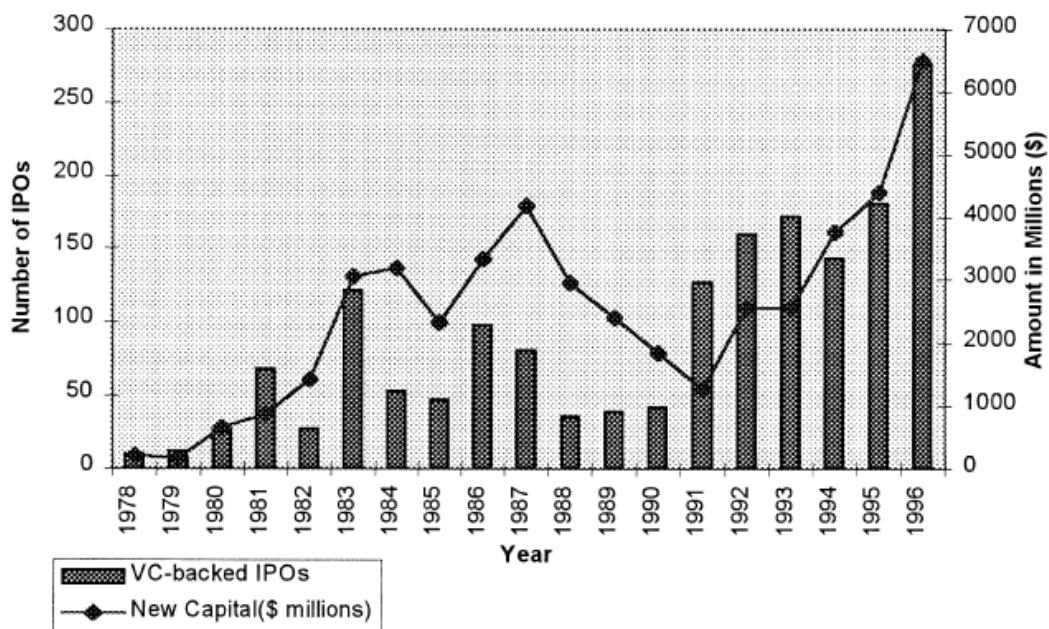
Figure 14: Venture capital-backed IPOs and new venture capital commitments. Number of initial public offerings of venture-capital-backed companies (left-hand scale), and amount of new capital commitments to venture capital funds (right-hand scale), between 1978 and 1996. Source: Venture Capital Journal and Venture Capital Yearbook (various dates); Economist, Mar. 29, 1997 (survey of Silicon Valley)[19]

Thus, an **active/well-developed stock market is crucial to the success of VC** via IPO's. Note also in figure 14 how new venture capital investments closely follow the number of venture backed IPOs.

Note: An indicator called *Stock Market Capitalization* is normally used to measure the relative size of stock markets and shall be frequently used to infer relationships between stock market development and other institutional indicators in the next chapter.

Now the question is, why do LMEs (or sometimes called the Anglo-Saxon economies) have better developed Stock Market systems?

I discussed in the previous chapter that LMEs are largely dependent on their valuations in equity markets for accessing finance. A well-developed stock market system is therefore required to ensure this. Thus one expects and finds that US has many banks that are small relative to large corporations and play a limited role in corporate governance but a well developed stock market which is the primary source of finance.

2) Legal Systems origin

Legal systems tend to influence venture capital investments. This is obvious since contracting problems are pervasive in the financing of innovation and law

---

[19] Source cited in Black and Gilson, 1998, p. 247

enforcement would be expected to play a major role in dealing with such issues. Lerner and Schoar (2004) find evidence that both legal origin and an index of law enforcement matter for the contractual relationships between venture capitalists and portfolio companies. Cumming, Schmidt and Walz (2010) also show that higher standards of legality translate into more control rights for venture capitalists. Moreover, the underlying legal systems have been found to play an important role in **facilitating the development of Stock Markets**. There is a considerable body of literature on law and finance that discuss legal theories of differences in financial development. La Porta, Lopez-de-Silane, Shleifer, & Vishny (1998, 1999, 1997) have argued for the importance of legal traditions in determining the development of financial markets (Figure 15).
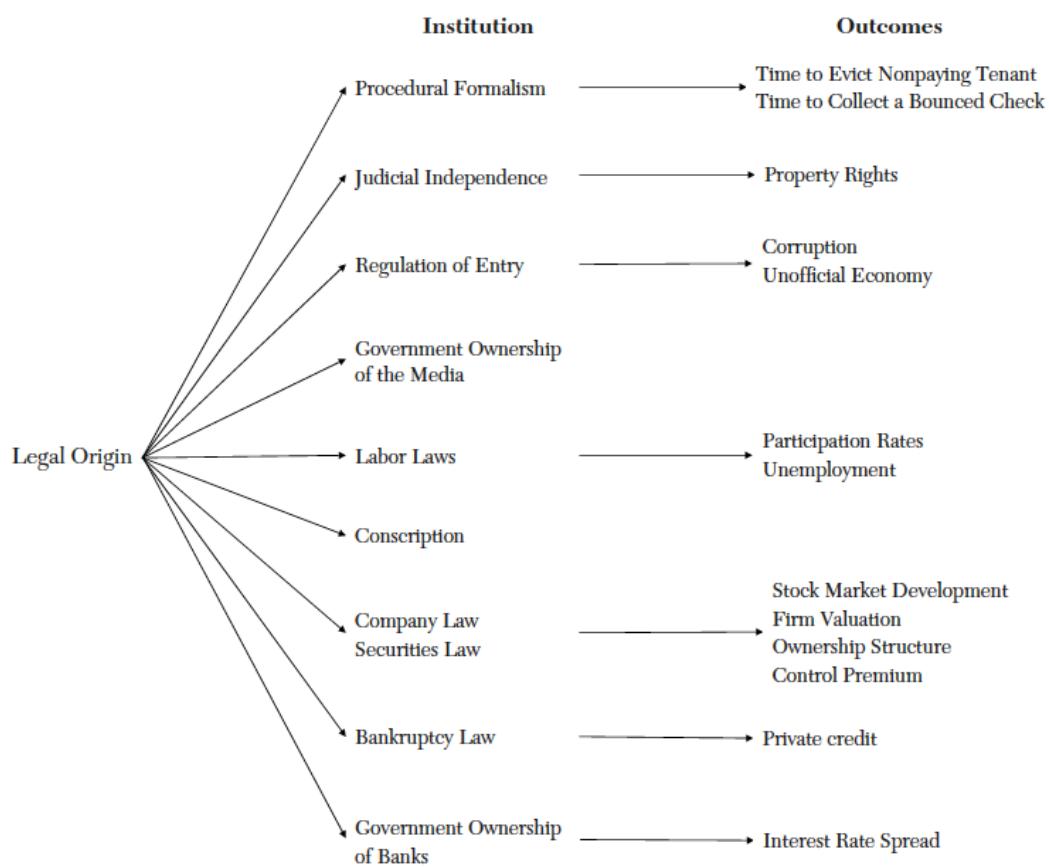
Figure 15: Legal origins, institutions and outcomes
Source: (Porta, Lopez-de-Silanes, & Shleifer, 2008, p. 292)

They find that countries adhering to a civil law system have both the weakest investor protection, through both legal rules and law enforcement, and least developed capital markets. Common Law countries fall at the other end of the spectrum. *American and British economies or societies have led to market-oriented financial systems.* Within civil law, La porte et al. (1997, p. 1132) distinguish French, German and Scandinavian systems, with "the French system offering the (outside) shareholder the least protection (against managerial abuse) and Scandinavian the most". La Porte et al. (1998) examined 49 countries categorized by legal tradition. On average, common law countries have greater market capitalization while French civil law countries the least. Data for some

countries is presented in table 3. Note that the values for stock market capitalization are from the period 1975-1995.

Country	Legal tradition	Stock Market Capitalization ratio	LME/CME
UK	Common Law	0.68	LME
Australia	Common Law	0.39	LME
USA	Common Law	0.55	LME
Canada	Common Law	0.42	LME
Common Law Avg.		**0.52**	
France	French Civil Law	0.17	CME
Netherlands	French Civil Law	0.36	CME
Belgium	French Civil Law	0.23	CME
Italy	French Civil Law	0.10	CME
Spain	French Civil Law	0.18	CME
French Civil Law Avg.		**0.15**	
Denmark	Scandinavian Civil Law	0.20	CME
Finland	Scandinavian Civil Law	0.18	CME
Norway	Scandinavian Civil Law	0.15	CME
Sweden	Scandinavian Civil Law	0.32	CME
Scandinavian Civil Law Avg.		**0.21**	
Austria	Germanic Civil Law	0.06	CME
Germany	Germanic Civil Law	0.17	CME
Switzerland	Germanic Civil Law	0.64	CME
Germanic Civil Law Avg.		**0.36**	

Table 3: Law and finance around the world.
(Table partially extracted from T. Beck, Demirgüç-Kunt, & Levine (2001, p. 492))

While the first conclusion that common law countries lead to more market based financial systems compared to civil law countries also holds true for data analyzed for the period 1990-2010, it is found that for the same period, contrary to the findings of La Porte et al. (1998), French civil law countries outperform the Germanic civil law countries in terms of stock market development (see Figure 16).
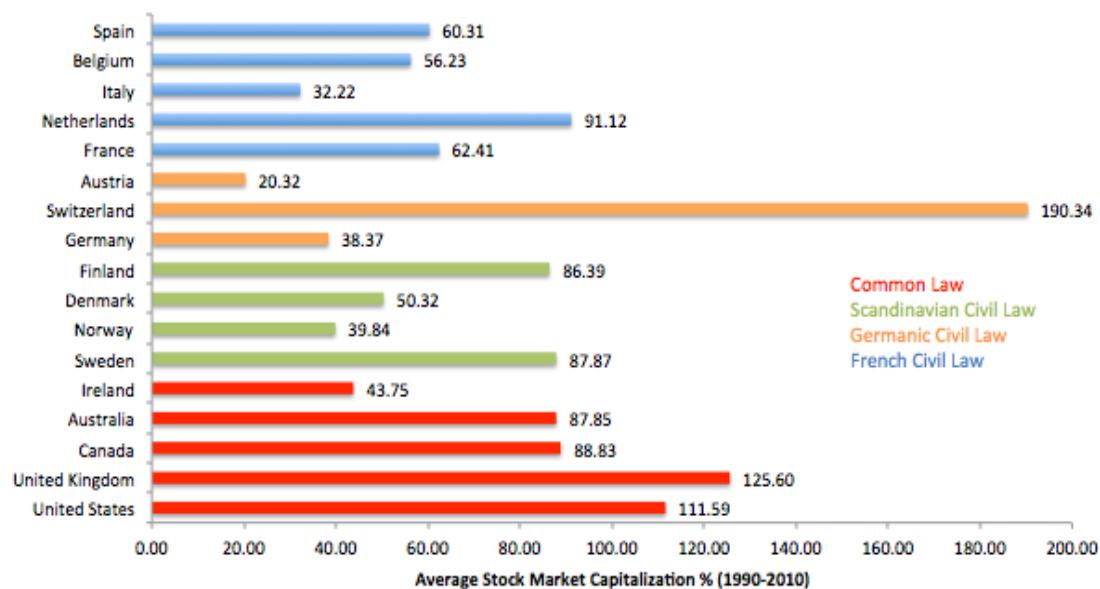
Figure 16: Stock Market development and Legal Origins
(Chart generated based on data from Global Financial Development Database (GFDD))

Some indicators used to measure legal systems are *investor protection index, shareholder rights* index and *efficiency of legal framework*. Data on Investor Protection index (measures the strength of minority shareholder protections against misuse of corporate assets by directors for their personal gain) is collected from the World Bank database. *Efficiency of legal framework* (measures the efficiency with which the legal framework settles disputes for private businesses) was collected from Government Indicators Database (DATAGOV). Data on *shareholder rights (definition similar to investor protection index)* was collected from La Porte et al. (1998). Graphs were plotted using the above indicators with *stock market capitalization ratio* for different countries. Values used were averaged over 1990-2010.
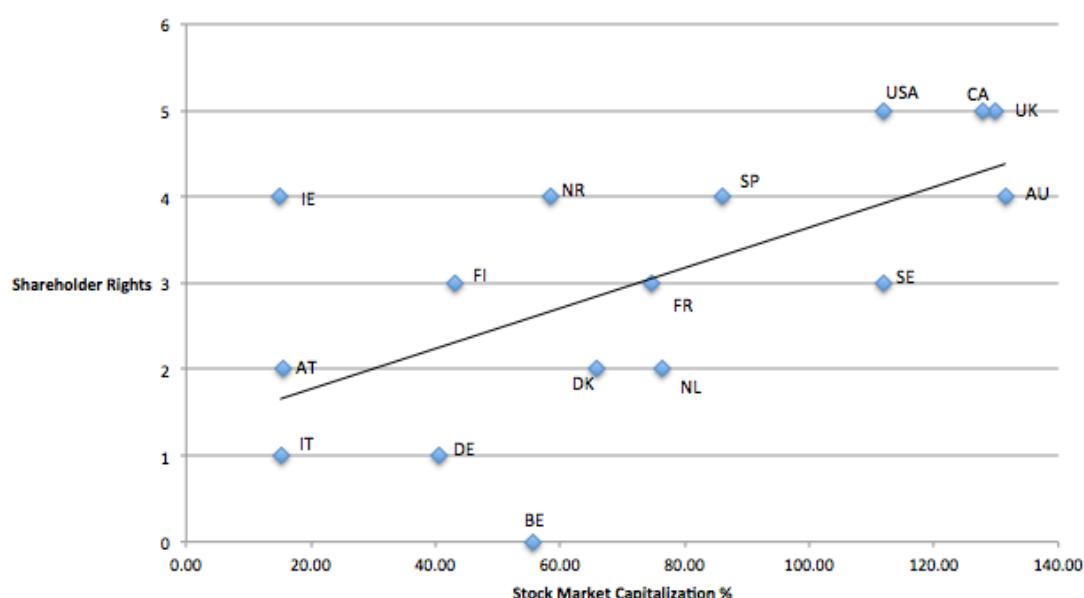
Figure 17: Shareholder rights and Stock market Capitalization
(Own chart based on data from Laporte et al. (1998) and GFDD)
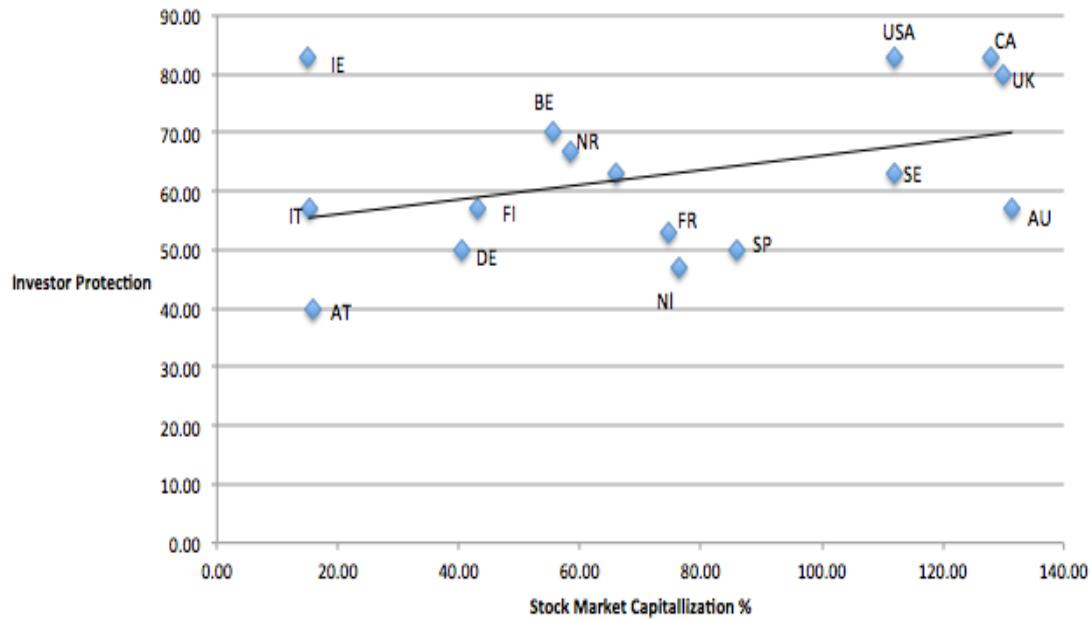
Figure 18: Investor Protection and Stock Market Capitalization
(Own chart based on data from World Bank database and GFDD)
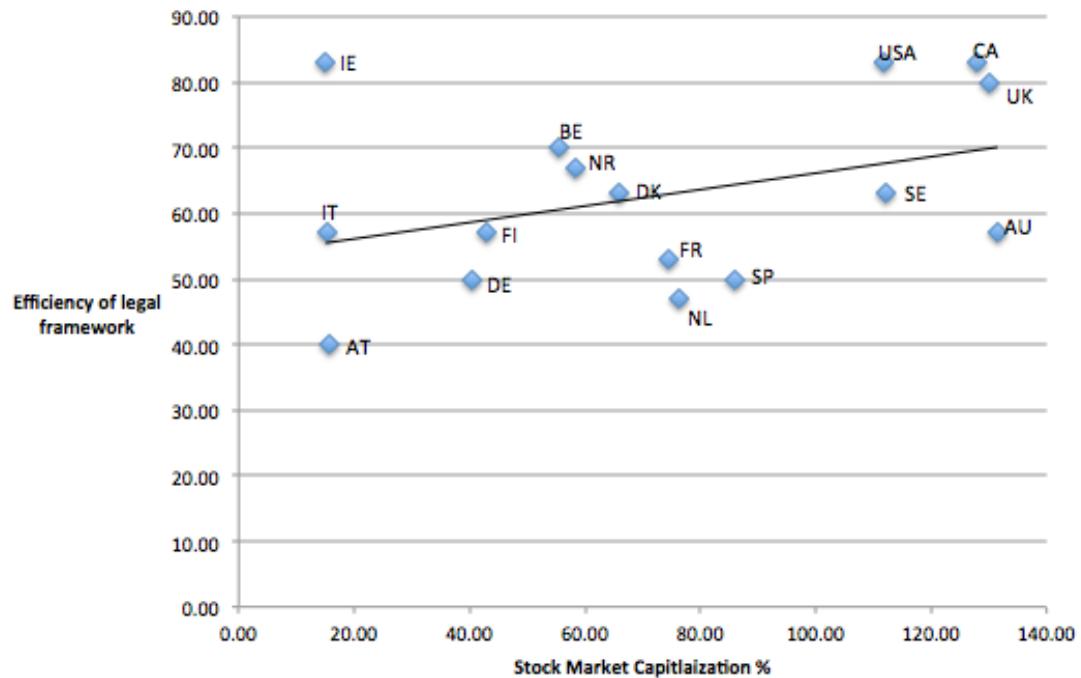
Figure 19: Efficiency of legal framework and Stock Market Capitalization %
(Own chart based on data from DATAGOV and GFDD)

Based on graphical interpretations (figure 17,18,19), it can be inferred that common law countries (having higher shareholder rights and investor

protection and more efficient legal frameworks) have better-developed stock markets (higher market capitalization).

Hypothesis: VC needs an active stock market to thrive and the legal system in LMEs (common law) is complementary (or more conducive) to stock market development.

3) Labor market rigidities

Labor market restrictions can affect Venture capital both by adversely affecting the culture of entrepreneurship and influencing the style of innovation process. Jeng and Wells (2000) note that labor market rigidities present an obstacle to venture capital growth. They provide example of Japan where "leaving a company is considered not only dishonorable, but departing individuals also loose valuable benefits of seniority." Jeng and Wells (2000, p. 256). Da Rin, Nicodano and Sembenelli (2005) and the The Economist (2012) emphasize that barriers to entrepreneurship may prevent VC markets from thriving. **One of the biggest barriers to entrepreneurship is labor market rigidities**.[20] This makes sense since strict labor laws make it difficult and expensive for entrepreneurs to lay-off workers in case of failure. One would expect this problem to be more pronounced in high-tech businesses where entrepreneurs have to deal with sudden developments inherent in the **radical innovation process**[21]**,** an innovation style that is quite conducive to favoring VC investments as discussed in the previous sections. Jeng and Wells (2000) indeed find a negative correlation between VC investments and labor market rigidities.

I have already discussed in section 3.4 how labor market rigidities in CMEs are associated with lower stock market development and vice versa for LMEs. The figure (figure 20) is shown again for better understanding in the following page.

---

[20] see Schertler(2003), Romain and van Pottelsberghe de la Potterie (2004) and Jeng and Wells (2000)

[21] see Hellman(2001)
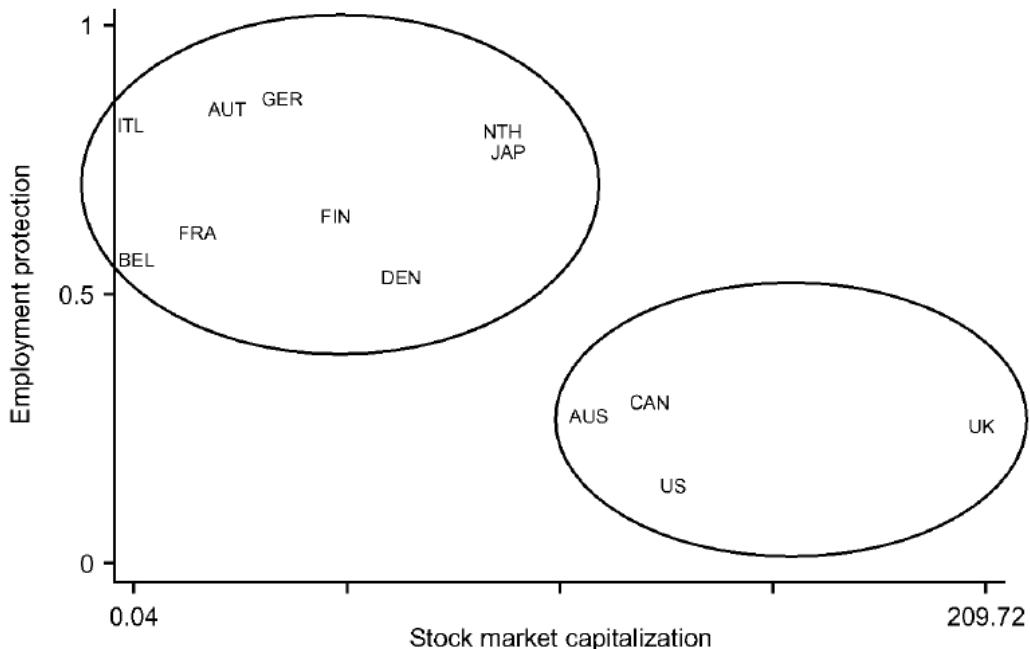
Figure 20: Employment Protection and Stock Market Capitalization
Source: (Hall and Soskice, 2001, p. 19)

Hypothesis: Weak labor market restrictions in LMEs are conducive to encouraging entrepreneurial behavior and promoting a more radical innovation style (features complementary to a more market based financial structure) and subsequently lead to greater VC investments.

4) Well-Endowed Human Capital

Schertler (2003) finds a well-endowed human capital in an economy to be a significant factor contributing to VC investments. According to Schertler (2003, p.5),

"*Only if the economy is endowed with sufficient human capital, which is necessary to generate innovative ideas, one can expect a liquid venture capital market to develop. For the development of venture capital a sufficient number of highly qualified scientists and engineers seems sensible. To be endowed with large amounts of particular human capital is certainly a necessary but not a sufficient condition for venture capital finance to emerge*".

By particular human capital, he is referring to one that is capable of generating a more radical form of innovation.

"*…the style of the innovation system can have a profound impact on the emergence of venture capital finance. For example, one can expect that the more creativity and individualism a university system initiates, the higher the number of individuals with high-technology ideas who demand venture capital to realize their business ideas might be*".

This is a reiteration of what Hall and Soskice (2001) comment on innovation

styles and has been mentioned briefly in section 3.5.2.

Hypothesis: A well-endowed human capital positively affects venture capital investments in a country by influencing the nature of innovation style and subsequently the market structure.

5) Cultural Barriers

Cultural factors have often been cited as possible deterrents to entrepreneurship and hence venture capital growth. The Economist (2012) discusses possible cultural explanations behind the "laggardly" entrepreneurial culture in Europe compared to USA and Canada. A major factor is the risk-averseness to failure found among European countries.

The European Commission "examined insolvency regimes and found that many countries treat honest insolvent entrepreneurs more or less like fraudsters, though only a tiny fraction of bankruptcies involve any fraud at all. Some countries keep failed entrepreneurs in limbo for years. Britain will discharge a bankrupt from his debts after 12 months; in America it is usually quicker. In Germany people expect it to take six years to get a fresh start, according to the commission; in France they expect it to take nine. In Germany bankrupts can face a lifetime ban on senior executive positions at big companies" Economist (2012).

See figure 21 for life sentences for a typical firm going bankrupt in different countries on the next page.

Life sentences `2`

Maximum typical time from the end of the liquidation process until the bankruptee is freed from debts, survey respondents' answers
2010, years

Source: European Commission
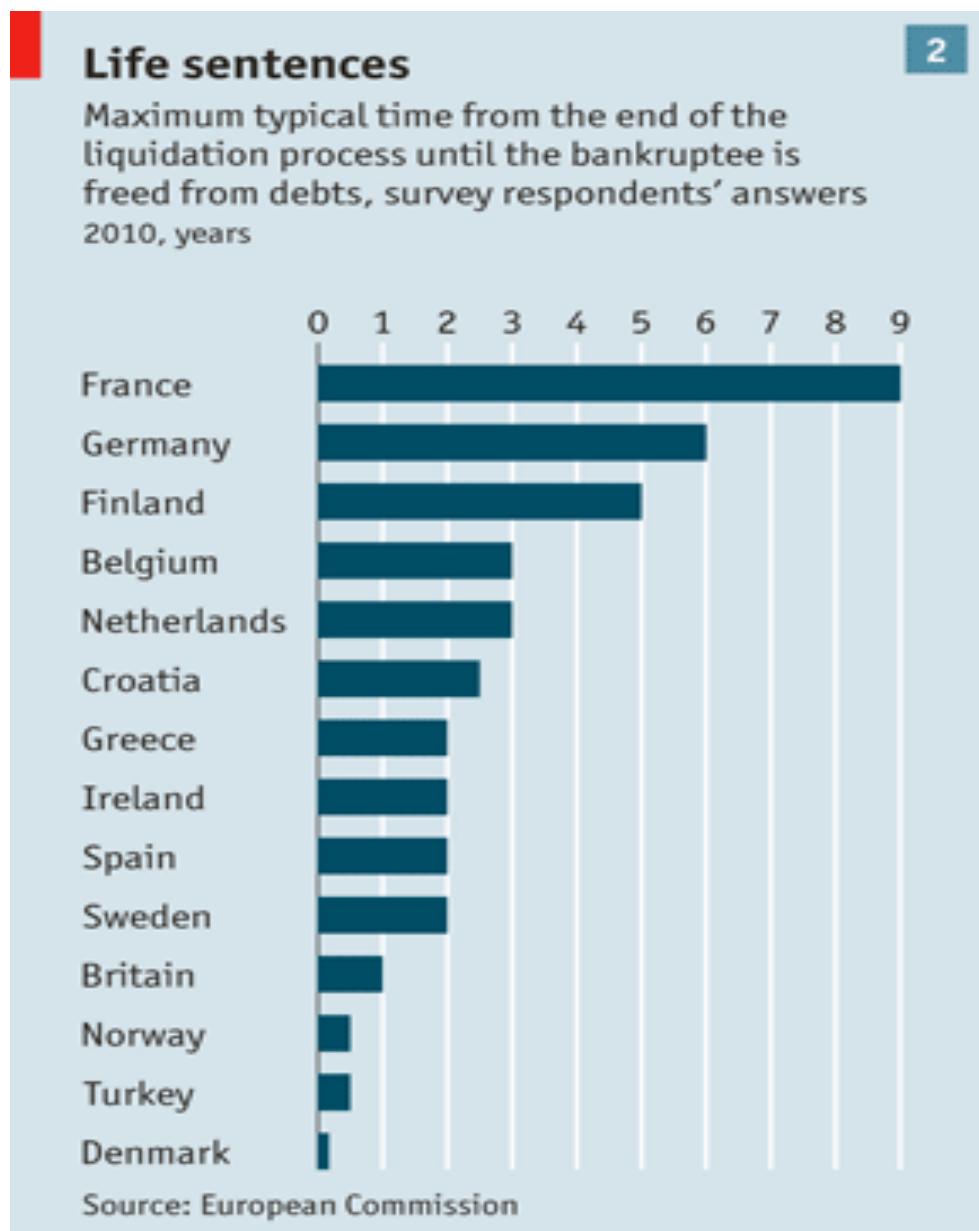
Figure 21: Life Sentences
Source: Economist (2012)

This risk-averseness is attributed to wars witnessed by Europe in the last century among other factors.

Hypothesis: Cultural factors may prevent one country from becoming more market-based and in general adversely affect the risk-taking behavior. This would indirectly affect VC growth.

Chapter conclusion and summary

So far, the underlying theoretical foundation has been laid down in the previous sections and an analytical framework has been discussed. Based on this research and some assumptions, a detailed conceptual model (figure 22) could be obtained indicating the boundaries of quantitative analysis.
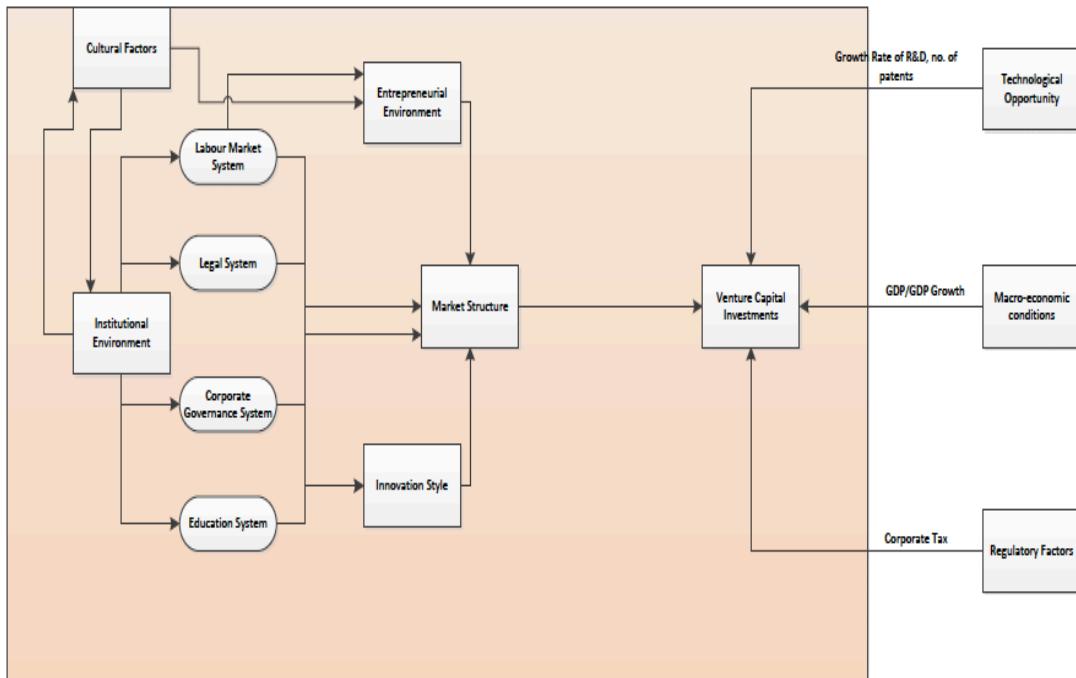
Figure 22: Detailed Conceptual Framework

In the figure above, several broad categories of factors known to affect Venture Capital flows/investments have been highlighted. They are technological opportunity, macroeconomic conditions, regulatory factors, cultural factors and the institutional environment. As depicted, the focus is primarily on how institutional environment affects Venture Capital flows by influencing the market structure. The next chapter deals with testing empirically the hypothesis or assumptions made from the above sections.

The institutional environment has been analyzed along the 4 sub-factors in the previous sections namely Labor Market rigidity, Legal Systems, Corporate Governance systems and the Education System. Labor market rigidity affects market structure indirectly by influencing the entrepreneurial environment (see section on labor market rigidities) as well as the type of innovation system. Legal system affects market structure through investor protection and law enforcement. The nature of Corporate Governance encourages firms to list themselves on Stock exchanges or form collaborative networks with banks for accessing finance. Finally the education system also influences the market structure indirectly by providing complementary support to labor market system and promoting a particular kind of innovation system.

5. Econometric Specification and Estimation

In this Chapter, explicit definitions of the variables and their constructions will be described and the main data sources would be introduced. A preliminary analysis of the data at the country level will also be presented in order to give a general view of the estimation and analysis. In the end, empirical and econometric analysis would be presented to draw conclusions and test the hypotheses developed theoretically in the previous chapter.

5.1 Venture Capital; Data, Source and Definitions

Data on *Venture Capital Investments* was collected from different sources for different countries. *Venture Capital Investments* have been used as a proxy for *Venture Capital Performance* because data on returns (measured by Internal Rate of Return) used to measure venture capital performance was hard to obtain. It is safe to assume that the amount of *Venture Capital Investments* in a given year would depend on the past performance (penultimate year) of the industry in a country. Data for Venture Capital Investments was collected for 17 countries (13 EU countries, UK, USA, Canada and Australia). Data for EU countries and UK was collected from European Venture Capital Association (EVCA) database. The database contains figures pertaining to Early Stage investments (seed and start-up), later stage, expansion/growth, buy-out, rescue/turn-around and replacement capital for the years 1989-2006 for 20 European countries.[22] The disaggregated and comprehensiveness feature of the EVCA database allows comparisons across countries and time. Data on Venture Capital investments (EU and UK) from 2007 onwards (till 2010) was obtained directly through EVCA yearbooks available on website. Data for USA, Australia and Canada was collected from the *National Venture Capital Association* (NVCA), *Australian Private Equity and Venture Capital Association Limited* (AVCAL) and *Canada's Venture Capital & Private Equity Association* (CVCA) yearbooks. I also contacted a research analyst at EVCA who provided me with detailed data on *fundraising, investments and divestments* for all EU countries. This made my research more reliable. (*Fundraising* refers to the capital that is collected from investors and that is subsequently available for investments. *Investment* definitions are described below. *Divestments* refer to the "exiting" of venture capitalists, thereby selling off shares in the portfolio company and earning a profit).

Before moving forward, I would like to clarify my use of the term Venture Capital, since it is defined differently in the US and Europe. Venture capital refers to one type of private equity investing. Private equity investments are investments by institutions or wealthy individuals in both publicly quoted and privately held companies. Private equity investors are more actively involved in

---

[22] These countries are Belgium, the Czech-republic, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Hungary, The Netherlands, Austria, Poland, Portugal, Romania, Finland, Sweden, The United Kingdom, Norway and Switzerland

managing their portfolio companies than regular, passive retail investors. The main types of financing included in private equity investing are venture capital and management and leveraged buyouts. Outside of the US, the term venture capital is frequently used to describe what could be referred to as private equity. I shall adhere to the commonly used definition in US according to which, venture capital comprises of three types of investing — **seed, startup, and expansion** since my interest is specifically in Venture Capital and not Private Equity Investment and excludes buyouts (Buyouts are usually applied to more mature companies). These types represent three stages of investing which are defined with reference to the stage of development of the company receiving the investment.

EVCA (2012) has broadly categorized venture capital investment data on the basis of stage as:

-Early Stage (Seed +Start-up)
-Later Stage (Expansion and Replacement)

These two stages in turn can be further deconstructed into several components, which are defined below (as per EVCA)

Stage	Definition
Seed	Financing provided to research, assess and develop an initial concept before a business has reached the start-up phase
Start-up	Financing provided to companies for product development and initial marketing. Companies may be in the process of being set up or may have been in business for a short time, but have not sold their product commercially
Later-stage venture	Financing provided for the expansion of an operating company, which may or may not be breaking even or trading profitably. Later-stage venture tends to finance companies already backed by venture capital firms.
Growth	A type of private equity investment – most often a minority investment but not necessarily – in relatively mature companies that are looking for capital to expand or restructure operations, enter new markets
Buyout	Financing provided to acquire a company. It may use a significant amount of borrowed money to meet the cost of acquisition
Rescue/Turnaround	Financing made available to an existing business, which has experienced trading difficulties, with a view to re-establishing prosperity
Replacement capital	The purchase of a minority stake of existing shares in a company from another private equity firm or from

another shareholder or shareholders.

Table 4: Venture capital stages and definitions
Source: EVCA (2012)

Note: EVCA treats later stage and expansion investments separately. However for the purpose of convenience and maintaining consistency with the American definition, I have clubbed the two stages together into a single "expansion" stage category.

Indicator Construction

- *Venture Capital Investment= Seed+ Start-up+ Later Stage/Expansion*

The dependent variable in my analysis is Venture Capital as a percentage of the Gross Domestic Product (GDP)[23] for a country.

- VC_{Invest} = (*Venture Capital Investment/GDP*)*100

(See Appendix A -Table A-1 and A-2- for country-wise average venture capital investments and sample calculation of venture capital investment respectively.)

5.2 Market/Financial Structure

The independent variable in my analysis is the financial structure. *By* financial structure *I mean, the extent of market basedness or bank basedness* of an economy, that is, how active are markets in allocating capital and providing risk management tools compared to banks in an economy.

The tota*l Stock Market capitalization* is a broad concept, which represents the total market value of all listed domestic firms. It is thus a measure of the size of stock market and when presented as a percentage of GDP (*Stock Market Capitalization Ratio*), it can serve as a good indicator of the degree of market basedness of an economy. *This indicator has mostly been used in finding relationships between stock market development and other institutional factors like labor market rigidities, legal systems etc. as discussed in the previous chapter.* The values for this indicator are taken from the Global Financial Development Database (GFDD).

However, a much more powerful and holistic construction to measure the market-basedness of an economy has been done by Levine (2002). Levine (2002) has made an important contribution of a broad cross-country dataset to examine market and bank based financial systems. He constructs an aggregate

---

[23] Data on current *GDP* is collected from the World Bank Database

indicator; *Structure Aggregate* based on three other indicators namely *Structure Activity, Structure Size and Structure efficiency.* These are explained below:

Structure Activity: It is a measure of activity of stock markets relative to banks. The activity of stock Markets is measured using the *total value traded ratio*, which equals the value of domestic equities traded on domestic exchanges divided by GDP. This total value traded ratio is frequently used to gauge market liquidity because it measures market trading relative to economic activity. The activity of banks is measured using the *bank credit ratio,* which equals the value of deposit money bank credits to the private sector as a share of GDP. This measure excludes credits to the public sector(central and local governments as well as public enterprises). Based on these measures, Levine (2002) defines *structure activity* as the logarithm of the *total value traded ratio* to *bank credit ratio.* Larger values of *structure activity* imply more market based financial system.

$$Struc_{Act} = \ln \frac{total\ value\ traded\ ratio}{bank\ credit\ ratio}$$

Structure Size: It is a measure of size of stock markets relative to banks. The size of the stock market is measured using the *stock market capitalization ratio* as discussed before. The size of the bank is again measured using the *bank credit ratio*. Structure size is then defined as the logarithm of *stock market capitalization ratio* to *bank credit ratio*. Larger values of structure size imply more market based financial system.

$$Struc_{size} = \ln \frac{stock\ market\ capitalization\ ratio}{bank\ credit\ ratio}$$

(Note: The difference between the above two indicators is that Structure Size focuses on the total shares outstanding in the economy's stock exchanges while structure activity focuses on the liquidity of the exchanges.)

Structure Efficiency: It is a measure of efficiency of stock markets relative to that of banks. The efficiency of stock markets is measured using the total value traded ratio since it reflects the liquidity of the domestic stock market. While the efficiency of banks is measured using the *overhead costs*, which equal the overhead costs of the banking system relative to banking system assets. Large overhead costs reflect inefficiencies in the banking system. However according to Levine, there are potential problems with this measure; Overhead costs may capture efficient investments in banking not inefficiencies. Yet this indicator captures the idea of measuring inefficiency and is included for completeness (*Higher levels of overhead costs indicate lower levels of banking system efficiency*) Structure Size is then defined as the logarithm of *total value traded ratio* times *the overhead cost.* Large values of structure efficiency imply a more market based financial structure.

$$Struc_{Eff} = \ln(total\ value\ traded\ ratio) * (overhead\ cost)$$

Structure Aggregate: It is a conglomerate measure of financial structure based on activity, size and efficiency. It is calculated using the first principal component of structure activity, structure size and structure efficiency, that is, it is a measure that best explains (highest joint R-square) the first three financial structure indicators.

$$Struc_{agg} = First\ Pricipal\ Component(Struc_{Act}, Struct_{size}, Struc_{Eff})$$

Levine (2002) gives a list of these indicators for a sample of countries for a given year (year not specified). Some of them are presented below.

Country	Struc_Activity	Struc_Size	Struc_Efficinecy	Struc_Agg
USA	-0.64	-0.11	-4.38	1.34
UK	-0.74	0.02	-4.79	1.24
Canada	-1.14	-0.06	-5.59	0.82
Sweden	-1.18	-0.15	-5.47	0.80
Netherlands	-1.36	-0.60	-6.26	0.33
Germany	-1.52	-1.53	-5.26	0.17
France	-2.28	-1.42	-5.60	-0.17

Table 5: Values of structure indicators for select countries
Source: Levine (2002)

The table suggests that USA with the highest value of $Struc_{agg}$ has the most market based financial structure while France and Germany have the least market based financial structure.

I use this indicator (Structure Aggregate) as the main indicator of financial structure (market basedness) and use it as the independent variable in testing my hypothesis that a more market based financial structure is positively associated with more Venture Capital flows/Investments in a country. This variable was constructed by collecting data on constituent indicators (structure activity, size and efficiency) for all the countries under analysis for the period 1990-2010. The data on constituent indicators like *stock market capitalization, total value traded ratio, bank credit ratio, overhead cost* was collected from the *Global Financial Development Database (GFDD).* The database was a very useful starting point in analyzing financial systems. It is based on the work by Beck, Demirguc-Kunt, & Levine (2000), Beck, Demirgüç-Kunt, & Levine (2009) and Čihák, Demirgüç-Kunt, Feyen, & Levine (2012).

Indicator Name	Description	Definition
Structure Activity	Measure of activity of stock markets relative to banks	$Struc_{Act} = \ln \dfrac{total\ value\ traded\ ratio}{bank\ credit\ ratio}$
Structure Size	Measure of size of stock markets relative to banks	$Struc_{size} = \ln \dfrac{stock\ market\ cap.ratio}{bank\ credit\ ratio}$
Structure Efficiency	Measure of efficiency of stock markets relative to that of banks	$Struc_{Eff} = \ln(total\ value\ traded\ ratio) * (overhead\ cost)$

Structure Aggregate	Conglomerate measure of financial structure based on activity, size and efficiency	$Struc_{agg}$ $= First\ Pricipal\ Component(Struc_{Act}, Struct_{size}, Struc_{E}$
Stock Market Cap ratio	Represents the total market value of all listed domestic firms as percentage of GDP	Market_Cap = (market value of all listed firms/GDP)*100

Table 6: Description and Definitions of financial structure indicators

Before going on to find statistical relationships between various indicators, I shall first present trends of these indicators (as discussed above) on the basis of collected data to see how the various countries compare in terms of their financial structures as well as how they have evolved over time.
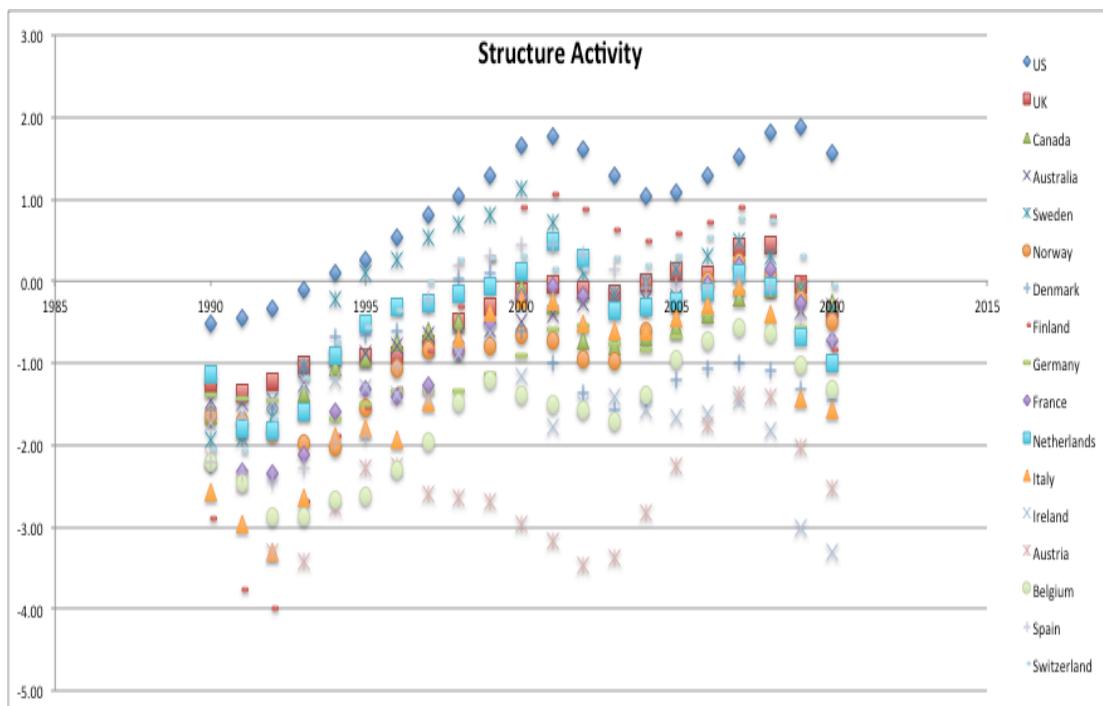
Figure 23: Structure Activity for countires under analysis.
Generated based on data from Global Financial Development Database (GFDD)

Though there is lot of individual variations in the indicator over the years, some general observations can be made. In terms of relative activity of stock markets with respect to banks, one can see that US outperforms all other countries throughout the period under analysis, that is 1990-2010. Austria is consistently at the bottom. Scandinavian countries (Sweden, Finland, Denmark) compare closely with other Anglo-Saxon countries UK, Canada and Australia in terms of relative stock market activity from 1994 onwards. The countries at the bottom are France, Germany, Ireland, Spain, Belgium (in no particular order). Overall one can see a gradual evolution of economies towards more market oriented systems (greater relative stock market activity), with values of structure activity reaching their peak in the period 2008-09 after which it shows a sharp decline for all countries. This can be attributed to the financial crisis in the period.
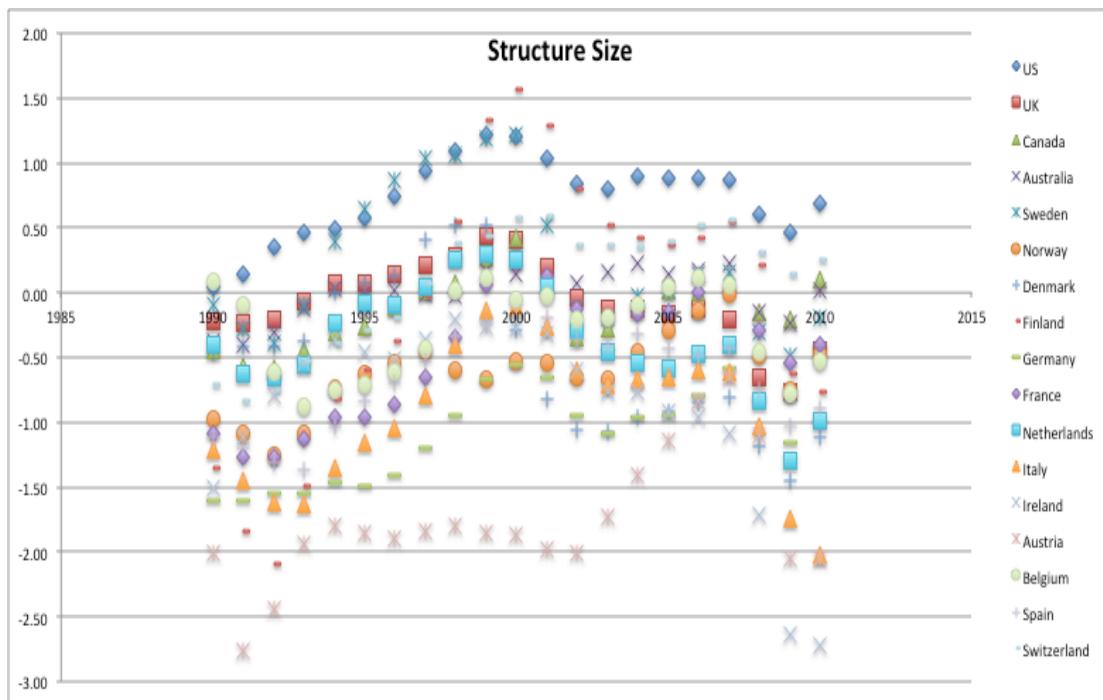
Figure 24: Structure Size for countires under analysis.
(Generated based on data from Global Financial Development Database (GFDD))

In terms of relative stock market size to bank credit, US and Sweden have the highest value of the indicator till 2000. After that, USA shows a slight decline but continues to be at the top of the table, while Sweden shows a sharp decline and is outperformed by countries like Switzerland, Finland and Australia. Austria has the least relative stock market size for most of the period. Anglo-Saxon countries (UK, Canada and Australia) along with Scandinavian countries and Netherlands dominate the table followed closely by French Civil law countries (France, Belgium, Spain). The countries at the bottom of the table are Germanic Civil law (Germany, Austria) with the exception of Switzerland. This could be attributed to the fact that Swiss banks attract international capital from the wealthy all over the world because of their strict banking policies of neutrality and confidentiality.

Note that while the *Structure Size* measure does not vary as much across the years, *Structure Activity* clearly indicates a much more important role for capital markets than banks for the countries under analysis. This is also validated by analyzing the *stock market capitalization ratio* separately (figure 25) whose trend closely resembles that of *Structure Activity*.

Figure 25: Stock Market Capitalization ratio for countires under analysis.
(Generated based on data from Global Financial Development Database (GFDD))
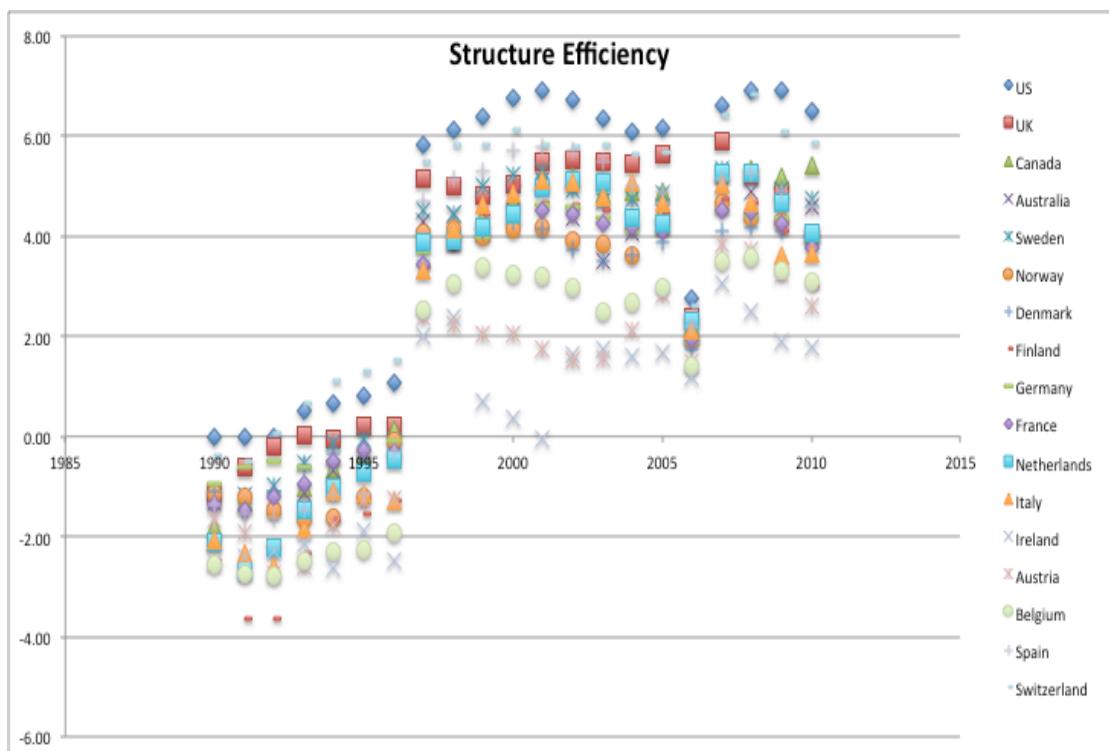
Figure 26: Structure Efficiency for countires under analysis.
(Generated based on data from Global Financial Development Database (GFDD))

The country-wise trends for *structure efficiency* are similar to above two indicators with USA, UK, Sweden at the top of the table. However, one notices a sharp rise in the values after 1996 for all countries. This is attributed to the sharp rise in *overhead costs* of the banking system after 1996. (Detailed explanation for this phenomenon is outside the scope of the study)
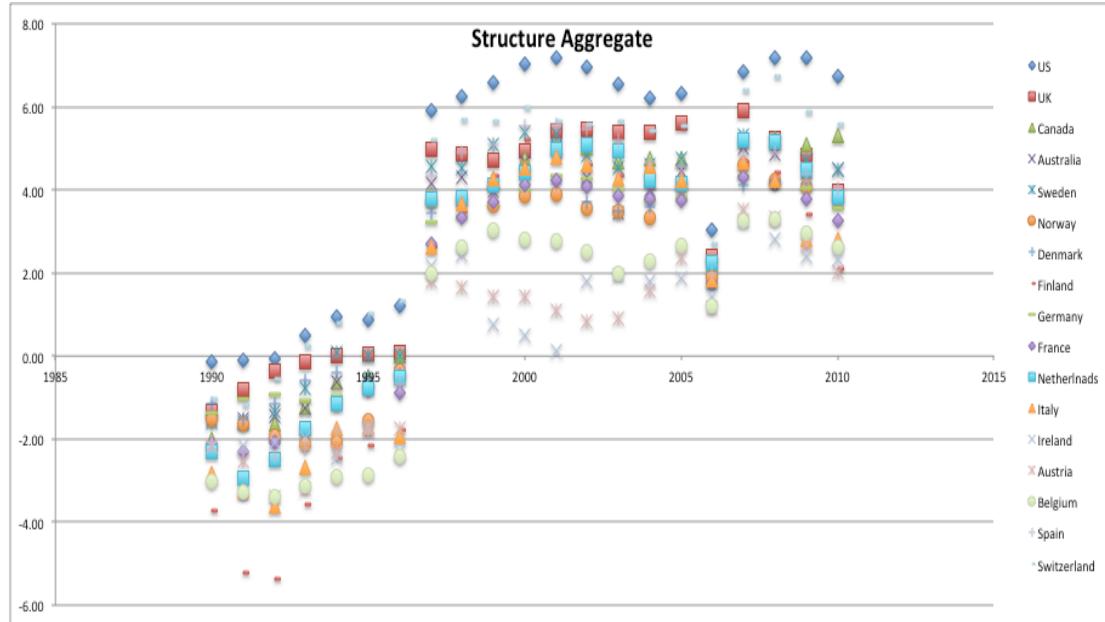

Figure 27: Structure Aggregate for countires under analysis.
(Generated based on data from Global Financial Development Database (GFDD))

Finally, the aggregate measure of relative activity, size and efficiency of markets and banks that is, structure aggregate is presented in the figure above. The cross-country trends are very similar to structure efficiency indicator. This implies that *structure efficiency* has the highest explained variance out of the 3 indicators in defining *structure aggregate*.

Section Conclusion and summary: In analyzing the trends in the relative importance of financial markets and financial institutions (banks), I find a trend towards market based financial systems, a finding consistent with Beck and Kunt 2009 (Financial Institutions and markets across countries and over time-Data And analysis) "While both market and bank finance has deepened over recent years, the deepening was stronger for markets than for banks." (Beck and Kunt 2009, p. 3)

5.3 Econometric Estimation

In this Chapter, I shall test relationships between *venture capital performance*, the *financial structure* and *institutional indicators* that have been discussed so far. The objective of the this chapter (and hence the thesis study) is **not to come up with a model that establishes determinants of Venture Capital Investments** but find and test expected relationships and associations between the institutional environment and Venture Capital Investments in a country (as has been maintained so far).

To fulfill this purpose, I shall divide the analysis into 2 parts. First part of the analysis (Part 1) will involve establishing and testing relationships between *financial structure (measured by stock market development)* and some important *institutional indicators*, the relationships that have been discussed in the previous chapter. The *Stock Market Capitalization Ratio* has been used as an indicator of market-basedness (or market orientation) in the first part of analysis (Figure 28).

Institutions → Financial Structure
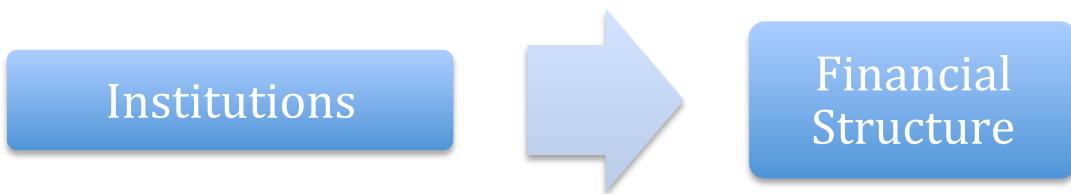
Figure 28: Part 1 of Analysis; Relationship between Institutions and Financial Structure

The second part will complete the link between *institutions* and *venture capital investments* by establishing and testing relationship between the *financial structure* and *Venture Capital Investment*. However a more holistic indicator called *structure aggregate* would be used as a proxy for financial structure instead of *stock market capitalization ratio*. The inconsistency between the choice of indicators in the two parts is justified since **there is a high degree of correlation between the two indicators** as can be seen in Table 7 (see also Appendix B; Table B-1). Moreover, the second part of the analysis is more detailed and spans over a time period of 20 years and forms the cornerstone of the whole analysis. Therefore it requires more accurate indicators compared to the first part. The line of thought is better elucidated using the visual description (figure 28).

Average Stock Market Capitalization (1990-2010)	Structure aggregate
Pearson Correlation	0,621
Sig. (2-tailed)	0,000
N	300

Table 7: Correlation between Stock Market Capitalization Ratio and Structure Aggregate index
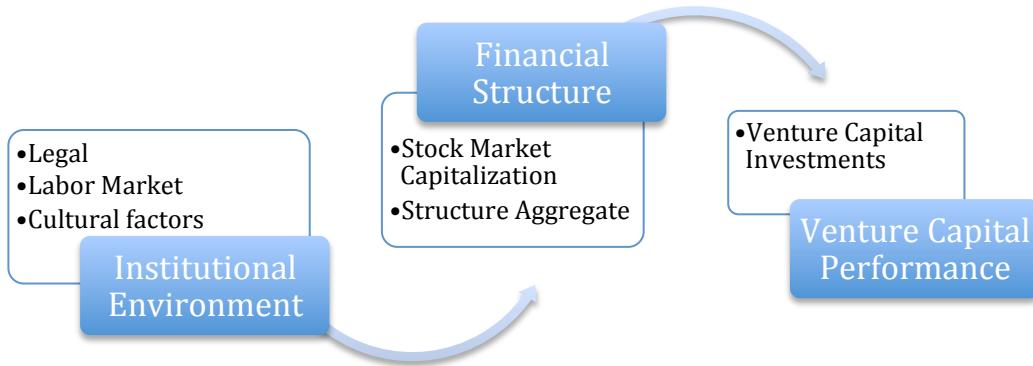
Figure 29: Complete Framework for Empirical Analysis

Part 1: Institutions and Financial Structure

This part has been divided into 3 sub-parts on the basis of institutions identified to be the most relevant factors determining venture capital investments in chapter 4 namely legal institution, labor market system and cultural factors (section 4.1). The factor well *endowed human capital* is not included in the analysis due to the unavailability of a good indicator that could distinguish between education systems in Anglo-Saxon countries and mainland European countries. Following table (Table 8) gives a summary description of all the indicators that are used in the analysis below.

Indicator Name	Description
Investor Protection (legal)	Measures the strength of minority shareholder protections against misuse of corporate assets by directors for their personal gain
Shareholder rights Index (legal)	Definition similar to investor protection index
Efficiency of legal framework (legal)	Measures the efficiency with which the legal framework settles disputes for private businesses
Employment Protection Index (labor market)	Measure the procedures and costs involved in dismissing individuals or groups of workers and the procedures involved in hiring workers
Risk Aversion Index (Cultural)	Measures risk propensities across countries
Legal Origin (Cultural)	Classifies legal systems on the basis of historical origins

Table 8: Summary description of legal system and culture indicators

1.1 Legal Institution and Financial Structure

A variety of indicators can be used to define the legal institution in a country. Some of them, which I discussed in the previous chapter, are *investor protection index, shareholder rights index* and *efficiency of legal framework*.

Avg. Stock Market Capitalization (1990-2010)	Shareholder rights	Investor Protection	Efficiency of legal framework
Pearson Correlation	0,588	0,452	0,298
Sig. (2-tailed)	0,017	0.079	0,262
N	16	16	16

Table 9: Financial structure correlation with legal system
(Results computed through statistical analysis)

The correlation results as presented in the table 9 (see also Appendix B; Table B-2, B-3 and B-4) above are discussed below.

- There is found to be a significant positive correlation (significant at 5%) between the *shareholder rights index* and *stock market capitalization ratio*. This is as per expectations.

- There is found to be a significant positive correlation (significant at 10%) between the *investor protection index* and *stock market capitalization ratio.*

- Although, there is a positive beta coefficient between the indicators *efficiency of legal framework* and *stock market capitalization ratio*, the relation is not significant contrary to expectations. This could be due to two reasons. First, the number of observations (countries) in the sample is small. I **expect the results to be more significant** between the indicators by including more number of countries in the analysis. Second, the indicator efficiency of legal framework is a subjective indicator based on business executive's opinion on how efficient their country's legal system is in settling disputes of private businesses (see methodology in Government Indicators Database (DATAGOV)). This could lead to inconsistent results between the two indicators.

Conclusion: One can infer that the legal system has positive correlation/association with market structure, that is, countries higher up on the scale of legal protection tend to have a more market-based economy.

Note: Switzerland is an outlier and its high degree of market and financial development is attributed to a great extent to its status of a tax haven apart from institutional factors. It is therefore not considered in the statistical analysis.

1.2 Labor Market Institution and Financial Structure

Stock Market Capitalization Ratio	Employment Protection Index
Pearson Correlation	-0,569
Sig. (2-tailed)	0,022
N	16

Table 10: Financial Structure correlation with Labor Market system
(Results computed through statistical analysis)

There is found to be a significant negative correlation (significant at 5%) between *employment protection index* and *stock market capitalization ratio* (see Appendix B; Table B-5). This is as per expectations since a higher employment protection value implies greater labor market rigidity.

Conclusion: One can infer that countries with weaker employment protection measures implying more fluid labor markets tend to have a more market-based economy.

 1.3 Cultural Factors and Market Structure

While it is hard to define or measure culture in a broad sense, some indicators can indeed be used as a proxy to measure the cultural aspects that are relevant for the analysis. I use two indicators for this purpose. One classifies the different countries on the basis of *legal origins* while the other measures their *risk-averse attitude* (that has an influence on the entrepreneurial behavior). The *Composite index of propensity to risk* (CIPR) (Scorbureanu & Holzhausen, 2011) is used to measure the risk propensities across countries. The scale of risk aversion ranges from -1, corresponding to the risk-seeking behavior, to 1, corresponding to the risk-averse behavior. Values of CIPR for some countries are given in figure below.

Rank[*]	Countries	Average Index (1995-2009)	Variance
1	United States	-0,037	0,024
2	Italy	0,068	0,051
3	Spain	0,072	0,051
4	Greece	0,092	0,046
5	Japan	0,107	0,043
6	Sweden	0,109	0,033
7	Austria	0,110	0,023
8	United Kingdom	0,121	0,030
9	France	0,152	0,052
10	Ireland	0,152	0,044
11	Netherlands	0,160	0,067
12	Belgium	0,163	0,056
13	Switzerland	0,167	0,023
14	Norway	0,174	0,011
15	Denmark	0,176	0,045
16	Portugal	0,183	0,026
17	Finland	0,191	0,042
18	Germany	0,241	0,050

[*] ordered increasingly by risk aversion levels: negative values indicate risk seeking behaviour; values next to zero indicate risk neutrality; positive values indicate risk aversion.

Table 11: CIPR values (Risk Aversion index) across countries
Source: Scorbureanu & Holzhausen (2011, p. 13)

Based on this data, I tested for the relationship between risk-averseness and market development for a sample of 14 countries for which data is available.

Although the correlation coefficient is negative as expected (higher risk averseness is associated with lower stock market development/market basedness), the result is not found to be significant (Appendix B; Table B-6) with the current sample size of 14 (Values for Canada and Australia not provided). I expect the results to be more significant by including more number of countries (observations) in the analysis.

	Stock Market Capitalization	Risk Aversion Index	Legal Origin
Pearson Correlation		-0,331	0,550
Sig. (2-tailed)		0,247	0,027
N		14	16

Table 12: Financial Structure Correlation with Cultural factors
(Results computed through statistical analysis)

Finally, correlation results between legal origin and market development are found to be significant at 5% level (Appendix B; Table B-7). Countries were classified on the basis of their legal origins as belonging either to common law or civil law (with common law=1 and civil law=0). A positive correlation implies greater market development in countries belonging to the common law end of spectrum.

Conclusion: One can infer that countries belonging to common law origin tend to have a more market-based economy.

Part 2: Financial Structure and Venture Capital Performance

The relationship between financial structure and venture capital performance is tested by carrying out regression analysis. The dependent variable is VC_{invest} and independent variable is $Struc_{Agg}$. To capture the differences in venture capital performance caused by specific situations in different countries, variables representing country-specific impacts are introduced into the regression in terms of dummies. There are 16 dummy variables from C1 to C16 for 17 countries (taking the United States as the reference category). The variable *year* is also included as an independent variable to eliminate time-effects.

However, it is important to note that other possible determinants of Venture capital performance are not included as independent variables since the purpose is not to find an overall model explaining depicting venture capital performance. The variations caused by other explanatory variables can be captured in the residual term μ.

We can thus formulate a baseline model as:

$$VC_{invest} = \alpha(Struc_{Agg}) + \beta(C_j) + \gamma(year) + \mu$$

For the sake of comparison, the above equation is implemented 4 times with different variables added into the regression. The results are summarized in the following table. Model 1 shows the output of regression with only one explanatory variable that is, $Struc_{Agg}$. Model 2 shows the output taking only *year* as the independent variable. Model 3 shows output with all the country dummy variables (performed using the *Enter Method* on SPSS). Model 4 shows output for all the independent variables (performed using *Stepwise Elimination Method*).

Dependent Variable: VC_{invest}	Model 1	Model 2	Model 3	Model 4
$Struc_{Agg}$	0,436(0,000)*			0,858(0,000)
Year		0,132(0,022)		-0,518(0,000)
UK			-0,298(0,000)	
Sweden			-0,285(0,000)	
Norway			-0,380(0,000)	
Denmark			-0,401(0,000)	
Finland			-0,400(0,000)	
Germany			-0,462(0,000)	-0,121(0,011)
France			-0,421(0,000)	
Netherlands			-0,301(0,000)	
Italy			-0,512(0,000)	-0,139(0,000)
Ireland			-0,450(0,000)	
Austria			-0,550(0,000)	
Belgium			-0,418(0,000)	
Spain			-0,447(0,000)	-0,128(0,007)
Switzerland			-0,445(0,000)	-0,214(0,000)
R-Square	0,187	0,014	0,217	0,344
F(Sig)	69,897(0,000)	5,301(0,022)	6,912(0,000)	27,092(0,000)

Table 13: Venture Capital Performance and Financial Structure

The coefficient of Model 1 shows a significant positive correlation (0,436) between the $Struc_{Agg}$ and VC_{invest} which is as per expectations and this correlation coefficient only increases to a very high value of 0,858 when all other independent variables are introduced (Model 4). In both the models, the relationship between the dependent and independent variables is highly significant (both within the 1% level). Model 1 also shows that the variable $Struc_{Agg}$ explains 18,7% of the model, which is a reasonably high value.

Model 2 shows a linear positive correlation of 0,132 between the variable *year* and VC_{invest} (significant at 5% level). This is as per expectations since venture capital investments show an increasing trend with time in general. This also implies that venture investments be controlled for time in the final model.

Model 3 shows that there are indeed differences across different countries although the variation is not that high (-0,298 to -0,550). However the general relationship with the dependent variable is negative. This implies that for all the countries, the venture capital investments are lesser for a given *market structure* and *year* compared to USA (since USA is reference category). Model 3 shows that the country-effects alone account for 21,7% of the model.

Finally, Model 4 (See Appendix C for Model 4 (Final regression model) computation) shows the output with all the independent variables taken together and performing a STEPWISE ELIMINATION METHOD on SPSS to automatically include variables with the highest explanatory power. The model controls for time (year) and certain country-specific variables. $Struc_{Agg}$ has a high degree of positive correlation with VC_{invest} , which confirms the hypothesis **that a more market based structure is associated with higher venture capital investments**. Variable *year* has a high negative correlation of -0,518 (significant at 1% level) and thus eliminates the time effect. Only a few countries figure in the final model as significant predictors. They include Germany, Italy, Belgium and Switzerland. For these countries, the level of venture capital investment is lesser than that predicted on the basis of $Struc_{Agg}$ and *year* alone. Overall the independent variables explain 34,4% of the model which is a reasonably high value given limited number of independent explanatory variables used in the regression.

Note: The entire analysis was executed in two steps since the aim was to find the effect of institutions on venture capital performance by studying their effects on market structure. This analysis however fails to provide a complete picture on which institutions (out of the ones discussed) have a direct influence on venture capital performance. So in addition to the analysis above, a simple regression analysis was performed taking all indicators (both financial structure as well as institutional) as independent variables and venture capital investment as the dependent variable. The values are again taken as average values for all indicators over a 20-year period (1990-2010). Some values were missing but reasonable assumptions were made. Also the country dummies were not considered to eliminate the country specific conditions. It is found that the most significant predictors of VC investments are **structure aggregate** and **labor market rigidity**. This provides some interesting insights that **labor market rigidity is the single most important factor among the institutional indicators (and after financial structure development)** that could explain venture capital investments in a country. The results are shown in table 14 below (See Appendix D).

Dependent Variable: VC_{invest}	Independent variables	Final Model
Financial Structure indicators	Stock Market Capitalization	
	Structure Aggregate	**0,688 (0,001)**
Legal Institution Indicators	Efficiency Legal Framework	
	Investor Protection	
Cultural factor indicators	Risk Averse Index	
	Legal Origin	
Labor Market Rigidity indicators	**Employment Protection Index**	**-0,360 (0,036)**
Adjusted R-Square		**0,744**

Table 14: Venture capital determinants: All indicators
(Results computed through statistical analysis)

Section conclusion and summary:

The section provides empirical backing and support to the assumptions formed so far that certain institutions lead to a more market based economy which in turn lead to higher venture capital investments. There is found to be a high degree of correlation and association between institutional indicators like legal systems, labor market systems, cultural factors with development of stock markets in a country. Further, greater development of stock markets or more market based financial structure is found to be highly correlated with venture capital performance in a country. Finally, out of all the institutional indicators, labor market rigidity was found to be the most significant predictor of VC investments when considered along with financial structure.

6. Conclusion

This chapter will synthesize the findings of previous chapters as well as answer the research questions posed in Section 1.3.b. It will provide recommendations for public policy based on the findings and propose directions for future research. It will also present the limitations of the current study.

6.1 Summary of findings

- Venture capital is believed to be important for fostering innovation, promoting long-term economic growth and raise the living standards. Indeed, a recent research paper by Deutche Bank (2010) found that a rise in venture capital investments of 0.1% of GDP can increase real GDP growth by 0.3 percentage points. The same rise in seed and early-stage investments could increase GDP growth by 0.96pp. The report says that countries with high VC activity typically have stronger economic growth.. VC has played a vital role in bringing innovative companies (mainly in US but also in Europe and Asia) that have changed the landscape of how thing are done and business is conducted. The importance of VC can be seen through the emphasis placed on it by European policy makers. They realize that their countries must emulate the US VC model to bring radical innovations else suffer from prolonged recessionary growth.

- Formal institutions like labor market system, legal system, corporate governance and education system as well as informal institutions (cultural factors) affect financial structure, that is the degree to which an economy is market based or bank based, which in turn influences venture capital investments and performance. A more market based financial structure/system is found to be associated with higher venture capital

performance. This answers the question on what kind of institutions and financial system are more conducive to fostering venture capital.

| Anglo-Saxon Institutions | → | Market Oriented Financial Structure | → | Higher VC performance |

- The US seems to be at an inherent institutional advantage when it comes to promoting and encouraging venture-backed growth. Europe has and is taking policy actions to create a venture capital niche in an otherwise predominantly bank based system. However, one can see a gradual evolution of financial structures (particularly in countries like Sweden, Norway, Denmark and Netherlands) towards more (stock) market oriented systems as measured by structure activity, size and efficiency over the last couple of decades. VC performance is thus expected to improve, accompanied by greater experience of European venture capital fund managers.

- The *Varieties of Capitalism* (VOC) approach however, recognizes that the barriers to fundamental institutional change are very high and is therefore skeptical about complete change or convergence arguments. Hall and Soskice (2001, p. 346) refer to the inherent rigidity and inflexibility towards adaptation or change when they state that institutions "derive from deeply rooted historical traditions and typically are defended at least by vested interests if not by powerful actors within national systems who will recognize the comparative advantages of their institutions."

6.2 Recommendations for public policy

As postulated in my problem description, there seems to be an upper limit to the effectiveness of the venture capital industry in promoting innovative SMEs in Europe. However, that doesn't provide justification for removing/reducing public intervention. It implies that expectations be set accordingly. More specifically, one should not expect to create a silicon valley in Europe. The public sector has an important role to play in the early stages of firm formation and commercialization of technology because market forces alone do not generate sufficient investments to provide a breeding ground for new-high tech ventures. The public sector role especially becomes important in an economic downturn when levels of private investments are low. A number of policy measures taken by European governments have indeed changed the (institutional) environment and made it more supportive to VC mechanism but this requires great effort and there are inherent barriers to change as discussed before.

Box 3: Case of Swedish Venture Capital

The fact that policy measures have made the environment more conducive to VC growth can be gauged by looking the Swedish Venture capital industry. Although Sweden was an early mover into venture capital (in 1973), venture capital was introduced in *an unsupportive environment for entrepreneurial activity* (The earlier system did not favor the formation of new firms resulting in an industry structure dominated by large enterprises). This was made possible as a result of government implementing regional initiatives that tried to compensate for the lack of social acceptance for entrepreneurs. These involved introducing tax incentives, deregulating the credit market as well as providing public development funds such as the Swedish Industrial Development fund (ALMI) in the late 1970s, the Swedish Business Development Agency (NUTEK) in 1991, and Stiftelson Innovationscentrum (SIC), found in 1994. This resulted in tremendous venture capital growth in the Swedish market especially in the period of late 1990s only to be stopped by the internet bubble burst of 2000.

A recent report by EVCA (2012b) does claim that European venture capital ecosystem has come of age and become a hotbed of entrepreneurial activity. It cites reasons such as highly experienced venture capitalists, a deepening of entrepreneurial talent pool, a number of success stories in a range of sectors such as life sciences, ICT, cleantech etc., as well as a more international outlook of European VCs who are selling companies all over the world instead of just domestic markets. Even though the number of IPO exits is decreasing, the average valuations of venture-backed companies have increased.

The seemingly better performance of European venture capital (particularly in north-western Europe) may at first seem to contradict the theoretical arguments on institutional advantage given so far, but if one digs deeper, one can attribute this success to 3 factors:

1) Evolution of financial systems over the years from predominantly bank based to a more hybrid system.
2) The fact that the new high-tech European start-ups are attracting a lot of their capital investments from US (where investors cite increasingly tough conditions or higher valuations in home market due to stiff competition for hot deals in silicon valley). Thus once can argue that the impetus is provided by a market economy. Moreover, the same report also stated that according to one European VC firm, "70% of their sales were in US dollars which implies that European VCs are "bypassing" the institutional constraints posed by domestic markets (such as smaller or less dynamic stock markets) by selling them to US companies/investors or **having IPO's on US exchanges**. This creates concern that the center of gravity of such companies will not stay in Europe. Moreover, obtaining a NASDAQ listing does not benefit the European financial services sector. This could be a possible direction of future research.
3) A number of favorable regulations and policy measures and public investments in top class R&D centers and universities. These policy

measures have promoted and created an entrepreneurial culture and thereby a niche industry of high-tech start-ups that, at the seed or growth stage, is not too much dependent on prevailing dominant institutions.

Some specific policy measures (at the European level) that can be taken are:

- Establishing a pan-European second tier stock market: There is a clear consensus of opinion that the NASDAQ market drives the US venture capital industry. The inference is therefore that the creation of secondary stock markets for smaller growing companies is crucial for the development of venture capital activity. A second tier market has the potential to fill the gap between the main exchanges and the non-regulated, informal markets where companies, venture capitalists and individuals buy and sell equity shares with or without intermediaries. There exist regional second tier markets in Europe but they suffer from liquidity and are often seen as inferior cousins to the main markets. A pan European stock market that caters to small company shares trading and under separate management could resolve liquidity problems by attracting institutional investors. Finally "an active IPO market can play a catalytic role in bringing about other changes- notably cultural changes (e.g. an active IPO market provides evidence that entrepreneurship is worthwhile) and the emergence of a specialist intermediary sector (e.g. dealers, investment banks)".[24]
- Induce environments to promote technological growth by easy sharing of information, Investing in R&D and enhancing vocational and traineeship programs that inculcate generic and more marketable skills. This can create a dynamic environment that leads to more start-ups.
- Lower taxes on entrepreneurship and businesses
- Introduce more attractive career paths for researchers who have an inclination towards innovation
- Popularize entrepreneurship as a career route in universities and establishing incubators that work in close association with universities in supporting young entrepreneurs to carry their ideas forward.
- Raise the portability of social security packages so as to increase mobility and facilitate spin-offs from existing companies in the form of new technology-based companies.

6.3 Directions of future research

A number of possibilities exist for future research. Some of them identified are as follows:

1) Remains to be seen how much European start-ups have contributed to European growth/employment.
2) Governments appear to be willing to finance early stage projects that would not be funded privately. To evaluate the usefulness of the

---

[24] see OECD (1996, p. 13)

government role, it is important to understand the economic value of these projects. If more data on returns were available, they could be used to better understand the role of government in venture capital.

3) A host of research possibilities would open up if data on how much the government spent for instance on guarantees, loans, subsidies, and tax incentives for a group of countries. This would help in evaluating the actual costs of VC policies.

4) To what extent can globalization of capital markets negate or compensate for the domestic institutional constraints in case of the venture capital industry? Moreover, how does attracting foreign capital through foreign IPO's adversely affect the domestic financial market?

6.4 Limitations of thesis study

1) Data unavailability: Use of VC investments instead of IRR to estimate the venture capital performance.

2) Missing data for a number of indicators like over the period under analysis. Reasonable assumptions were made to fill in the missing values.

3) Thesis doesn't provide a definite model determining VC investments, rather, it highlights important associations and linkages between a variety of indicators.

4) Lack of a reasonable indicator to distinguish between the type of human capital (or to measure the indicator "well endowed human capital") in the Anglo-Saxon and Continental European economies.

Bibliography

Akkermans, D., Castaldi, C., & Los, B. (2009). Do "liberal market economies" really innovate more radically than "coordinated market economies"? *Research Policy*, *38*(1), 181–191. doi:10.1016/j.respol.2008.10.002

Andersson, T., & Napier, G. (2007). *The Role Of Venture Capital. Global Trends And Issues From A Nordic Perspective* (p. 103). Malmo. Retrieved from http://www.iked.org/pdf/THE ROLE OF VENTURE CAPITAL,GLOBAL TRENDS AND ISSUES.pdf

Aoki, M. (1994). *The Japanese Firm: Sources of Competitive Strength* (p. 410). Oxford: Oxford University Press. Retrieved from http://books.google.com/books?hl=en&lr=&id=VPxQbLYppuYC&pgis=1

Beck, T, Demirguckunt, A., & Maksimovic, V. (2008). Financing patterns around the world: Are small firms different?☆. *Journal of Financial Economics*, *89*(3), 467–487. doi:10.1016/j.jfineco.2007.10.005

Beck, T., & Demirguc-Kunt, A. (2006). Small and medium-size enterprises: Access to finance as a growth constraint. *Journal of Banking & Finance*, *30*(11), 2931–2943. doi:10.1016/j.jbankfin.2006.05.009

Beck, T., Demirguc-Kunt, A., & Levine, R. (2000). A New Database on the Structure and Development of the Financial Sector. *The World Bank Economic Review*, *14*(3), 597–605. doi:10.1093/wber/14.3.597

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2003). Small and Medium Enterprises, Growth, and Poverty: Cross-Country Evidence. doi:10.1596/1813-9450-3178

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2001). Legal Theories of Financial Development. *Oxford Review of Economic Policy*, *17*(4), 483–501. doi:10.1093/oxrep/17.4.483

Beck, Thorsten, Demirgüç-Kunt, A., & Levine, R. (2009). Financial institutions and markets across countries and over time-data and analysis. World Bank Policy Research Working Paper 4943, May 2009. Retrieved from http://econ.worldbank.org/external/default/main?menuPK=64166093&pagePK=64165259&piPK=64165421&theSitePK=469382&repNo= WPS4943

Black, B. S., & Gilson, R. J. (1998). Venture capital and the structure of capital markets: banks versus stock markets. *Journal of Financial Economics*, *47*(3), 243–277. doi:10.1016/S0304-405X(97)00045-7

Borrus, M., & Zysman, J. (1997). Globalization With Borders. *Industry & Innovation*, *4*(2), 141–166. doi:10.1080/13662719700000008

Bygrave, W. D., & Timmons, J. A. (1992). *Venture Capital At The Crossroads* (p. 356). Harvard Business Press. Retrieved from http://books.google.com/books?hl=en&lr=&id=J1yUXKd3hA4C&pgis=1

Caballero, R. J., & Hammour, M. L. (1996). The Macroeconomics of Specificity. Retrieved from http://www.nber.org/papers/w5757

Casamatta, C. (2003). Financing and Advising: Optimal Financial Contracts with Venture Capitalists. *The Journal of Finance*, *58*(5), 2059–2086. doi:10.1111/1540-6261.00597

Čihák, M., Demirgüç-Kunt, A., Feyen, E., & Levine, R. (2012). Benchmarking financial systems around the world. World Bank Policy Research Working Paper 6175, August 2012. Retrieved from http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=469372&piPK=64165421&menuPK=64166093&entityID=000158349_20120831220007

Cumming, D., Schmidt, D., & Walz, U. (2010). Legality and venture capital governance around the world. *Journal of Business Venturing*, *25*(1), 54–72. doi:10.1016/j.jbusvent.2008.07.001

Da Rin, M., Nicodano, G., & Sembenelli, A. (2006). Public policy and the creation of active venture capital markets. *Journal of Public Economics*, *90*(8-9), 1699–1723. doi:10.1016/j.jpubeco.2005.09.013

Davidsson, P., Lindmark, L., & Olofsson, C. (1998). The Extent of Overestimation of Small Firm Job Creation – An Empirical Examination of the Regression Bias. *Small Business Economics*, *11*(1), 87–100.

Demirguc-Kunt, A., & Levine, R. (1999). Bank-Based and Market-Based Financial Systems: Cross-Country Comparisons. Policy research working paper series 2143. The World Bank. doi:10.1596/1813-9450-2143

Deutche Bank. (2010). *Venture Capital adds economic spice* (p. 6). Frankfurt. Retrieved from http://www.dvca.dk/uploads/Publikationer/Venture/SpiceII.pdf

Dosi, G. (1990). Finance, innovation and industrial change. *Journal of Economic Behavior & Organization*, *13*(3), 299–319. doi:10.1016/0167-2681(90)90003-V

Douglass C. North. (1991). *Institutions, Institutional Change and Economic Performance*. Washington: Washington University Press. Retrieved from http://www.cambridge.org/gb/knowledge/isbn/item1139799/?site_locale=en_GB

Eisinger, P. (1991). The State of State Venture Capitalism. *Economic Development Quarterly*, *5*(1), 64–76. doi:10.1177/089124249100500107

Elitzur, R., & Gavious, A. (2003). A multi-period game theoretic model of venture capitalists and entrepreneurs. *European Journal of Operational Research*, *144*(2), 440–453. doi:10.1016/S0377-2217(02)00144-3

European Commission. (2003). European Commission : CORDIS News. Retrieved July 29, 2013, from http://cordis.europa.eu/fetch?CALLER=EN_NEWS&ACTION=D&SESSION=&RCN=20220

EVCA. (2012a). *2012 Pan-European Private Equity and Venture Capital* (p. 76). Brussels. Retrieved from http://www.evca.eu/uploadedfiles/home/knowledge_center/evca_research/2012_Pan-European_PE&VC_Activity.pdf

EVCA. (2012b). *Smart Choice: The case for investing in European Venture Capital* (p. 29). Retrieved from http://www.evca.eu/publications/VC_report_interactive.pdf

Ferrary, M., & Granovetter, M. (2009). The role of venture capital firms in Silicon Valley's complex innovation network. *Economy and Society*, *38*(2), 326–359. doi:10.1080/03085140902786827

Florida, R. L., & Kenney, M. (1988). Venture capital-financed innovation and technological change in the USA. *Research Policy*, *17*(3), 119–137. doi:10.1016/0048-7333(88)90038-8

Global Entrepreneurship Monitor. (2004). *Global Entrepreneurship Monitor-2004 Executive report*. Retrieved from http://www.emekin.net/documentos/eu/GEM_2004_Exec_Report.pdf

Gompers, P. A. (1995). Optimal Investment, Monitoring, and the Staging of Venture Capital. *The Journal of Finance*, *50*(5), 1461–1489. doi:10.1111/j.1540-6261.1995.tb05185.x

Greenhalgh, C., & Rogers, M. (2010). *Innovation, Intellectual Property, and Economic Growth (Google eBook)* (p. 384). Princeton University Press. Retrieved from http://books.google.com/books?hl=en&lr=&id=hxLGq8NwciAC&pgis=1

Gugler, K., Mueller, D. C., & Yurtoglu, B. B. (2004). Corporate Governance and Globalization. *Oxford Review of Economic Policy*, *20*(1), 129–156. doi:10.1093/oxrep/grh008

Hall, B. H. (2002). The Financing of Research and Development. *Oxford Review of Economic Policy*, *18*(1), 35–51. doi:10.1093/oxrep/18.1.35

Hall, P. A., & Soskice, D. (2001). *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage* (p. 560). Oxford: Oxford University Press. Retrieved from http://www.amazon.com/Varieties-Capitalism-Institutional-Foundations-Comparative/dp/0199247757

Hege, U., Palomino, F., & Schwienbacher, A. (2009, June 1). Venture Capital Performance: The Disparity Between Europe and the United States. *Finance*. Presses univ. de Grenoble. Retrieved from http://www.cairn.info/article.php?ID_ARTICLE=FINA_301_0007

Hellmann, T. (1998). The Allocation of Control Rights in Venture Capital Contracts. *RAND Journal of Economics*, *29*(1), 57–76. Retrieved from http://www.jstor.org/stable/2555816

Howitt, P. (2007). Innovation, Competition and Growth: A Schumpeterian Perspective on Canada's Economy. C.D. Howe Institute Commentary No. 246. C.D. Howe Institute. Retrieved from http://www.cdhowe.org/pdf/temp/commentary_246.pdf

International Financial Corporation. (n.d.). Enterprise Surveys - What Businesses Experience. *World Bank Publications*. Retrieved March 29, 2013, from http://www.enterprisesurveys.org/

Jeng, L. a., & Wells, P. C. (2000). The determinants of venture capital funding: evidence across countries. *Journal of Corporate Finance*, *6*(3), 241–289. doi:10.1016/S0929-1199(00)00003-1

Jovanovic, B., & Nyarko, Y. (1994). "Learning By Doing and the Choice of Technology." Retrieved from http://www.nber.org/papers/w4739

Karlgaard, R. (2010). What Grows An Economy? *Forbes Magazine*. Retrieved June 27, 2013, from http://www.forbes.com/sites/richkarlgaard/2010/10/20/what-grows-an-economy/

Koenders, W. (2013). *Venture Capital Policies in the Netherlands*. Tilburg School of Economics and Management. Retrieved from http://www.nvp.nl/data_files/Master Thesis Willem Koenders - Venture Capital Policies in the Netherlands.pdf

Kortum, S., & Lerner, J. (2000). Assessing the Contribution of Venture Capital to Innovation. *RAND Journal of Economics*, *31*(4), 674–692. Retrieved from http://econpapers.repec.org/RePEc:rje:randje:v:31:y:2000:i:winter:p:674-692

La Porta, R., Lopez-de-Silane, F., Shleifer, A., & Vishny, R. (1998). Law and Finance. *Journal of Political Economy*, *106*, 1113–1155. Retrieved from http://works.bepress.com/florencio_lopez_de_silanes/18/

La Porta, R., Lopez-de-Silane, F., Shleifer, A., & Vishny, R. (1999). The quality of government. *Journal of Law, Economics, and Organization*, *15*(1), 222–279. doi:10.1093/jleo/15.1.222

La Porta, R., Lopez-de-Silane, F., Shleifer, A., & Vishny, R. W. (1997). Legal Determinants of External Finance. *American Finance Association*, *52*(3), 1131–50. Retrieved from http://ideas.repec.org/p/nbr/nberwo/5879.html

Lerner, J., & Schoar, A. (2004, March 8). Transaction Structures in the Developing World. Retrieved from http://www.nber.org/papers/w10348

Levine, R. (1997). Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature*, *35*(2), 688–726. Retrieved from http://www.jstor.org/stable/10.2307/2729790

Levine, Ross. (2002). Bank Based or Market Based Financial Systems: Which is better? Minneapolis.

Manigart, S. (1994). The founding rate of venture capital firms in three European countries (1970–1990). *Journal of Business Venturing*, *9*(6), 525–541. doi:10.1016/0883-9026(94)90020-5

Mann, R. J., & Sager, T. W. (2007). Patents, venture capital, and software start-ups. *Research Policy*, *36*(2), 193–208. doi:10.1016/j.respol.2006.10.002

Milgrom, P., & Roberts, J. (1990). The Economics of Modern Manufacturing: Technology, Strategy, and Organization. *The American Economic Review*, *80*(3), 511–528. Retrieved from http://www.jstor.org/stable/2006681

Moore, B. (1993). *Financial constraints to the growth and development of small high-technology firms.* Cambridge. Retrieved from http://www.opengrey.eu/item/display/10068/490010

OECD. (1996). *Venture Capital and innovation* (p. 121). Paris.

OECD. (2005). *OECD SME and Entrepreneurship Outlook - 2005 Edition*. Instanbul. Retrieved from http://www.oecd.org/industry/smes/oecdsmeandentrepreneurshipoutlook-2005edition.htm

Oehler, A., Pukthuanthong, K., Rummer, M., & Thomas, W. (2007). Venture Capital in Europe: Closing the Gap to the U.S. *Elsevier Finance*, 3–17. Retrieved from http://papers.ssrn.com/abstract=1659311

Porta, R. La, Lopez-de-Silanes, F., & Shleifer, A. (2008). The Economic Consequences of Legal Origins. *Journal of Economic Literature*, *46*(2), 285–332. doi:10.1257/jel.46.2.285

Rajan, R. G., & Zingales, L. (2001). Financial Systems, Industrial Structure, and Growth. *Oxford Review of Economic Policy*, *17*(4), 467–482. doi:10.1093/oxrep/17.4.467

Revest, V., & Sapio, A. (2010). Financing technology-based small firms in Europe: what do we know? *Small Business Economics*, *39*(1), 179–205. doi:10.1007/s11187-010-9291-6

Romain, A., & Pottelsberghe, B. van de la P. (2004). The determinants of Venture Capital: A Panel data Analysis of 16 OECD countries. Brussels.

Scharpf, F. W. (1997). *Games Real Actors Play: Actor-centered Institutionalism In Policy Research (Theoretical Lenses on Public Policy)* (p. 318). Westview Press. Retrieved from http://www.amazon.com/Games-Real-Actors-Play-Institutionalism/dp/0813399688

Schertler, A. (2003). Driving Forces of Venture Capital Investments in Europe : A Dynamic Panel Data Analysis. Retrieved from http://www.econstor.eu/handle/10419/17695
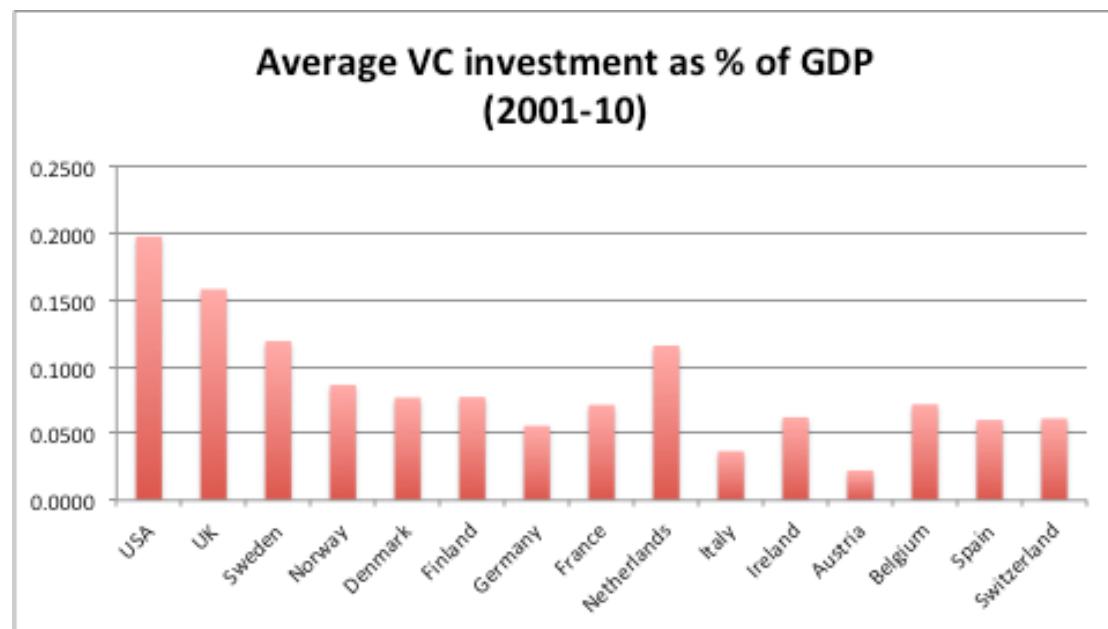
Schumpeter, J. A. (1942). *Capitalism, Socialism and Democracy*. New York: Harper and Brothers. Retrieved from http://www.u.arizona.edu/~zshipley/pol437/docs/Schumpeter.pdf

Scorbureanu, A., & Holzhausen, D. A. (2011). The Composite Index of Propensity to Risk.

Smith, A. (1776). *An Inquiry into the Nature and Causes of The Wealth Of Nations*. (Jim Manis, Ed.) (p. 786). Pennsylvania: Electronic Classic Series. Retrieved from http://pdf.thepdfportal.com/PDFFiles/36244.pdf

Solow, R. M. (1957). Technical Change and Aggregate Production Function. *Review of Economics and Statistics*, *39*, 312–320. Retrieved from http://www.alda.name/texty/Robert M. Solow - Technical Change and the Aggregate Production Function - 1957.pdf

Stiglitz, J. E., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review*, *71*(3), 393–410. Retrieved from http://www.jstor.org/stable/1802787

Taylor, M. Z. (2004). Empirical Evidence Against Varieties of Capitalism's Theory of Technological Innovation. *International Organization*, *58*(03), 601–631. Retrieved from http://journals.cambridge.org/action/displayFulltext?type=1&fid=236236&jid=INO&volumeId=58&issueId=03&aid=236234

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, *15*(6), 285–305. doi:10.1016/0048-7333(86)90027-2

The Economist. (2012). European entrepreneurs: Les misérables. Retrieved April 15, 2013, from http://www.economist.com/node/21559618

Titman, S., & Wessels, R. (1988). The Determinants of Capital Structure Choice. *Journal of finance*, *43*(1), 1–19. Retrieved from http://www.jstor.org/stable/2328319

Wagenvoort, R. (2003). Are finance constraints hindering the growth of SMEs in Europe? *EIB Papers*, *8*(2), 23–50. Retrieved from http://www.econstor.eu/handle/10419/44823

Wasmer, E., & Weil, P. (2004). The Macroeconomics of Labor and Credit Market Imperfections. *American Economic Review*, *94*(4), 944–963. doi:10.1257/0002828042002525

Westhead, P., & Storey, D. J. (1997). Financial constraints on the growth of high technology small firms in the United Kingdom. *Applied Financial Economics*, *7*(2), 197–201. doi:10.1080/096031097333763

World Bank. (2002). Financing Patterns Around the World: The Role of
    Institutions. Washington. Retrieved from
    http://elibrary.worldbank.org/content/workingpaper/10.1596/1813-
    9450-2905

Appendix

Appendix A: Venture Capital Investment Calculation

Table A-1: Average venture capital investment as a percentage of GDP

Calculated using absolute venture capital investments in Euros over the period
2001-2010. GDP values available in current US dollars were converted to Euro
amount using current exchange rates for every individual year.

Table A-2: Sample calculation of USA venture capital investments

Stage/Year	2005	2006	2007	2008	2009	2010
			US Data			
Seed	1006.3	1293.6	1819.6	1917.3	1870.7	1661.3
Early Stage	4056.3	4727.4	6081.5	5731	4906.9	5867
Expansion	8607.9	11154.8	11091.8	10857.4	6824.2	8702
Later Stage	9942	10441.5	12882.2	11420.1	6776.5	7085.4
Total(MillionUSD)	$ 23,612.50	$ 27,617.30	$ 31,875.10	$ 29,925.80	$ 20,378.30	$ 23,315.70
Exchange Rate Dollar/Eur	0.73	0.85	0.76	0.68	0.72	0.69
Total (Million Euros)	€ 17,237.13	€ 23,474.71	€ 24,225.08	€ 20,349.54	€ 14,672.38	€ 16,087.83

Appendix B: Correlations between Stock Market Development and Institutional Indicators

Table B-1: Correlation between Stock Market Capitalization ratio and Structure Aggregate indicator.

Correlations

		Stock_Mrkt_Cap	Struc_Agg(y-1)
Stock_Mrkt_Cap	Pearson Correlation	1	,621[**]
	Sig. (2-tailed)		,000
	N	300	300
Struc_Agg(y-1)	Pearson Correlation	,621[**]	1
	Sig. (2-tailed)	,000	
	N	300	300

**. Correlation is significant at the 0.01 level (2-tailed).

Table B-2: Correlation between Stock Market Capitalization ratio and Shareholder rights index

Correlations

		Market_Cap	Shareholder_ Rights
Market_Cap	Pearson Correlation	1	,588[*]
	Sig. (2-tailed)		,017
	N	16	16
Shareholder_Rights	Pearson Correlation	,588[*]	1
	Sig. (2-tailed)	,017	
	N	16	16

*. Correlation is significant at the 0.05 level (2-tailed).

Table B-3: Correlation between Stock Market Capitalization Ratio and investor Protection Index

Correlations

		Market_Cap	Invest_Protect ion
Market_Cap	Pearson Correlation	1	,452
	Sig. (2-tailed)		,079
	N	16	16
Invest_Protection	Pearson Correlation	,452	1
	Sig. (2-tailed)	,079	
	N	16	16

Table B-4: Correlation between Stock Market Capitalization Ratio and Efficiency Of Legal Framework

Correlations

		Market_Cap	Eff_Legal
Market_Cap	Pearson Correlation	1	,298
	Sig. (2-tailed)		,262
	N	16	16
Eff_Legal	Pearson Correlation	,298	1
	Sig. (2-tailed)	,262	
	N	16	16

Table B-5: Correlation between Stock Market Capitalization Ratio and Employment Protection Index

Correlations

		Market_Cap	Employment_ Protection
Market_Cap	Pearson Correlation	1	-,569[*]
	Sig. (2-tailed)		,022
	N	16	16
Employment_Protection	Pearson Correlation	-,569[*]	1
	Sig. (2-tailed)	,022	
	N	16	16

*. Correlation is significant at the 0.05 level (2-tailed).

Table B-6: Correlation between Stock Market Capitalization Ratio and Risk Aversion Index

Correlations

		Market_Cap	Risk_Aversion
Market_Cap	Pearson Correlation	1	-,331
	Sig. (2-tailed)		,247
	N	16	14
Risk_Aversion	Pearson Correlation	-,331	1
	Sig. (2-tailed)	,247	
	N	14	14

Table B-7: Correlation between Stock Market Capitalization Ratio and Legal Origin

Correlations

		Market_Cap	Legal_Origin
Market_Cap	Pearson Correlation	1	,550[*]
	Sig. (2-tailed)		,027
	N	16	16
Legal_Origin	Pearson Correlation	,550[*]	1
	Sig. (2-tailed)	,027	
	N	16	16

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix C: Regression Model using venture capital investment as percentage of GDP as dependent variable and Structure Aggregate, year and country dummies as independent variables using Stepwise elimination Method

Table C-1: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,436[a]	,190	,187	,0859207
2	,531[b]	,282	,277	,0810362
3	,561[c]	,314	,307	,0793144
4	,573[d]	,329	,320	,0786081
5	,585[e]	,343	,331	,0779347
6	,597[f]	,357	,344	,0772132

a. Predictors: (Constant), Struc_Agg(y-1)

b. Predictors: (Constant), Struc_Agg(y-1), Year

c. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland

d. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland, Italy

e. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland, Italy, Spain

f. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland, Italy, Spain, Germany

Final model, that is, model 6 has Structure Aggregate, Year, Switzerland, Italy, Spain and Germany as significant predictors

Table C-2: ANOVA test and F statistic for Final Regression Model

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,516	1	,516	69,897	,000[b]
	Residual	2,200	298	,007		
	Total	2,716	299			
2	Regression	,766	2	,383	58,292	,000[c]
	Residual	1,950	297	,007		
	Total	2,716	299			
3	Regression	,854	3	,285	45,245	,000[d]
	Residual	1,862	296	,006		
	Total	2,716	299			
4	Regression	,893	4	,223	36,132	,000[e]
	Residual	1,823	295	,006		
	Total	2,716	299			
5	Regression	,930	5	,186	30,631	,000[f]
	Residual	1,786	294	,006		
	Total	2,716	299			
6	Regression	,969	6	,162	27,092	,000[g]
	Residual	1,747	293	,006		
	Total	2,716	299			

a. Dependent Variable: VC(y)

b. Predictors: (Constant), Struc_Agg(y-1)

c. Predictors: (Constant), Struc_Agg(y-1), Year

d. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland

e. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland, Italy

f. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland, Italy, Spain

g. Predictors: (Constant), Struc_Agg(y-1), Year, Switzerland, Italy, Spain, Germany

Table C-3: Standardized Beta Coefficients for the Final Regression Model

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,058	,006		9,569	,000
	Struc_Agg(y-1)	,014	,002	,436	8,360	,000
2	(Constant)	15,360	2,482		6,188	,000
	Struc_Agg(y-1)	,025	,002	,788	10,457	,000
	Year	-,008	,001	-,464	-6,165	,000
3	(Constant)	16,894	2,464		6,857	,000
	Struc_Agg(y-1)	,027	,002	,849	11,242	,000
	Year	-,008	,001	-,511	-6,833	,000
	Switzerland	-,070	,019	-,185	-3,746	,000
4	(Constant)	16,711	2,443		6,841	,000
	Struc_Agg(y-1)	,027	,002	,841	11,235	,000
	Year	-,008	,001	-,505	-6,815	,000
	Switzerland	-,073	,019	-,192	-3,927	,000
	Italy	-,046	,018	-,121	-2,519	,012
5	(Constant)	17,004	2,425		7,013	,000
	Struc_Agg(y-1)	,027	,002	,853	11,466	,000
	Year	-,008	,001	-,514	-6,985	,000
	Switzerland	-,077	,019	-,203	-4,165	,000
	Italy	-,049	,018	-,129	-2,718	,007
	Spain	-,045	,018	-,118	-2,474	,014
6	(Constant)	17,128	2,403		7,128	,000
	Struc_Agg(y-1)	,028	,002	,858	11,634	,000
	Year	-,009	,001	-,518	-7,099	,000
	Switzerland	-,082	,018	-,214	-4,410	,000
	Italy	-,053	,018	-,139	-2,944	,003
	Spain	-,049	,018	-,128	-2,704	,007
	Germany	-,046	,018	-,121	-2,553	,011

a. Dependent Variable: VC(y)

Appendix D: Regression Model using Venture Capital Investment as dependent variable and institutional and financial indicators as independent variables using Stepwise elimination method

Table D-1: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,819[a]	,671	,644	,0293212
2	,885[b]	,783	,744	,0248576

a. Predictors: (Constant), Avg_Struc_Agg

b. Predictors: (Constant), Avg_Struc_Agg, Employment_Protection

Final Model that is model 2 has Structure Aggregate and Employment Protection as the most significant predictors

Table D-2: ANOVA test and F statistic

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,021	1	,021	24,492	,000[b]
	Residual	,010	12	,001		
	Total	,031	13			
2	Regression	,025	2	,012	19,887	,000[c]
	Residual	,007	11	,001		
	Total	,031	13			

a. Dependent Variable: VC_invest

b. Predictors: (Constant), Avg_Struc_Agg

c. Predictors: (Constant), Avg_Struc_Agg, Employment_Protection

Table D-3: Standardized Beta Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	,011	,017		,625	,544		
	Avg_Struc_Agg	,037	,008	,819	4,949	,000	1,000	1,000
2	(Constant)	,064	,027		2,406	,035		
	Avg_Struc_Agg	,031	,007	,688	4,565	,001	,867	1,153
	Employment_Protection	-,020	,008	-,360	-2,387	,036	,867	1,153

a. Dependent Variable: VC_invest