

Explaining Variations in Private Equity: A Panel Approach

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Abstract:

This study employs a panel approach to investigate factors that influence the development of private equity markets over time and across countries. The empirical evidence indicates that profitable exit options are essential to the growth and development of private equity across both time and countries. The opportunity cost of investing is also found to be important. Moreover, the evidence strongly supports the hypothesis that venture capital investing and patent screening are positively related. Across countries the evidence suggests that institutional features that support property rights and contract enforcement and that facilitate information flow and expectations formation contribute to more robust private equity markets.

1. Introduction

Private equity (PE) investments generally and venture capital (VC) funds specifically have been driving forces behind the innovation and stunning economic growth in some of the most influential sectors of the American economy. Venture capital investments have been instrumental in the emergence of such organizations as Ariba, Yahoo!, Microsoft, Dell, Cisco, and Sun Microsystems to name but a few. During the past decade these funds have also been credited with contributing to the explosive growth of broader financial sectors in the United States and countries such as Ireland and Israel. PE funds have enabled risky, innovative, entrepreneurial activity by overcoming liquidity constraints, mentoring young firms and facilitating more efficient allocations of financial resources. These activities have contributed to real sector growth and may foster an economy's ability to sustain non-inflationary economic expansions.

Although there is consensus with respect to the importance of private equity investing, a large discrepancy exists in private equity market development even among the world's most industrialized nations. Currently, the United States (US) and the United Kingdom (UK) have the broadest and most developed private equity markets in the world. According to the European Venture Capital Association (EVCA), United States was the worldwide leader in 1999 with private equity funds totaling \$98 billion. The United Kingdom followed with \$12 billion of funding (*EVCA Yearbook*, 2000).

The United States' notable lead is not surprising in light of its earlier establishment of a venture capital industry, a culture more inclined to take economic risks, early commercial exploitation of new technology and the backing of large state pension funds. However, while the absolute levels of VC investments in the United States have far exceeded those exhibited throughout the rest of the world, the recent rate of growth in private equity funding in Western Europe has outpaced that of the US. In fact, between 1994 and 1999 Western European VC grew at a rate of approximately 40% per year. Despite the dot.com bust, the correction in the equity

markets, and the sudden dearth of initial public offerings at the end of the twentieth century, venture capital investment in Europe was at an all-time high.

The EVCA points out that European venture-backed companies increased revenues by an average of 35% a year from 1991-1995, more than twice as fast as revenue growth of the leading European companies. In addition, venture-backed firms showed a 15% annual rise in employment over that same time period. This was seven times greater than the employment generated in the top 500 European companies (*EVCA Yearbook*, 1997). Clearly, venture-backed industries have made a significant contribution to European economic growth and international competitiveness. However, not all European nations have benefited to the same extent.

This heterogeneity in national venture capital markets provides the impetus to the study presented here. Our research produces insights with respect to the issue of the determinants of private equity for nine countries, Finland, France, Germany, Ireland, Italy, Portugal, Spain, the UK and the US between 1986 and 1999. Leading contemporary scholarship describes in detail one or a limited combination of relevant determinants of VC market development for a particular country across time or for a group of countries at one point in or averaged over time. This study extends and synthesizes all approaches by employing a pooled time series cross-sectional (TSCS) system to empirically investigate the issue. The approach accommodates the complexity in causal dynamics across multiple cases or units by incorporating the ability for space and time to interact. It is novel in that it allows for joint examination of economic determinants over time and institutional factors across countries, thereby broadening our understanding of the optimal environmental conditions for the development of a robust PE market.

Results indicate that over time and countries profitable exit options are a key determinant of venture capital activity. The hypothesis that venture capital and screening are positively related is also strongly supported by the array of results presented here. In fact, the evidence suggests that patent screening by patent authorities combined with intellectual property rights enforcement leads to significantly higher levels of PE activity. When these activities are combined with the

screening and mentoring provided by venture capitalists [see e.g. Kaplan and Stromberg (2001b)] a virtuous cycle for private equity may result. The opportunity cost of investment is also found to be significant, especially in countries that rely more heavily on conventional sources of financing. Additionally results suggest that the business cycle may influence PE markets. However, the impacts evidenced here vary across countries and are not generally consistent with existing theories or empirical evidence. Finally, across countries empirical results support the notion that institutions are significant determinants of robust VC markets. Specifically, institutions that support property rights and contract enforcement and information flow and expectations contribute to healthier private equity markets.

The paper is organized as follows. Section 1 is the introduction. Section 2 reviews the literature on venture capital investment and the links between financial market development and economic growth. Section 3 presents a brief discussion of private equity for the nine countries studied here. It also outlines the array of independent variables included in the empirical analysis. The fourth section presents the methodology and empirical results and discusses the implications of the findings. Section 6 concludes.

2. Literature Review

Historically, matching entrepreneurs with those willing to fund their ideas was the role of wealthy individuals or institutions willing to take the risk. According to Gompers and Lerner (1999a) this relationship between investor and entrepreneur has existed since the time of Hammurabi in the Babylonian era. In the modern era venture capital fills this role.

As Gompers and Lerner (1999a) point out, the first modern venture capital firm, American Research and Development (ARD), appeared at the close of World War II. It was founded by the president of the Massachusetts Institute of Technology, who along with local business leaders, sought to commercialize the technologies developed for the war. Despite ARD's success, only a handful of other venture firms followed, generally structuring themselves as publicly traded, closed-end funds. In the early years, the annual flow of money into these funds

never exceeded several hundred million dollars. However, during the late 1970's and early 1980's funds flowing into the venture capital industry in the United States increased dramatically. The increase, in large part, is attributable to a 1979 ruling that allowed pension funds to invest money in venture capital and other higher risk investments. Concurrently the rise of the limited partnership evolved as the dominant organizational form.

Startup companies, the typical recipients of VC investments, operate in relatively new markets where information is incipient, scarce or simply unavailable. These firms usually do not have a past record that can be used to measure their performance and the majority of their value lies in the potential for future growth rather than current or tangible assets. As a result, there are large costs due to administration, information gathering, and search efforts that coincide with funding a startup company. The costs of matching ideas and funding are attributable to the presence of adverse selection and moral hazard, issues that characterize the principle-agent problem in financial contracting [see e.g. Hart (2000) for a review of the principle-agent issue and Kaplan and Stromberg (2000, 2001b) for a discussion of VC contracting specifically]. Furthermore, Atje and Jovanovich (1993) explain that because the riskier and possibly more productive investments are illiquid, investors wishing to participate must rely on financial intermediaries to disperse the risk and provide liquidity. This information and financing void has led to the emergence of venture capitalists to fill the role of financial intermediaries for startup companies.

The startup firms typically funded by venture capitalists present a unique set of issues for corporate governance and place particular demands on monitors of financial performance. Jensen (1993) describes the type of investor suited for these startup companies as an "active investor." Active investors are those that have large financial interests in their investments and that also provide an impartial view of individual firm management. To paraphrase Kaplan and Stromberg (2001b), they exert costly effort to improve (company) outcomes. Due to legal constraints that prohibit holding large equity stakes in a company or being actively involved on a company's

board of directors, many of the most common financial intermediaries such as pension funds, banks, insurance companies, and money managers are typically unable to perform the role of active investors.

Sahlman (1990) finds that venture capitalists fill this niche. He points out that the structure and governance of venture capital organizations promote this role. He notes that the life of a venture capital fund is limited. This implies that the limited partners can refuse to invest beyond their initial commitment thereby aligning the interests of investors and managers. Moreover, the partnership structure usually limits the amount of capital that can be invested in a single venture promoting diversification across an array of high-risk investments. In addition, many VC contracts call for mandatory distribution of realized gains. This prevents the fund from increasing its risk without an increase in the return on its capital.

Gompers and Lerner (1997) build on the work of Sahlman (1990) by producing comprehensive research on the role and structure of VCs. Their study presents a number of findings that have become “conventional wisdom” with respect to the role of the PE industry. First, venture capitalists represent a viable solution to financing high risk and potentially high return opportunities. These types of companies have difficulty obtaining bank funding or debt financing because of the lack of assets and uncertain cash flows. In order to solve this problem, venture funds are structured as limited partnerships with a lengthy investment time horizon to allow for business development. Venture capitalists also provide a much-needed filter of entrepreneurial ideas through an intensive review and selection process. This process effectively reduces the adverse selection problem inherent in business funding. In addition, venture capitalists intensely monitor their portfolio of companies and require substantial control over companies’ business decisions. This reduces moral hazard. Finally, venture investors play a key role in managing the exiting of these investments through either initial public offerings (IPO) or merger and acquisition (M&A) opportunities.

The work of Gorman and Sahlman (1989), Lerner (1995), Kaplan and Stromberg (2000), Hellman and Puri (2000a,b) and Quindlen (2000) further support the observations of Sahlman (1990) and Gompers and Lerner (1997) with respect to the value added of VC activity. Evidence indicates that VCs aid in recruiting the senior management team and/or minimizing the impact of management turnover (Lerner, 1995 and Kaplan and Stromberg, 2000). VC-financed firms are more likely and faster to professionalize by adopting stock option plans, hiring a VP of sales, and bringing in a CEO from the outside (Hellman and Puri, 2000b). And, VC-associated firms experience a shorter time-line with respect to bringing a product to market (Hellman and Puri, 2000a).

The structure of VC contracts further buttresses the value added associated with venture investing. It also provides the essential organizational infrastructure for active investors. Kaplan and Stromberg (2001a) review the characteristics of VC contracting. They find that VC cash-flow rights matter in a way that is consistent with principle-agent theories; cash-flow and control rights can be separated and made contingent on observable and verifiable measures of performance; voting rights, board rights and liquidation rights are allocated in a manner that returns control to the VC if company performance is poor; and, commonly, VCs include non-compete and vesting provisions to reduce the probability of holdup. They conclude that the array of findings is consistent with financial contracting theory.

The recent focus on understanding the nature and structure of venture capital is a result of the recognition that venture-backed companies have a role to play in promoting entrepreneurship, innovation, and economic growth. Consistent with the evidence provided by the EVCA and presented in the introduction, a study by the National Venture Capital Association (NVCA) found that venture-backed firms in the United States create jobs at a far faster rate than Fortune 500 companies. Venture-backed companies have also done well even when compared to other high-growth companies. In 1995 annual revenue growth for venture-backed high growth companies was 36.8% compared to 23.8% for non-venture backed high growth companies. Furthermore,

many of these venture capital investments have been instrumental in the development of new technologies (*NVCA Yearbook*, 1997).

Keuschnigg (2000) develops a theoretical model that explicitly outlines the VC-growth connection. He extends the 2-period overlapping generations model of Diamond (1965) to build a model that “explores how the joint inputs of both entrepreneurs and VCs determine the prospects of start-up firms.” (pg.3). He uses the model to study the impact of the quality of VC finance on entrepreneurship and innovation in general equilibrium thereby providing the theoretical link between the VC industry and growth.

Kortum and Lerner (2000) empirically scrutinize the relationship between venture capital funding and innovation. In their examination of the American manufacturing sector, they find that venture capital is associated with a substantial increase in innovation and patenting. A dollar of venture capital is found to be about three times more potent with respect to innovation than a dollar spent on traditional corporate research and development (R&D). They conclude that venture dollars accounted for 14% of total US innovation by 1998. And, while venture capital averaged less than 3% of corporate R&D expenditures from 1983 to 1992, it was responsible for nearly 8% of industrial innovations over the period.

Kortum and Lerner (2000) acknowledge that, in the association between VC and innovation, higher levels of innovation might be a reason for increased venture funding. That is, reverse causality may be present. However, Gompers and Lerner (1999a) examined whether venture capital actually drives innovation or simply leads to a larger number of lower-quality patents. The results indicate that venture capitalists are more familiar with protecting innovations and utilize that ability to apply for patents. In addition, the patents applied for by venture-backed companies are found to be of a higher quality and are more often cited by other patents. Gompers and Lerner and Kaplan and Stromberg (2001b) suggest that venture capitalists’ enhanced ability to screen patents, startup firms and investment opportunities may account for these findings.

Due to the prevalence of asymmetric information and moral hazard issues associated with VC, true venture markets are only present in countries with relatively well-developed, established financial sectors. Well-developed financial sectors have been found to be a significant determinant of economic growth. In fact, in a study of 47 different countries, Levine and Zervos (1998) find that a number of different measures of financial sector development are positively associated with growth. The transmission mechanisms are hypothesized to be more efficient allocation of funds, capital accumulation, and the technological innovation these funds foster. Pagano (1993) outlines the theoretical links.

Furthermore, Levine and Zervos (1998) find that financial market liquidity is a key factor in determining economic growth. Additionally, the current literature on entrepreneurship finds that liquidity constraints are some of the biggest problems faced by entrepreneurs in the early stages of business development [see e.g. Evans and Jovanovich (1989)]. With respect to startup firms, venture capitalists play a crucial role by providing a matching function between those who have excess funds and those who need them. Thus venture capital also fosters entrepreneurship and growth by reducing problems faced by young businesses due to liquidity constraints.¹

Given the connections between financial market development, PE market development and growth, recent empirical efforts have concentrated on discerning the critical factors that determine and promote healthy PE markets. Black and Gilson (1997) were two of the first to explore the characteristics of financing as determinants of venture capital. In particular, they emphasize the importance of equity versus bank financing. Their work examines the capital structures of Japan, Germany, and the United States in order to explore the spectrum of possible financing methods prevalent in industrialized countries. Results indicate that an active IPO market is a key determinant of venture activity due to the fact that initial public offerings provide

¹ Evans and Jovanovich (1989) point out that potentially liquidity constraints might be surmounted by large corporations playing an active role in the development of startup companies with innovative ideas. However, there are many issues that make this an inefficient form of corporate governance for startup firms. For example, Hardyman, DeNino and Salter (1983) find that legal difficulties often arise over whether the large company has access to the startup's proprietary information. Sahlman (1990) points out

quick, profitable exits for the investor. The second and less obvious reason that IPOs are important is that an IPO may alter control of the company. Black and Gilson describe the implicit change of control as a major reason that the entrepreneur prefers an IPO exit. At the time of the public offering, the venture investor has the option of selling his stake in the company.

Frequently, this entails a reduction in the number of board seats the investor is entitled to and therefore, a limitation on the amount of control the venture capitalist wields. For an entrepreneur, this setup is desirable because it effectively returns control of the company back to the creator.

Black and Gilson (1997) find that in Germany, the majority of capital is derived from bank lending. This limits exit options for German firms to stock buy-backs or M&A transactions. Frequently, multiples related to these exit activities are far lower than a traditional IPO, making the entire process less lucrative for the investor. Similarly, in Japan the majority of financing activity is through bank lending. This results in the same dearth of exit options, lower potential for profit and control issues that German venture-backed companies face.

Belke, Fehn and Foster (2002) point out that even in countries such as Japan or Germany that do not have restrictions on banks holding equity in companies, the banking sector is not as efficient in filling the role of corporate governance for startup companies. Frequently, these banks lack the specialization, focus, and managerial involvement necessary to help startups. For example, Edwards (1994) notes that German banks do not play an active role in management and that bank representation on the board of directors is very rare. This may further reduce the potential for profitability and/or extend the development phase.

Ritter (1998) also focuses on the role of the IPO exit in promoting venture capital development. He addresses the problems associated with raising capital from a small number of investors who play an active role in managing the firm. As long as the firm remains a private entity, any equity investment is illiquid. As the firm becomes larger, conflicts between

that the approval process within large corporations is slow and ineffective. In addition, the entrepreneur is not sufficiently motivated due to the lack of equity stake in the new firm.

entrepreneurs and venture capitalists may arise and private financing may instead, become a disadvantage. This is the point in the life cycle of a firm's financing at which it is optimal to go public. According to Ritter, venture capitalists are willing to finance firms knowing that an active IPO market will allow them to cash out as friction rises and/or the firm succeeds. Therefore, he argues that the greater opportunity for IPOs in the American market has helped to create and fund young companies especially in the most highly innovative sectors of the economy.

Jeng and Wells (2000) produce one of the most comprehensive empirical assessments of factors that determine the growth and development of venture capital markets. Their approach is similar in spirit to this investigation. They employ a 21-country cross-section of ten year averages to model both the supply and demand for venture capital funds. The model incorporates IPOs, accounting standards, GDP growth, and market capitalization as determinants of the supply of venture capital funds. The demand for venture capital is a function of the factors noted above, as well as labor market rigidities. Consistent with the research of Ritter (1998) and Black and Gilson (1997), their results indicate that initial public offerings are the most important factor in determining venture capital funding. In addition, private pension funds are found to be a significant determinant of funding in certain sub-periods.

The sub-period results with respect to the importance of pension funds lead Jeng and Wells (2000) to postulate that government policy can have a strong impact on VC. Implicit in their discussion of government policy are the different legal traditions, tax codes and government regulations that influence the environment for venture capital activity. According to the authors, active government involvement has been able to generate venture capital investments where it otherwise would have been non-existent.

One such example noted above is investment regulations of pension funds and other large investment vehicles. In the eight years following the decision to allow American pension funds to invest in VC the amount of money invested in new venture funds in the US soared from \$481 million to nearly \$5 billion with pension funds accounting for nearly half of all

contributions (Gompers and Lerner, 1999a). Germany has witnessed a similar increase in venture capital funding since easing restrictions on pension fund contributions to private equity investments. In addition, Ireland experienced a large increase in PE investments in 1994 as a result of government's recommendation to increase private equity investments by pension funds (Jeng and Wells, 2000).

These observations are consistent with an emerging body of work which suggests that domestic institutional features as well as government policy are important factors influencing the robustness of the financial and business sectors generally. Recent work by Johnson, McMillan and Woodruff (2002) finds that in post-communist countries those with weak property rights experience less reinvestment of profits. This finding leads them to conclude that property rights are necessary for "entrepreneurs to take full advantage of opportunities to invest" (pp. 3-4). Moreover, at low levels of institutional development they conclude that secure property rights are both necessary and sufficient for investment. Djankov, La Porta, Lopez-de-Silanes and Shleifer (2000) have produced evidence that supports the notion that weak property rights increase barriers to entry. Berkowitz and DeJong (2000) find that the rate of new firm formation is associated with the degree of local reform.

With respect to the issue of external financing, Demirguc-Kunt and Maksimovic (1998) find that less external investment occurs in countries where property rights are weak. Similarly the work of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998, 2000) shows that when the legal system is stronger and organizations are more transparent more external funds are available to the firm. In the La Porta et.al (1997) work, a variety of countries are examined with respect to their levels of capital market development and legal traditions. Utilizing a sample of 49 countries, the authors find that common law countries give investors stronger legal rights than civil law countries by providing better legal protection to shareholders, better creditor rights, and requiring better accounting standards and business practices (which promote transparency). Thus,

the results are striking: English common law countries as a whole, vastly outperform the civil law countries in promoting developed financial markets.

3. Private Equity and Its Determinants

3.1 Private Equity

Private equity investments are investments held by institutions and high net worth investors in both publicly and privately held companies in which the investors play an active managerial role. The major types of financing included under the umbrella of private equity are venture capital and management or leveraged buyouts (LBO). In the United States, venture capital refers to seed, early-stage, and expansion investments in companies. The American definition of venture capital does not include any type of buyout or re-capitalizations. In contrast, European PE includes all early stage activity (venture activity) as well as buyouts and market re-capitalizations. Consequently, this study employs the more general private equity measure as our metric for venture activity.

The *EVCA Yearbook* is the source for the PE series and all of the market summaries that follow for all of the countries included in our sample except the US. The *NVCA Yearbook* provides the US data and market summary information. To minimize issues that may arise due to varying country size, private equity funding is reported as a percentage of each country's GDP in billion of dollars. Graphs of these series for our nine countries are presented in Figures 1 through 9 in the Appendix and are discussed below.

As can be seen in Figure 1, Finland's private equity investing did not really begin to grow until the mid 1990's. To date, investments remain highly concentrated in the technology sector, with 46.7% of funds allocated towards high-tech companies. However, after only 15 years the industry has become highly active and plays a major role among institutional investors. Government-backed funding for startup companies provided the impetus to the VC industry in the early 1980's. More recently the role of government has diminished as the industry has continued to mature. The stability of the Finnish legal and fiscal environment as well as domestic

economic growth and solid stock market performance at the end of the 1990s have all contributed to strong recent performance. In addition, Finland has witnessed an increase in “business angel” investing due to the many entrepreneurial successes over the past few years. This has helped propel the total amount of divestments from FIM 320 million in 1998 to FIM 507 million in 1999, when seven companies were divested by IPO, the majority of them on the Helsinki Exchange.

In Figure 2 we present the French PE market series. In France the private equity industry is very specialized. It is comprised of three principal fund structures that focus on particular industries or stages of financing. In addition, divestment by means of a LBO has been the major exit strategy followed by trade sales, sales of a company to a larger, more established company, and public sales of equity. France witnessed a large increase in the number of private equity funds operating in 1999 due to a favorable economic environment and the rapid expansion of European high-growth stock exchanges. These developments have improved exit opportunities for investors. The close of the 1990’s also saw the introduction of several legal and fiscal measures which have encouraged venture capital investment and help explain the notable upturn in PE activity after 1997.

Figure 3 shows that German private equity investments experienced an upsurge in the late 1990s. This “boomlet” in private equity follows years of sluggish activity due to German reunification, poor institutional infrastructure and slow economic growth. After only DM 2.6 billion in 1997 and DM 3.8 billion in 1998, the amount of new funds invested in PE jumped to DM 6.2 billion in 1999. This has been the result of a number of factors. The creation of the “Neuer Markt” stock exchange has produced the potential for more successful exits through initial public offerings. More than 50% of the companies listed on the Neuer Market are or were backed by venture funding. In addition, a 1999 tax reform reduced many important corporate tax rates and eliminated the capital gains tax on specific investment opportunities. Finally, in the last

decade an increasing number of incubators have focused on supporting the high technology sector.

Economic growth in the Irish economy has been among the highest of all OECD countries in recent years. This has resulted in low rates of unemployment and stable interest rates, creating a very favorable investment climate. In addition, the legal and fiscal environments have been largely supportive of the private equity industry. One key feature has been the relatively low capital gains tax that has encouraged many entrepreneurs who sold businesses to reinvest, especially in the high-tech sector. As can be seen in Figure 4, Ireland's private equity market has been a beneficiary of these advantageous conditions. Total new funds flowing into the Irish PE market doubled from 1998 to 1999 and almost half of the new funds raised were allocated toward high-tech. Beginning in 1994 the government endorsed increasing private equity investments from pension funds. This change accounts for the spike in Irish PE activity in Figure 4. The most common exit strategies are trade sales and company stock buy-backs. In the Irish market, exiting through an initial public offering arises in a limited number of circumstances and those that do occur typically take place on the London Stock Exchange.

The Italian private equity series is displayed in Figure 5. It has experienced steady growth that has accelerated in the last few years. The recent performance has been spurred by the introduction of several important regulatory reforms, most notably with respect to corporate and investment tax laws. In addition, there has been an increasing trend toward greater specialization of private equity, primarily in the high-tech sector. In fact, the total amount invested in high-tech grew by over 225% from 1998 to 1999. Trade sales remain the most common method of divestment, however their relative share fell from 58% in 1998 to 37% in 1999.

Figure 6 indicates that private equity in Portugal underwent two periods of rapid growth, one during the 1980's and the other during the early 1990's. However, a slowdown in the Portuguese economy in the middle of the 1990's limited the amount of funds available as well as the number of profitable business opportunities. Legal and fiscal reforms undertaken in 1998

produced a new venture capital legal framework. The effort was aimed at fostering growth in the private equity industry and, as is evident in Figure 6, it has been relatively successful. The majority of divestments, however, are still in the form of trade sales. Yet 19% of divestments in 1999 were accomplished through the sale of equity as compared to only 4% one year earlier.

Private equity activity in Spain began in the mid 1970's, mainly as a result in the government's interest in venture capital as a mechanism to allocate money for regional development. However, from 1987 on the industry's growth can be attributed to private venture capital funds. In Figure 7 the PE series is presented. In Spain, the lack of a favorable environment for venture capital led to diminishing importance of start-up companies until the late 1990's. Since 1997, the economic reforms that have coincided with Spain's participation in the European Monetary Union have encouraged economic growth and the flow of money into private equity. Additionally, the Spanish government has become increasingly interested in developing an environment for small and medium sized companies and as a result has passed legislation offering tax incentives to venture capital investors. Consequently, total funds under management nearly doubled between 1996 and 1999. Trade sales have historically been the most common exit strategy for Spanish venture investments. More recently, however, there have been a number of changes including the establishment of a new stock market designed to facilitate IPOs.

As can be seen in Figure 8, the United Kingdom is home to the largest private equity industry in Europe accounting for 46% of total European PE activity in 1999. In the UK, private equity is funded primarily from institutional investors such as pension funds and insurance companies. The market for private equity has experienced rapid growth since the mid 1980's due to the strong performance of the British economy, the establishment of a secondary stock market, continuing improvement in the entrepreneurial environment, and a recent surge in high technology and internet related ventures. In addition, the UK has one of the most favorable legal and fiscal environments for private equity in Europe.

Finally, a graph of the American PE series is presented in Figure 9. The United States is home to the largest and most developed private equity industry in the world. As noted in Section 2, the US has been the pioneer in modern venture capital investing. However, it was only following the 1979 ruling that allowed pension funds to invest money in venture capital and other higher risk investments that the volume of funds flowing into the American VC industry began to significantly expand. Over the past two decades the private equity industry in the US has raised an impressive volume of funds from both individual and institutional investors. The technology boom and the emergence of the NASDAQ stock market helped propel venture capital investments to record levels at the end of the 20th century.

3.2 Determinants

One of the key factors cited in the success of venture markets in the US and the UK has been the presence of a viable and profitable exit mechanism. This feature has been regarded as the critical determinant of venture funding. As noted above, Black and Gilson (1997) and Ritter (1997) point out that the existence of IPOs as an exit mechanism increases profitability and enables managers to reestablish their control over the firm. A study conducted by NVCA found that \$1.00 of venture capital invested in a firm that eventually goes public yields a 195% average return over a four year holding period. The same investment in a firm that is acquired by another firm provides only a 40% average return (*NVCA Yearbook*, 1998).

However, initial public offerings are only one potential exit strategy for a venture capital investment. As was pointed out above, in the majority of European markets trade sales are the most common exit mechanism. According to Jeng and Wells (2000) the percentage of divestments accounted for by trade sales from 1991-1995 in various European markets ranged from 30% in the United Kingdom to 76% in Portugal. Thus, while IPOs might be considered the most precise measure of the availability of profitable exit strategies, market capitalization represents a more general proxy for exit options across the array of diverse countries included in our sample.

The equity market capitalization series employed here is provided by Global Financial Data. It is divided by billions of dollars of domestic GDP. As is the case with the private equity series, this adjustment has been made to accommodate cross-sectional issues that may arise due to country size. These market capitalization series reflect the relative breadth, depth and liquidity of each country's equity market thereby proxying for the potential for a quick, profitable exit.

The state of a country's economy has also been postulated to affect venture capital market growth and development. According to Arcs and Audertsch (1994) macroeconomic fluctuations have a profound influence on business startup activity. Results from their work indicate that expansions are found to lead to an increase in the number of startup firms. Since an increase in startup activity requires additional funding, GDP growth should increase the demand for venture capital funds. In addition, GDP growth leads to enhanced business opportunities, more economic success, and a more favorable environment for investors. This serves to increase the supply of venture capital funds available in an economy. While Jeng and Wells (2000) invoke just such reasoning, their empirical results find no support for it. Consequently, inclusion of the rate of growth of GDP should shed light on this confounding issue.

The IMF's International Financial Statistics Yearbook provides country GDP data. It is reported in local currency and accompanied by dollar exchange rates thereby facilitating the conversion of each nation's GDP into dollars. The annual GDP deflator for each country is employed to convert each series to real values from which real GDP growth rates are derived.

The real interest rate in the economy represents the opportunity cost of holding/investing money. It is a reflection of the real return on investment, the market consensus with respect to risk and the market clearing price for loanable funds. Higher interest rates suggest limited sources of borrowing for a given demand or an excess demand for funds given supply. In either case the access of firms to conventional funding is restricted. With respect to the VC industry, angel investors and countries that rely more heavily on bank lending may be especially sensitive to opportunity costs. Therefore, the real rate that banks charge corporations for borrowing is

included in our model to calibrate the potential impact of opportunity costs on VC activity. For all countries the data series are drawn from the IMF's International Financial Statistics.

The percentage of patents granted and denied may reflect the level of innovation and regulation in an economy respectively. Reasoning suggests that more innovative economies are more likely to have greater VC activity while economies that are more heavily regulated will have less. Additionally, innovation may be associated with labor market flexibility. Jeng and Wells (2000) argue for this connection while Sahlman (1990) discusses the drag that labor market rigidities place on entrepreneurship and venture investing. Finally, patenting, especially patent denial, may reflect more discriminating screening in the patenting process. Gompers and Lerner (1999a) and Kaplan and Stromberg (2001b) make this case with respect to the value-added associated with VC investments. However, Kortum and Lerner (2000) point out that patenting (as a proxy for innovation) may lead to higher levels of VC activity. Thus, there is no clear theoretical or empirical consensus regarding the nature and impacts of patenting on VC activity.

This study produces insight with respect to this issue by including two measures of patenting activity in a sub-period model of PE investments. For the array of countries examined here, patent data is only available from 1994 forward. It is provided by the World Intellectual Property Organization. Therefore, in Section 4, we re-estimated our system of variables over a shorter time period with the percent of patents applied for and denied included.

Kortum and Lerner (2000) have shown that VC and patenting are associated. Demirkunt and Maksimovic (1998) find that less external investment occurs in countries where property rights are weak. Therefore it stands to reason that intellectual property rights may be an important institutional factor determining the robustness of a nation's venture capital industry.

According to Park and Ginarte (1997) intellectual property rights (IPR) affect economic growth by stimulating the accumulation of factor inputs such as research and development and physical capital. They conclude that countries lacking strong IPR protection are very unlikely to establish innovative sectors in the economy. According to the authors intellectual property right

protection can be gauged by looking at specific variables such as patent agreements, provisions for loss of protection, enforcement mechanisms, and duration. In fact, they employ these factors to establish an index of property rights protection from 1960-1990. They assign each country a score between 0 and 4 (inclusive) on compulsory licensing of inventions, the revoking of patents, and the exploitation of patents. These scores are then used to produce an index value for each country. For the countries in our sample Park and Ginarte scores are presented in Table 1.

TABLE ONE HERE

We use these scores to develop a dummy variable for IPR protection. As can be seen in Table 1, the country scores range from 1.82-3.53. The distribution of scores suggests a natural truncation point of 3.0 and above for categorizing countries as ones with high levels of property right protection. Finland, France, Germany, Italy, the UK and the US are classified as such. Thus they receive a value of one for the IPR dummy. The remaining countries exhibit IPR values that are less than 3.0 and are assigned a zero.

Clearly some countries have been able to produce stronger capitalistic systems and more robust financial sectors than others. Nations such as the United States and the United Kingdom have more developed capital markets and more companies that go public than nations such as France and Germany. According to the Wall Street Journal (9/6/01), the main factor in capital market development can be traced to the different legal traditions that emerged throughout history. As pointed out by LaPorta, et.al (1997, 1998, 2000), the two main legal traditions are common law, with its roots in England, and civil law, with its roots in Ancient Rome and redefined later throughout Europe. Common law countries such as the United States, the United Kingdom, and other former British colonies, rely on independent judges and juries to establish legal precedents, which are then used to determine future cases. Hence, the bodies of law with regard to a specific issue become cumulative. In civil law countries, which include most of Europe and Latin America, law is established by judges on an individual case basis with no legal

precedent. As a result, civil law can produce rulings that are arbitrary and not well adapted to change.

According to studies by Shleifer and Vishny (1997) and Shleifer (1997) civil law countries exhibit heavier regulation, weaker property right protection, more corrupt governments and less political freedom than common law countries. The authors argue that investors in civil-law countries are less certain that their property rights will be enforced and as a result fewer individuals are active in financial markets. Additionally, evidence indicates that smaller and younger companies have a more difficult time procuring financing in civil law countries due to reliance on conventional funding and concerns over bankruptcy law. High concentration of company ownership is also more a common in civil law countries. These factors all decrease the amount of venture capital activity.

In order to incorporate these ideas into the model estimated here, legal traditions are structured as a dummy variable based on the work of La Porta, et al. (1997). The US, UK and Ireland possess traditions based on English or common law and as a result are assigned a score of one for this metric. The remaining countries have civil law based legal institutions and are consequently assigned a score of zero.

Similarly, capital market development in general and VC activity in particular are dependent on the level of transparency in a country. Transparency is a key component for promoting the investor protections that La Porta, et al. (2000) argue contribute to the success of firms in procuring external financing. A country lacking transparency can only offer limited protection for outside investors and thus will be dependent on internal investors or the state to finance firms. Since outside investors contribute a large part of the capital utilized by venture capital funds, those nations lacking transparency will have a more difficult time attracting funds and establishing an active venture market. In addition, the lack of transparency fosters an environment more conducive to the inefficiencies that arise due to the presence of asymmetric information and moral hazard.

La Porta ,et al. (2000) argue that transparency can be calibrated by gauging such things as rule of law, corruption, risk of expropriation, and risk of contract repudiation. In Table 2 we present the La Porta, et al. scores on each of these dimensions for our nine countries. These four scores are added together and divided by the total possible number of points to determine an average transparency value for each country. It is presented in column 6. We then use this value to develop a transparency dummy variable. Countries receiving 95% or higher are considered transparent and assigned a value of one (Finland, Germany, the UK and the US). The remaining countries are considered less transparent and are assigned a zero value.

TABLE TWO HERE

From the discussion above it should be clear that there is much overlap between our institutional metrics. Clearly intellectual property rights protection and legal tradition are related [see e.g. Shleifer (1997) for discussion]. Similarly, Park and Ginarte (1997) use some of the same factors to assess property rights protection that La Porta, et al. (2000) use to calibrate transparency. And, La Porta, et al. (1997, 1998, 2000) point out that transparency and legal tradition are related. Nonetheless, the variety of metrics included here can be generically interpreted as reflecting the importance of property rights and contract enforcement on the one hand, and information flow and expectations on the other.

4. Methodology and Results

4.1 Methodology

As noted in the introduction, this study employs a system of TSCS data to explore the determinants of venture capital funding. The data are characterized by having repeated observations on the array of variables for our set of nine countries. Implicit in such a data set are the key assumptions that venture capital may have a distinctly national characterization and that it may be influenced by changes both within and between countries over time.²

² A few adjustments have been made to various series included in our system of variables. They are outlined in the Appendix.

The general specification of such a system is

$$Y_{it} = X_{it} \beta + e_{it} \quad (1)$$

$$i = 1 \dots N,$$

$$t = 1 \dots T,$$

where Y is venture capital and X is a vector of (k) exogenous explanatory variables. All observations are indexed by both country ($N=9$) and time ($T=14$). The X vector includes market capitalization, GDP growth, the real cost of capital, intellectual property rights, legal tradition and transparency. The sample period is 1986 through 1999. The system is therefore time series dominant. Additionally, we estimate a system that is cross-sectionally dominant for a shorter subperiod, 1994-1999. As pointed out Section 3, this system also includes the percent of patents denied and/or granted.

Stimson (1985) points out that ordinary least squares (OLS) is the most common starting point for pooled systems. However, OLS ignores the pooled structure of the data treating each observation as if it is independent of both space and time. Beck and Katz (1995) note that such a treatment implies that the errors are assumed to be generated in an uncomplicated, “spherical” manner. Thus the expected error covariance is $\sigma^2 I$, where σ^2 is the expected constant variance and I assumes uncorrelated errors.

In practice these assumptions of constant variance (homoscedasticity) and serial independence rarely hold in pooled systems. In fact, generally speaking, when a pooled system is time series dominant the probability of violating the assumption of serial independence is highest. Cross-sectionally dominant systems are more likely to be plagued by problems of heteroskedasticity (Stimson, 1985). Regardless of the source, when the errors are non-spherical the regression coefficient estimates are robust, yet the indicators of model fit are suspect. In particular, the OLS standard errors are not correct, biasing the statistical tests.

Therefore, Equation (1) is estimated by generalized least squares (GLS). Generalized least squares works by transforming Equation (1) with a general error covariance matrix into another linear equation where the error covariance matrix is spherical, thus suitable for OLS estimation. Specifically, in standard OLS

$$\beta = [X'X]^{-1} X'Y, \quad (2)$$

while the GLS estimates of β are

$$\beta = [X'\Omega^{-1}X]^{-1} X'\Omega^{-1}Y \quad (3)$$

where the estimated covariance matrix is $[X'\Omega^{-1}X]^{-1}$ (Beck and Katz, 1995).

As a practical matter the covariance matrix of the errors Ω is not known. Therefore an estimate of Ω , $\hat{\Omega}$ is used in Equation (3). The estimation of Ω improves as $(N \times T)$ increases in relationship to the number of parameters in Ω . In fact, in large samples this procedure performs well and, in the limit, is equivalent to full maximum likelihood with all of the same optimal asymptotic properties [see e.g. Stimson (1985) and Beck and Katz (1995) for more discussion].

For the full sample, the procedure employed here is based on the work of Parks (1967). The Parks method consists of two sequential GLS transformations. The first eliminates serial correlation of the errors; the second eliminates contemporaneous correlation of the errors (which automatically corrects for any panel heteroskedasticity). This is done by initially estimating Equation (1) with OLS. The residuals are then used to estimate unit specific serial correlation of the errors that is employed to transform the model into one with serially independent errors. Next the residuals from this estimation are used to estimate contemporaneous error correlation. The data is then transformed a second time to enable OLS estimation with now spherical errors [see Stimson (1985) and Beck and Katz (1995) for further discussion].³

³ The Parks (1967) method assumes unit specific first order autoregressive processes where

$$\varepsilon_{i,t} = \rho_i \varepsilon_{i,t-1} + \nu_{i,t}.$$

Beck and Katz (1995) point out that the Parks procedure may be plagued by a number of shortcomings. In particular, the Parks correction for contemporaneous correlation of the errors is problematic unless T is considerably larger than N . However, as the degree of contemporaneous correlation rises the Parks method produces significant advantage over alternative methods of estimation. Additionally, the correction for serial correlation may lead to under estimates of ρ_1 , the first order autoregressive coefficient. These problems lead to over confidence. Beck and Katz suggest that substituting a critical T -value of 2.6 for the conventional T -ratio of 1.68 should compensate for these problems. Therefore, in the empirical results we utilize the more conservative T -value of 2.6 to determine coefficient significance.⁴

In our sub-period models N is greater than T . Hence the system is cross-sectionally dominant. Moreover, at $T=6$ the time series is quite limited. Given these conditions, any problems that arise due to serial correlation are unlikely to be present. Hence the sequential GLS procedure developed by Parks (1967) will not produce the most efficient specifications. Consequently, in the models that include patent data, the system is estimated using cross-section weights. That is, the system is estimated with one transformation that corrects for heteroskedasticity. Again, based on the work of Beck and Katz (1995) we employ the conservative critical T -value of 2.6 to determine variable significance.

In addition to the methodological approaches outlined above, we also utilize the data transformations noted in Section 3 to minimize the problems associated with heteroskedasticity and serial correlation. Specifically, adjusting private equity and market capitalization by domestic GDP addresses the issue of scale or country size thereby reducing homoskedasticity related issues. Employing real figures for all continuous series reduces the prevalence of serial correlation.

4.2 Results

⁴ All systems of variables were also estimated using conventional OLS. Beck and Katz (1995) argue that unless average contemporaneous correlation is greater than .5 OLS may be more efficient. Results using

Table 3 displays the results from full sample estimation. Recall that patent variables are excluded from this system. In Equations 1-4 empirical results are presented for a variety of specifications. Equation 1 includes the estimated coefficients from the basic, common coefficients model. Equations 2-4 contain estimates of models that allow for cross-section specific coefficients for the continuous variables.

TABLE 3 HERE

Results from estimation of the basic model indicate that market capitalization, the opportunity costs of capital and the legal system dummy are statistically significant at at least the 95% confidence level. And, all coefficient estimates exhibit the appropriate sign. Inspection of the cross section specific coefficients models in Equations 2-4 produce additional information. As is evident in column three, Equation 2 has the highest R^2 and the market capitalization variable is significant for all countries except Ireland and Portugal.⁵ In every case the estimated values exhibit the appropriate positive sign. Additionally, the common coefficient market capitalization variable is consistently positive and significant across all specifications. These results confirm the findings of Black and Gilson (1997), Ritter (1998) and Jeng and Wells (2000) with respect to the importance of exit options to venture capital market activity.

This finding, however, is inconsistent with the insignificance of the market capitalization variable reported by Jeng and Wells (2000). In their work, market capitalization reflects general investment conditions while exit options are represented by IPOs. Thus, the differences in results can be accounted for by the differences in specifications and methodology.

The real rate of GDP growth also presents as significant in the cross-section specific coefficients models. In equations where GDP growth is estimated as a common coefficient it is negative suggesting that higher rates of GDP growth reduce PE activity. This finding could be

OLS are not substantively different from those presented and are available from the authors on request.

⁵ The insignificance of market capitalization for Ireland may be attributable to the fact that based on the work of Black and Gilson (1997) we have utilized the market capitalization series of the UK for Ireland (see the Appendix for discussion).

due to the association between conservative monetary policy and business cycle expansions. However, in the model that allows the GDP growth coefficient to vary across countries, it is just as likely to be positive as negative. In countries where it is significant, France, Ireland, Italy, Spain and the UK, the coefficient estimates vary. They are positive for France and the UK and negative for Ireland, Italy and Spain. This combination of results suggests that the impact of GDP growth on VC activity may be country specific and could be related to the conduct and transmission mechanisms of monetary policy.

Moreover, recall that the sample period is 1986 through 1999. This is a period characterized by expansion, punctuated by a short, mild recession, followed by another period of prolonged expansion. Hence, it only captures one complete business cycle. This may not be enough to enable the estimation process to accurately gauge the impact of GDP growth on VC activity.

Our findings concerning the real rate of GDP growth are generally at odds with the impacts suggested by Arcs and Audertsch (1994). They also contradict the insignificance of the GDP variable reported by Jeng and Wells (2000). However, differences in methodology and sampling may account for this discrepancy. Further research is needed to clarify the issue.

With respect to the cost of capital, it is significant and negative in two of the three models where it is estimated as a common coefficient. In the cross-section specific coefficients model estimates are negative for all countries except the UK (where the estimate is insignificant). Coefficient values are significant for Finland, Germany, Ireland, Italy and Spain. In all of these countries there is a greater reliance, compared to say the US or the UK, on bank capital as a financing source. Thus, it may be the case that financing options influence the impact of opportunity costs on PE.

Finally, the results concerning the importance of institutions to PE market activity indicate that legal institutions matter. The dummy variable representing common law legal institutions is significant and positive in Equations 1 and 3. In addition, in results not reported but

available from the authors on request, when we enter the institutional variables separately the legal system dummy is consistently significant and positive while the IPR and transparency dummies are not. These findings indicate that common law based legal institutions promote more robust private equity markets. They buttress the findings produced by La Porta, et al. (1997, 1998, 2000) and are more generally consistent with the work of Demirguc-Kunt and Maksimovic (1998), Berkowitz and DeJong (2000), Djankov, et al. (2000) and Johnson, et al. (2000).

Table 4 displays the empirical results for a variety of models that include patent data. As is the case for the full sample, market capitalization is highly significant and positive in all specifications. GDP growth is also significant in a number of specifications. Consistent with the full sample results, the coefficient is negative. Where the cost of capital is significant, Equations 3 and 5, it is negative not unlike the full sample results.

In column two of Table 4 we present estimates of a common coefficients model that includes only the continuous variables. In this specification both the percent of patents denied and granted are significant. And, at first blush, their signs appear counter intuitive. The patents denied variable exhibits a positive sign while the coefficient on the percent of patents granted is negative. However, the combination of results and their consistency across the remaining specifications produce strong empirical support for the notion that patent screening and venture capital are positively related.

TABLE 4 HERE

Inspection of Equations 4 and 5 further supports this conclusion. In Equation 4 we present the country specific coefficient estimates for the patents denied variable. It is significant for all countries and positive. Additionally, Equation 4 displays the highest R^2 of all specifications, including those estimated over the full sample. As can be seen in Equation 5, country specific coefficients for the percent of patents granted is negative in every case although not necessarily significant. In Equation 4 (5) the highly significant positive (negative) IPR variable in combination with the significant and positive (negative) patents denied (granted)

variables suggest that a more discriminating patenting process a priori combined with patent enforcement boosts PE. These activities work to enhance the potential for profitability of a VC investment and, when combined with the screening and mentoring outlined in Kaplan and Stromberg (2001b), may create a virtuous cycle of PE investing. These findings can be interpreted as consistent with the concerns expressed by Kortum and Lerner (2000) regarding causal directions. However, they are also broadly consistent with the screening hypothesis of Gompers and Lerner (1997) and Kaplan and Stromberg (2001b). But, they suggest that screening before as well as after a VC commitment by patent authorities as well as venture capitalists is critical to PE activity. With respect to the hypothesis developed by Sahlman (1990) and Jeng and Wells (2000) concerning innovation and labor market rigidity, the combination of results simply do not support it.

Finally, in three of the four systems in which they are included, institutional variables are significant at at least the 95% confidence level. Across specifications however, the variables that are significant, and in some cases their sign, vary. In Equation 2 the transparency variable is significant and positive. In Equations 4 and 5 the IPR dummy variable coefficient is significant. However, consistent with the sign of the patenting variables, the estimated value is positive and large in Equation 4 and small and negative in Equation 5. As discussed in Section 3, we interpret these findings in combination with those produced from the full sample as evidence that the metrics employed here are characterized by common features which taint the purity of our three institutional dummies. Consistent with the work of Berkowitz and DeJong (2000), Demirguc-Kunt and Maksimovic (1998), Djankov, et al. (2000), Johnson, et al. (2000), La Porta, et al. (1997, 1998, 2000) and Park and Ginarte (1997), the combination of results can be interpreted as evidence that institutional infrastructure matters to private equity markets. And, why it matters is related to property rights and contract enforcement and information flow and expectations. However, disentangling the effects more specifically will require finer metrics.

6. Conclusions

The level of PE market activity and development varies significantly even among the most industrialized of economies. The goal of this study is to provide insight into why this might be the case. To do this we develop and estimate a variety of models that assess the impact and importance of various economic and institutional factors on private equity funding. To accomplish the task we employ a pooled, time series cross-sectional data sample. Such a data set enables us to address the question, ‘Why does private equity vary across countries and time?’.

Results indicate that differences in market capitalization are one of the key reasons that PE market activity varies across both time and country. Thus, here again the empirical evidence supports the notion that exit options are elemental to robust private equity markets. The opportunity costs of investing is also found to be a significant determinant of VC activity, especially in countries that rely more heavily on bank lending. Evidence across time concerning the impact of the business cycle on PE funding does not support existing theories that postulate a positive association between GDP growth and venture funding. However, evidence across countries indicates that the impact of the business cycle may be country specific. Using patent data we find quite strong empirical support for the hypothesis that across countries screening and venture capital activity are positively related. The evidence suggests that screening a priori by patent authorities combined with strong intellectual property rights protection contribute to higher levels of PE activity. When these conditions are also combined with the screening and mentoring capabilities of venture capitalists a virtuous venture capital cycle may result. Finally, our results indicate that institutions affect private equity. Specifically, institutions that underpin property rights and contract enforcement and information flow and market and investor expectations are necessary for cultivating a robust private equity market.

Appendix

A.) Data

For Finland data on private equity is not available for 1987. Consequently, we have filled in the missing observation by multiplying the 1986 Finnish PE figure by the nominal rate of domestic GDP growth to create a continuous PE series. Similarly, Portugal is missing an observation for PE for 1995. To fill in this missing data point we have multiplied the 1994 observation by the nominal rate of Portuguese GDP growth to generate a 1995 data point.

Black and Gilson (1997) review the Irish and Israeli venture capital markets. They argue that Ireland has a strong reliance on the United Kingdom's active equity markets, which allows Irish companies to exit with an IPO on the British exchange. They conclude that this ability to tap into the well-developed and liquid British market in large measure explains Ireland's impressive venture industry. These findings lead Black and Gilson to prescribe a program of reliance on developed IPO markets as a solution for countries hoping to improve their venture capital industry. Therefore, based on the evidence of Black and Gilson, in all of our empirical estimations we employ the British market capitalization series to represent Irish market capitalization.

TABLE 1:
Intellectual Property Rights¹

Country	Value	Dummy Value
U.S.A	3.52	1
U.K.	3.26	1
Ireland	2.46	0
Finland	2.39	0
Germany	3.29	1
France	3.48	1
Italy	3.5	1
Spain	3.53	1
Portugal	1.82	0

¹ Values are from Park and Ginarte (1997).

TABLE 2:
Transparency¹

Country	Rule of Law	Corruption	Risk of Expropriation	Risk of Contract Repudiation	AVERAGE	Dummy Value
U.S.A.	10	10	9.98	9	97.450%	1
U.K.	10	8.57	9.71	9.63	94.775%	1
Ireland	8.75	7.8	9.67	8.96	87.950%	0
Finland	10	10	9.67	9.15	97.050%	1
Germany	9	9.23	9.9	9.77	94.750%	1
France	8	8.98	9.65	9.19	89.550%	0
Italy	6.75	8.33	9.35	9.17	84.000%	0
Spain	6.25	7.8	9.52	8.4	79.925%	0
Portugal	5.5	8.68	8.9	8.57	79.125%	0

¹ Transparency values are from La Porta, et al. (2000).

Table 3
Regression Results (1986-1999)

Variable/Equation	1	2	3	4
Constant	1.16* (0.12)	0.50 (0.23)	1.49* (0.15)	0.88* (0.30)
Market Capitalization	0.000028* (0.0000025)		0.000028* (0.000004)	0.000026* (0.000006)
GDP Growth	-0.49 (0.77)	-1.68* (0.30)		-2.71* (0.86)
Cost of Capital	-8.91* (1.15)	-0.30 (0.68)	-8.71* (1.22)	
Int. Property Rights	0.16 (0.07)	-0.56 (0.42)	-0.22 (0.10)	-0.14 (0.34)
Legal System	1.02* (0.24)	-0.52 (0.19)	1.70* (0.46)	1.30 (0.65)
Transparency	0.10 (0.13)	-0.39 (0.22)	-0.08 (0.09)	0.81 (0.40)
Adjusted R2	0.45	0.65	0.44	0.43
		Market Capitalization	GDP Growth	Cost of Capital
Fixed Effects				
Finland		0.0024* (0.00018)	2.84 (1.97)	-15.45* (4.36)
France		0.0047* (0.00056)	20.84* (4.73)	-9.51 (6.75)
Germany		0.0033* (0.00071)	-0.34 (0.60)	-16.73* (4.99)
Ireland		0.00072 (0.00051)	-21.00* (7.28)	-25.92* (9.84)
Italy		0.0019* (0.00023)	-6.93* (1.78)	-5.80* (1.64)
Portugal		0.0013 (0.0011)	-0.10 (1.29)	-0.09 (2.99)
Spain		0.0014* (0.00022)	-2.42* (0.91)	-5.28* (1.97)
U.K.		0.0037* (0.00048)	43.57* (11.75)	5.78 (14.97)
USA		0.000046* (0.0000044)	-22.56 (15.72)	-26.16 (15.07)

Standard errors in parenthesis

* indicates $\alpha = .05$ significance using the conservative critical value of 2.6 based on the work of Beck and Katz (1995).

Table 4
Regression Results (1994-1999)

Variable/Equation	1	2	3	4	5
Constant	0.97 (0.51)	-1.84 (0.86)	2.47 (0.97)	-37.32* (7.87)	4.02* (0.26)
Market Capitalization	0.000043 [†] (0.000002)	0.000037* (0.0000081)	0.000037* (0.0000087)	0.00008* (0.0000096)	0.000064* (0.00001)
GDP Growth	-3.14 (3.23)	-3.51 (2.93)	-4.14* (1.54)	-1.5* (0.55)	-2.29* (0.37)
Cost of Capital	-7.96 (4.45)	-2.49 (3.82)	-12.36* (2.67)	1.68 (1.45)	-8.93* (1.50)
Int. Property Rights		0.88 (0.47)	-0.34 (0.54)	35.44* (8.02)	-1.29* (0.45)
Legal System		1.06 (1.33)	0.57 (1.65)	-9.67 (3.82)	2.55 (6.06)
Transparency		0.84* (0.17)	0.47 (0.19)	-0.74 (0.49)	3.56 (2.49)
Patents Denied	2.03 [†] (0.47)	3.18* (0.61)			
Patents Granted	-0.021 [†] (0.0055)		-0.015 (0.015)		
Adjusted R2	0.71	0.47	0.54	0.91	0.60
Fixed Effects				Patents Denied	Patents Granted
Finland				42.2* (8.36)	-0.27 (0.12)
France				7.91* (0.79)	-0.02 (0.01)
Germany				5.09* (0.74)	-0.19 (0.10)
Ireland				53.9* (9.58)	-56.67 (76.25)
Italy				4.29* (0.32)	-0.04* (0.01)
Portugal				40.55* (8.41)	-0.04* (0.003)
Spain				3.24* (0.32)	-0.05* (0.01)
U.K.				27.66* (8.73)	-0.06 (0.16)
USA				15.02* (4.95)	-0.73 (0.5)

Standard errors in parenthesis

* indicates $\alpha = .05$ significance using the conservative critical value of 2.6 based on the work of Beck and Katz (1995).

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