THE LEGAL ROAD TO REPLICATING SILICON VALLEY

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Abstract
Must policymakers seeking to replicate the success of Silicon Valley's venture capital market first replicate other US institutions, such as deep and liquid stock markets? Or can legal reforms alone make a significant difference? In this paper, we compare the economic and legal determinants of venture capital investment, fundraising and exits. We introduce a cross-sectional and time series empirical analysis across 15 countries and 13 years of data spanning an entire business cycle. We show that the legal environment matters as much as the strength of stock markets; that government programmes more often hinder than help the development of private equity, and that temperate bankruptcy laws stimulate entrepreneurial demand for venture capital. Our results provide generalizable lessons for legal reform.

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1. Introduction

An important question for the industrial policymakers around the world is: "how do we replicate the success phenomenon of Silicon Valley's entrepreneurialism and venture capital finance?"[1] Whilst Silicon Valley's success is surely a multi-faceted story, one key to its dynamism appears to be the use of venture capital, a form of financial intermediation that seems particularly well-matched to the development of innovative, high-tech products. Understanding the way in which venture capital operates, and the economic, institutional and legal factors that help it to flourish, is therefore an important question for research.

The structure of venture capital investment has in recent years received considerable attention.[2] Several studies have shown that levels of venture capital investment in the US are responsive to changes in a range of legal and fiscal variables, including pension fund regulation, taxes and subsidies.[3] However, less work has been done on investigating its determinants across countries. The principal proposition established in the literature is that venture capital flourishes in countries with deep and liquid stock markets (Gompers, 1998; Gompers and Lerner, 1998, 1999, 2001; Black and Gilson, 1998; Jeng and Wells, 2000; Lerner, 1999, 2002a). This would seem to imply that policymakers seeking to develop venture capital markets might be best to focus upon developing national stock markets, rather than seek to stimulate venture capital directly. A subsidiary proposition established in the literature reinforces this: that direct subsidies, or government-controlled venture capital funds, intended to 'seed' private equity industries, have in many cases been failures. This implies that for policymakers who wish to promote venture capital in the absence of stock markets, the engineering task is a tall order (Lerner, 2002b; Gilson, 2003).

In this paper, we build upon this prior work by considering how *law* matters for venture capital finance. The paper begins by surveying the existing literature and formulating several hypotheses for the way in which different aspects of law might impact upon the supply of, and demand for, venture capital finance. We then test these hypotheses empirically, using a methodology that identifies the effect of legal variables whilst controlling for economic factors, and also allows for comparisons of the *relative* importance of economic and legal variables for the level of venture capital investment.

We employ a cross-sectional and time series empirical analysis across an entire business cycle—the years 1990 to 2002—of data drawn from 15 Western European and North American countries.[4] Our dependent variables are drawn

from trade association data, compared relative to national GDP.[5] Our primary focus is on levels of *investment* by venture capital funds in entrepreneurial firms. Using simultaneous equations methods, we distinguish those independent variables that affect the *supply* of investment funds from venture capitalists to entrepreneurial firms, those that affect the *demand* for equity finance by such firms, and variables that affect both supply and demand. In so doing we distinguish between early stage, expansion stage and total private equity investment.[6] Whilst 'early stage' investment is most closely related to new business start-up and hence of most interest to policymakers seeking to foster a 'start-up' culture, we study these different sectors of investment both separately and together in order to consider the robustness of the results to different definitions of venture capital and private equity. To cross-check our results, we also analyse data for *fundraising* by venture capitalists and private equity funds from their end-investors, and *exits* by such funds from their investee firms.

Like earlier studies (Gompers and Lerner, 1999; Jeng and Wells, 2000), our empirical results show that economic factors are important determinants of venture capital investment. As might be expected, stock market conditions, particularly over the bubble period in 1999 and 2000, significantly impacted both the supply of and demand for venture capital. We also show, again consistently with expectations, that a nation's levels of entrepreneurial activity (as represented by self-employment rates) and 'idea' generation (patent applications) are significant determinants of demand for venture capital finance.

This paper's contribution, however, lies in the findings relating to the role of legal variables. We consider first whether, in a general sense, the legal environment does 'matter' for venture capital finance. Previous literature has tended to employ 'law and finance' variables specified by reference to investment in public companies, rather than the particular needs of venture capitalists. For the first time, we employ an index of legal and fiscal variables that pertain specifically to factors considered important by a leading trade association, the European Venture Capital Association ('EVCA'). If law does 'matter', then we would expect favourable rankings on EVCA's index to be correlated to higher levels of venture capital investment. Our empirical findings show that the EVCA index of the 'investor friendliness' of country's legal and fiscal environment *is* a significant determinant of the supply of venture capital investment to entrepreneurial firms, and also of fundraising and exit activity by venture capitalists.

Secondly, we revisit the question of the impact of government investment designed to 'seed' private venture capital finance. Whilst it is possible that such programs may be successful in their aim of 'jump starting' venture capital

2

markets, poorly-designed public programs may waste government funds, or, worse still, compete with private funds for the same investments thereby 'crowding out' the very investments they are seeking to promote. In this paper, we investigate the impact of publicly funded venture capital programs on aggregate levels of venture capital investment and fundraising. We find that the introduction of significant publicly sponsored programs is actually associated with a *reduction* of the overall level of investment by venture capital and private equity firms, even after accounting for the possible endogeneity of government programs to low national levels of venture capital activity.[7] We similarly find that the presence of such programs has a negative impact on overall levels of fundraising by venture capitalists and private equity funds, and also on total value of exits by such funds from their investments, suggesting that government programs have impeded overall industry profitability in the 15 countries studied. These findings are consistent with the 'crowding out' hypothesis, and suggest that the appropriate 'engineering' of government programs so as to 'seed' investment successfully may be an even more difficult task than has hitherto been imagined.[8]

Thirdly, we focus on the role of bankruptcy law, hitherto ignored in the venture capital literature. It seems at first counterintuitive that bankruptcy law might matter. Venture-backed companies have few or no liquid assets. This implies that their 'bankruptcy' will be a non-event, and hence that the configuration of a nation's corporate bankruptcy law is unlikely to make much difference to its venture capitalists. Furthermore, as entrepreneurs enjoy the benefit of limited liability through incorporation, personal bankruptcy law might also appear to be irrelevant. We suggest that these common intuitions overlook the potential impact of personal bankruptcy law at a point in time that is very significant for the formulation of the demand function: that is, the 'pre-seed' stage—*before* an entrepreneur obtains venture funding. Until this point, entrepreneurs will often rely upon their personal funds and credit, thereby creating a risk of personal bankruptcy.

The 'severity' of the consequences of personal bankruptcy—most importantly whether or not a 'fresh start' is available and, if so, after what time—might therefore be expected to have an impact on demand for venture capital. The absence of a fresh start would not only deter marginal entrepreneurs from 'taking the leap' *ex ante*, but will also prevent some inframarginal entrepreneurs for whom an earlier idea has ended in failure from ever returning to a nation's talent pool. Our empirical results are consistent with this hypothesis. We show that countries with more 'severe' personal bankruptcy laws, measured by reference to the number of years before a bankrupt individual would obtain a

3

'fresh start' and controlling for countries in which no fresh start is available, have significantly lower demand for venture capital and private equity.

In addition to showing the significance of the foregoing legal variables whilst controlling for economic factors, our results also allow us to *compare* their relative significance. A particularly striking result is therefore that the EVCA index, a composite of various legal and fiscal indicators, is *as* significant a determinant of venture capital and private equity investment as economic factors such as stock market returns. This suggests that much development of venture capital markets may be achieved through purely technical legal measures. More specifically, the finding implies to policymakers that the road to establishing a Silicon Valley-like venture capital market outside the U.S. is paved with favourable tax laws and legal structures that accommodate the establishment of venture capital funds, temperate bankruptcy laws that provide little or no time to discharge for entrepreneurs, and at most only a very small scope for direct government investment programs.

The rest of the paper is structured as follows. Section 2 provides a brief description of the structure of venture capital finance, explains why it is of interest to academics and policymakers, and reviews literature on its determinants. We develop three hypotheses in section 3, relating respectively to the general legal environment (as measured by the EVCA index), the direct investment of government funds, and the 'severity' of personal bankruptcy laws. Section 4 describes our dataset, and the empirical methods are explained in section 5. Section 6 sets out our results, and Section 7 explains their implications.

2. Venture capital and its determinants

Venture capital is a subset of private equity investment, distinguished by the fact that funds are advanced to businesses that are starting up or at an early stage in their development—that is, before a profit has been earned. Venture capitalists are *active* investors, ameliorating agency problems between themselves and their portfolio companies by developing specialist expertise and using sophisticated contractual terms designed both to give the entrepreneur appropriate incentives and to give the investor a significant role in the governance of the firm.[9] Venture capitalists will hold their investments for a period of around 3-7 years, during which time they will provide 'hands on' governance and business advice. Successful investments are exited either by listing the company through an initial public offering (IPO), or by selling the company to a competitor (a 'trade sale'). Unsuccessful investments are liquidated. One good investment can earn enough to cancel out ten write-offs

and still generate a healthy portfolio return. Venture capitalists are themselves *financial intermediaries*, raising their investment funds from end-investors, the most important of which are institutional investors. Complex contractual provisions are again used to resolve agency problems between end-investors and venture fund managers (Gompers and Lerner, 1999).

Venture capital markets are of particular interest to policy makers because this type of investment is typically used to fund 'high-tech' companies with the potential and ambition to grow rapidly. It is thought to be of disproportionate importance in stimulating innovation.[10] 'Start-up' firms developing new technologies commonly do not generate steady cash flows that can be used to make interest payments, and lack liquid assets that could be used as collateral.[11] Instead, the value (if any) of a start-up firm will inhere in the ideas and 'human capital' of the entrepreneur and opportunities for growth. This makes such firms unsuitable candidates for debt investment (see e.g. Berger and Udell, 1998; Carpenter and Petersen, 2002). Rather, there is a strong *complementarity* between 'soft' assets and concentrated equity finance, in the form of venture capital. This is evidenced by empirical findings that equity (venture capital), and not debt, financing, predominates in privately-held 'high-tech' firms (Freear and Wetzel, 1990; Carpenter and Petersen, 2002).

Understanding the determinants of VC finance is an important research question from the perspectives of both policymakers and academics. The orthodox wisdom suggests that *economic and institutional variables*—in particular, economic growth, size and liquidity of stock markets and returns to stock market investments—are probably the most important determinants. First, and most obviously, venture capital investment levels both across time and across countries (Gompers and Lerner, 1999; Jeng and Wells, 2000), closely tracking business cycles in the economy generally.

Theory and evidence also indicates a strong link between size and liquidity of a nation's stock markets, and the size of its VC investment market (Black and Gilson, 1998; Jeng and Wells, 2000). Stock markets facilitate 'exit' from VC investment through IPOs. Black and Gilson (1998) argue that the potential availability of an IPO allows for an implicit contract between VC and entrepreneur that is uniquely compatible with both sets of incentives. The VC promises, if the company performs well, to exit via an IPO, an event that will simultaneously return wealth to investors and control to entrepreneurs. In contrast, a 'trade sale' will not return control to the entrepreneur, and if this is expected at the outset to be the only form of profitable exit for the VC, the entrepreneur's incentives will be diluted. That said, the ability to offer the entrepreneur the 'carrot' of regaining control depends not only upon the

possibility of an IPO, but on the ownership of the company's shares thereafter being dispersed, as in an 'arm's length' financial system.

Where stock markets are dominated by 'relationship' finance, ownership of publicly traded shares will tend to be concentrated in the hands of blockholders, meaning that entrepreneur-managers will not be free of investor control.[12] If we conclude these factors are the most significant determinants of venture capital finance, it seems that venture capital finance must be thought of as being closely associated with 'arm's length' financial systems (Black and Gilson, 1998). Moreover, the question of how to stimulate a venture capital market in systems without deep and liquid stock markets becomes one of 'chicken and egg'. It is necessary to solve what Gilson (2003) terms the 'simultaneity' problem—that capital, venture capitalists, and entrepreneurs must be present *simultaneously* in order for a thriving market to develop: a formidably difficult engineering problem.

However, a related literature suggests that *legal and regulatory* variables may also be determinants of VC investment. From a policy perspective, these questions are of particular interest, as they offer the potential promise of a technical mechanism for engineering a venture capital market. In theory, a range of legal and regulatory factors could impact upon the supply of, and demand for, venture capital finance (see e.g. Kanniainen and Keuschnigg, 2003a,b; Keuschnigg, 2002, 2003; Keuschnigg and Nielsen, 2001, 2003a,b; Armour, 2003). Most obviously, we might expect the *supply* of funds for investment by venture capitalists to be affected by relevant taxes and subsidies. Furthermore, regulations that restrict the range of investments open to collective investment schemes—such as pension funds—can be expected to inhibit the supply of capital. Similarly, *demand* for venture capital finance—that is, the number of entrepreneurs seeking funding for projects—might also be affected by relevant taxes and subsidies. For example, low rates of capital gains tax mean that successful entrepreneurs keep a larger 'slice' of their earnings. In addition, demand may be affected by the way in which legal variables impact upon *unsuccessful* entrepreneurs. For example, bankruptcy law affects the 'hardness' of the landing experienced by those whose projects fail, and so might be expected to play an important role in determining demand.

There is some support for these hypotheses from time-series studies of US data. Levels of venture capital investment have been shown to be affected by the regulation of pension funds (Gompers and Lerner, 1999), levels of capital gains tax (Poterba, 1989a,b; Gompers, 1998; Gompers and Lerner, 1998) and the provision of state subsidies to 'seed' the development of VC markets (Lerner, 1999, 2002b). How, if at all, these factors may make a difference across

countries is less clearly understood. If any of these factors mattered significantly, this would be of great interest to policymakers.

The existing literature on cross-country comparisons has tended to suffer, on the one hand, from a failure to distinguish variables affecting supply from those affecting demand and, on the other hand, a failure to specify legal variables in accordance with a clearly-specified theory of how they are expected to impact upon venture capital investment. Thus, a number of studies have considered a range of 'legality' variables drawn from the work of La Porta *et al* (1997, 1998) (Jeng and Wells, 2000; Allen and Song, 2003; Lerner and Schoar, 2003). At a high degree of generality, it should be expected that greater respect for the rule of law should be a determinant of venture capital investment, given that the latter relies heavily on complex investment contracts. However, many of the other variables considered in La Porta *et al*'s studies—for example, minority shareholder rights, antidirector rights and creditor rights—are likely to have very little impact upon venture capital investment activity, as the rights of VCs derive largely from their complex investment contracts, as opposed to general corporate law (Gompers and Lerner, 1999). Thus, several of these studies report findings of no correlation (Jeng and Wells, 2000) or even negative correlations (Allen and Song, 2003) between shareholder rights-type variables and venture capital investments.[13]

3. Theories and formulation of hypotheses

To investigate differences in aggregate levels of demand for and supply of private equity investment across countries, it is important to identify an appropriate menu of legal variables that impacts the supply of and demand for venture capital and private equity finance, and distinguish supply-based legal variables from demand-based legal variables. In this section, we outline theories and develop three hypotheses about how law may matter for venture capital finance. We begin in subsection 3.1 with a theory that is derived from what industry experts say are legal and fiscal variables that matter for the *supply* of venture capital. In subsection 3.2 we consider a second *supply*-side factor: the role of public subsidies designed to stimulate venture capital investment. Finally, in subsection 3.3, we develop a theory relating to a feature of the legal environment that we argue will affect *demand* for venture capital: personal bankruptcy law.

3.1 Supply-side: the EVCA 'investor-friendliness' benchmark

Crucial to the success of legal reform is the need to understand the mechanism by which laws impact upon the venture capital market. Our first hypothesis

adopts the thinking of a leading trade association, the European Venture Capital Association ('EVCA'). EVCA has in recent years been a vocal lobbyist of European governments for changes in local laws designed to facilitate venture capital and private equity investment. A recent report (EVCA, 2003) sets out a 'benchmark' index for tax and legal environments, taking into account a multitude of legal and fiscal measures in unison that EVCA consider will be likely to stimulate *supply* of venture capital finance.

The EVCA index (see EVCA, 2003) is a composite ranking of many factors, including:

- the tax transparency for domestic investors;
- the ability to avoid permanent establishment for international investors from treaty or non-treaty countries;
- the ability to incorporate a tax efficient capital investment regarding incentives for fund managers;
- the ability to avoid paying value-added tax (VAT) on management charges;
- the ability to avoid paying VAT on carried interest;
- the degree of restrictions on investments;
- mergers regulations (including whether or not there is an obligation to suspend a deal until the responsible authority makes a decision);
- the regulation on pension funds in their ability to invest in venture capital;
- the corporate tax rate on profits and dividends;
- the corporate tax rate for SMEs;
- the capital gains tax rate;
- the tax incentives for individual investors;
- stock options taxation;
- fiscal R&D incentives; and
- time and capital involved in setting up a private limited partnership or company.

The EVCA index is structured in a way that a lower number (on a 3-point scale) indicates a better legal and tax environment for the venture capital or private equity fund itself. We make use of this index in our empirical study to identify equations for the supply of venture capital and private equity across countries. For reasons of collinearity across variables discussed further below, we do not use each of these variables separately.

Hypothesis 1: The EVCA index is a significant determinant of the supply of venture capital and private equity. We would expect the impact to be similar for all stages of investment. We also conjecture that countries with better (lower) EVCA index values will raise more capital and have more success with exit transactions.

3.2 Supply-side: government funds

Our second line of enquiry concerns the impact of government-backed programs on the levels of private venture capital investment. Is it possible for governments to 'seed' the development of a venture capital industry by setting up publicly funded venture capital funds? Put simply, the best available answer appears to be that 'it depends' on the careful specification of the scheme's structure (Gilson, 2003). A well-designed scheme can, it appears, stimulate the provision of private finance. However, a poorly designed public fund will at best waste resources, and at worst may actively hinder the development of private equity markets (Cumming and MacIntosh, 2003b). In this section, we illustrate how in some cases design problems have led to the underperformance of such schemes. We then outline hypotheses for testing whether public schemes across our sample of 15 countries have in general helped or hindered private equity investment and fundraising. This line of enquiry may give an insight into how easy this policy instrument has been for governments to use, at least to date. Moreover, conducting this test in the context of our simultaneous equations specification allows for us to compare its impact with the other economic and legal variables under consideration.

The design and structure of public venture capital funds varies widely and, because of this, it is difficult to generalise about the mechanisms by which they may affect levels of private equity investment. That said, it is possible to hypothesise various outcomes. On the one hand, the provision of public funds in a country with no, or an underdeveloped, tradition of venture capital, may act to 'pump prime' demand by entrepreneurs, thereby opening up new markets. On the other hand, if the incentives of public fund managers are not appropriately set, they may end up making poor investments and wasting public money.[14] Worse still, if public funds compete for the same investments as private venture capitalists, the public money may actually 'crowd out' investment from the private sector.

This latter point is worth expanding upon. Such 'crowding out' might occur by a variety of means. If public funds receive direct investment from government, and their managers are not incentivised to maximise fund value by an

9

appropriate set of governance mechanisms, they will face a less binding budget constraint than private fund managers, who by virtue of their contractual restrictions will be concerned to maximise the returns to their end investors. We might expect weak fund manager incentives to result in poor returns. The first German VC fund (the 'WFG'), which was government-backed, provides a good illustration of the problem (Becker and Hellmann, 2003). The WFG's supply of future funds was not made dependent on the investment fund's past performance. Moreover, the fund managers' personal compensation did not reflect their successes or failures. These weak incentives, coupled with lack of experience, lead to poor selection of initial investments and the use of only rudimentary contractual protection against agency costs in the VC-portfolio company relationship. Unsurprisingly, the result was disastrous: the WFG's average internal rate of return was –25%.[15] Even today, German public-private partnership funds do not make use of such sophisticated contractual protection as their purely private counterparts (Bascha and Walz, 2001).

If public venture capital funds facing weak budget constraints are not prohibited from competing with private funds for the same investments, then the public funds will be able to outbid their private counterparts for promising opportunities. The expectation of such contests would in turn *reduce* end-investors' willingness to commit money to private equity funds, the opposite effect to that desired by policymakers. Instead of enhancing the supply of private funds, government programs in such scenarios are simply substituting for them. Moreover, institutional investors may be required to commit to private equity funds well in advance of their knowing the extent to which government funds will be invested in the market. If the agents responsible for the relevant decisions at the institutions are risk averse, then they will overestimate the presence of government funds, and commensurately reduce their level of commitment to private funds. This could result in a net reduction in the *total* (public and private) funds invested as venture capital invested: that is the overall degree of crowding out may be even greater than 100%.[16]

Another form of public scheme involves indirect public support through tax subsidies given to investors committing funds to certain investment vehicles. The goal of such schemes is to stimulate investment in venture capital, by tempting taxable investors with higher expected returns. However, it may be that they only result in another substitution effect, if taxable investors who would formerly have invested in non-subsidised funds simply switch to subsidised funds.[17] If this is coupled with poorly designed incentives for the managers of the subsidised funds,[18] competition between subsidised and private-sector funds for the same investment opportunities could compound matters, again potentially leading to an overall level of crowding out that

exceeds 100%. In Canada, for example, Cumming and MacIntosh (2003b) provide evidence consistent with such a 'crowding out' effect. The introduction of legislation setting up subsidised Labour-Sponsored Venture Capital Corporations (LSVCCs) actually led to an overall reduction of the supply of venture capital funds.[19]

It seems perfectly plausible, in theory, that a public scheme could be designed with more effective governance—perhaps through harnessing private sector monitoring more effectively, and reducing or eliminating incentives for public funds to compete with private funds—and thereby avoid crowding out. It is similarly plausible that such a scheme could achieve good rates of return. What is not so well understood is how straightforward this design task is, particularly when compared to other policy instruments that might be employed. By examining the impact of the provision of a significant proportion of a country's venture capital finance through direct or indirectly subsidised schemes, we are able to consider whether, in most cases, this design problem has been solved effectively. This leads us to formulate two alternative hypotheses:

> **Hypothesis 2a**: Government-sponsored funds seed private investment and increase the overall level of venture capital investment and fundraising.
>
> **Hypothesis 2b**: Government-sponsored funds crowd out private investment and reduce the overall level of venture capital investment and fundraising.

3.3 Demand side: Personal bankruptcy laws and the value of a 'fresh start'

Personal bankruptcy laws vary widely across countries, reflecting differing national policies concerning the rehabilitation of debtors. This subsection outlines a theory of how personal bankruptcy law may affect demand for venture capital finance. Despite its significance for entrepreneurship, the links between bankruptcy law and venture capital finance have not been explored in previous literature.[20] Moreover, because the EVCA index relates solely to supply-side factors, it does not include any bankruptcy-related factors.

A link between bankruptcy law and VC finance seems at first counterintuitive. The fact that VC finance complements projects with 'soft' assets implies that, where VC-backed projects fail, there will be few liquid assets over which to fight (Gilson and Schizer, 2003). Hence the structure of corporate insolvency proceedings is unlikely to make much difference to incentives *ex ante*. Indeed, the lack of liquid assets means there will be little debt capacity anyway, and so

few creditors even to be interested in insolvency proceedings. At first blush, personal insolvency law would seem to have even less impact on VC investment, given that, even in the unlikely event that a venture-backed company should go into corporate bankruptcy proceedings, its founders would have limited liability.

The discussion has so far focused on the position where a venture-backed company fails, implicitly assuming it was *started* in the first place. However, we argue that personal insolvency law may have a pronounced impact at the 'pre-seed' stage—that is, *before* an application is made to a venture capitalist for finance. In jurisdictions where the sanctions for personal bankruptcy are most severe, marginal entrepreneurs will be deterred from shouldering the personal financial risk necessary to prepare an application for venture capital finance. Moreover, inframarginal entrepreneurs who have experienced failure in the past may be prevented from founding new businesses if they are not discharged from bankruptcy. In order to explain these conjectures, this section will first consider the operation of personal bankruptcy law, and then turn to the way in which this might interact with entrepreneurs' decisions as to whether to prepare an application for venture capital finance.

Purposes of personal bankruptcy law

In the US, Chapter 7 and Chapter 11 bankruptcy proceedings are open both to individuals and to corporate debtors. However, many countries have different procedures for individuals and corporates, or distinguish according to whether the debtor is a 'trader' (individual or corporate) or a consumer. In this paper, we use the term 'personal' bankruptcy law to refer to the bankruptcy regime that would govern an individual entrepreneur engaged in business start-up, should the business fail. Bankruptcy law generally provides an orderly mechanism for the realisation of the insolvent's assets.[21] In addition, and more importantly for our purposes, *personal* bankruptcy law also serves functions to punish or to rehabilitate financially distressed individuals. The way in which the bankruptcy law applicable to individuals is structured can therefore impact significantly on the incentives and ability of individuals to engage in high-risk business activity. We now turn to consider the way in which these sanctions differ across countries.

Generally speaking, personal insolvency proceedings typically result in a *divestment* of the debtor's ownership of most of his assets in favour of an official Trustee, who will liquidate them in order to raise money to pay creditors. Whilst the individual remains 'in bankruptcy', any assets that fall into

his patrimony will automatically also pass to the Trustee. Thus future income earned by the debtor will also be available for distribution to creditors.

The 'severity' of these consequences for the debtor are mitigated in two ways. First, some assets are *exempt* from the process. Universally, debtors are entitled to retain living expenses, personal effects and the like. In the US, debtors are also allowed to retain an interest in their homes, although the maximum value of this 'homestead exemption' varies from state to state. Secondly, and more importantly for present purposes, many jurisdictions allow a bankrupt debtor to obtain a '*fresh start*': namely, that after a certain period of time, a bankrupt is permitted to discharge his outstanding credit obligations and emerge from bankruptcy proceedings (Hallinan, 1986). Many jurisdictions do not permit a discharge of debts following insolvency (see Armour, 2002, for details). For those that do, the length of time which must elapse, and the other conditions which must be fulfilled (e.g. demonstration of good behaviour), vary considerably.[22]

The link between personal bankruptcy law and demand for VC finance

We suggest that the 'severity' of personal bankruptcy law will impact upon two types of potential entrepreneurs, whom we term 'marginal' and 'inframarginal' respectively. We now explain each in turn.

The process of raising venture capital finance itself involves transaction costs. A putative entrepreneur must have at least the genesis of a product, develop a credible business plan and assemble a team in order to convince a venture capitalist that their project is worth backing. Whilst a VC will of course add value to the entrepreneur's efforts, they will want to see that the raw material is worthwhile. Gearing up for a 'pitch' will therefore require putative entrepreneurs to invest time and money. This 'pre-seed' financing will need to be sourced from the entrepreneurs' personal finances, or those of his friends and family.[23] At the same time, entrepreneurs often have to give up their regular jobs whilst the process is ongoing. Thus going through this process will impose a severe strain on the entrepreneur's personal finances: income may have ceased whilst outgoings dramatically increase. If the entrepreneur fails at the outset to raise venture capital finance,[24] then the entrepreneur will find himself or herself in a position of considerable personal financial fragility, where personal financial resources have been depleted and they have no job. The 'downside' outcomes may include potential personal bankruptcy, either if the entrepreneur is unable to regain paid employment quickly enough so as to pay her fixed outgoings, or worse still, if the entrepreneur has borrowed to fund the pre-seed stage.[25]

The structure of personal bankruptcy law will in many cases therefore affect the *marginal* entrepreneur's decision whether or not to 'take the leap' to pursue innovative business ideas, by dampening or exacerbating the potential 'downside' consequences. If potential entrepreneurs have heterogeneous risk preferences, then relaxing the 'severity' of the consequences of personal bankruptcy—whether increasing the level of exemptions, or reducing the time to discharge—may be expected to increase the willingness of entrepreneurs to borrow to fund 'pre-seed' financing. This in turn will increase demand for venture capital finance.

Existing studies have found a correlation between the levels of exemptions available under personal bankruptcy law in different US states and levels of entrepreneurship, measured by reference to self-employment (Fan and White, 2002; Georgellis and Wall, 2002). States with more generous exemptions have more entrepreneurs, which although it does not relate directly to demand for venture capital, it provides support for the conjecture that bankruptcy law affects the incentives of marginal entrepreneurs.[26]

A second effect of personal insolvency law concerns the ease with which *inframarginal* entrepreneurs may be rehabilitated into the economy after a bankruptcy. Bankruptcy is just as likely to occur because of 'bad luck' as because of incompetence on the part of the entrepreneur. If no 'fresh start' is available to exit bankruptcy, then entrepreneurs get only one chance to fail, because they will be unable to raise pre-seed funds in circumstances where all their present and future assets must be handed over to creditors. Conversely, a readily available 'fresh start' means that failed entrepreneurs can be rapidly rehabilitated (Jackson, 1985; Georgakopoulos, 2002). Perhaps surprisingly, this potential effect of time to discharge on *inframarginal* entrepreneurs has not, to our knowledge, been tested empirically.[27]

Levels of exemptions from personal bankruptcy do not differ widely outside the US. In fact, the US is an outlier: in all other jurisdictions we surveyed, permitted exemptions were very modest—clothing, personal effects, living expenses and the like. However, there are significant differences across countries in the time to discharge in the event of bankruptcy. Some countries have no time to discharge (e.g. the U.S.), others have a lengthy period prior to discharge (e.g. 12 years in Ireland and 6 years in Germany), others allow discharge only at the discretion of the bankruptcy court, and others do not allow a 'fresh start' at all. Thus, we formulate our third hypothesis in terms of time to discharge:

4. Data and summary statistics

This section outlines our data and provides summary statistics. We study 13 years (1990 – 2002) of private equity investing from 15 countries: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, the UK, and the US. We pool the data (as described in, e.g. Judge *et al*, 1988) to form a total of 195 observations. We make use of publicly available data from the European Venture Capital Association (EVCA), Venture Economics, and the Canadian Venture Capital Association (CVCA).[28]

We do not consider developing countries or countries from other regions. This is because to do so would involve confronting pronounced institutional differences that give rise to problems associated with combining analyses and data across countries (see e.g. Gompers *et al*, 2003b, and Lerner and Schoar, 2003, for an analysis and discussion of private equity in developing countries). Our analysis is based on countries with legal and institutional structures that have significant differences for the purpose of comparative analyses, but not so different that an entirely different empirical approach is warranted for subsets of the data. Moreover, our analysis does not consider the period prior to 1990, because the venture capital and private equity markets in prior years in certain countries in our sample were not very well developed. Relatedly, data in prior years in those countries with smaller venture capital markets are less reliable.

For comparative purposes across countries, the data are scaled by the GDP in each country. A snapshot of the data is provided in Figure 1. Figure 1 indicates the total amount of early stage investment (investment in 'idea' type entrepreneurial companies without positive earnings), expansion stage investment (investment in companies that could be earning profits but need significant capital inflows for plant expansion, marketing, and to initiate product commercialization), total private equity (including all types of early stage venture capital and other forms of private equity such as late stage, buyout and turnaround investments), total fundraising (capital flows from institutional and investors into venture capital and private equity funds, for all types of private equity in each country), and total dispositions or exits (the value of all sale

transactions through either IPOs, acquisitions, secondary sales, buybacks and write-offs), each expressed as a proportion of GDP in each country. The values are averaged for the full 1990 – 2002 period in Figure 1. There are lags between the time that venture capital and private equity funds receive capital for investment from institutional investors and the time that capital is reinvested into entrepreneurial firms (Gompers and Lerner, 1999, 2001), hence the total fundraising values do not match the total private equity investment values.

Figure 1.   Venture Capital and Private Equity Investing, Fundraising and Dispositions Relative to GDP, 1990-2002
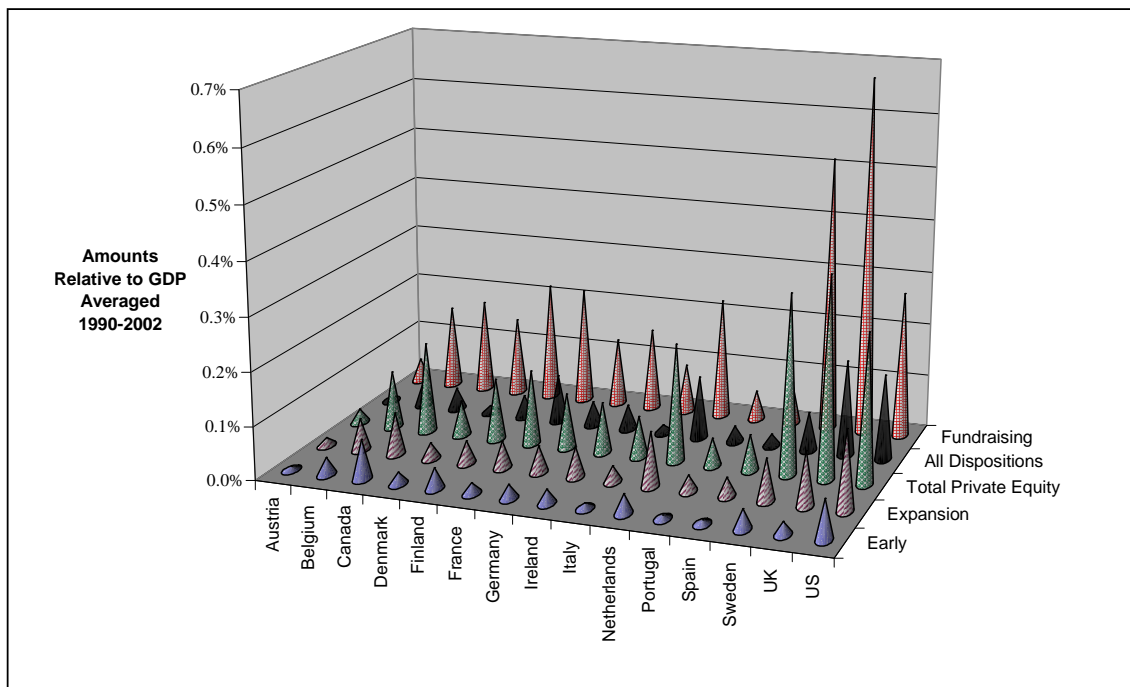
Figure 1 indicates that the largest market in terms of early and expansion stage venture capital investment relative to GDP is the U.S. The U.K. has the largest total private equity market and greatest amount of fundraising relative to GDP, which is attributable to the greater number of large scale buyout transactions. U.K. private equity investors have also brought about the largest average value of exits relative to GDP, followed closely by the U.S. Austria has the smallest venture capital and private equity market on all the metrics reported in Figure 1.

Table 1 provides an initial insight into the rationales for the relative size of the values presented in Figure 1. Table 1 provides a number of comparison of means tests depending on the value of the country-specific MSCI stock market return (lagged one year), the real GDP growth (lagged one year), the 1999-2000 bubble period, the proportion of self-employment (lagged one year), the number of patents (lagged one period), the time to discharge in bankruptcy, the EVCA

16

tax and legal index (the 3-point scale, as defined in section 3.1), and the extent to which government funds participate in the market. These comparison of means tests strongly indicate that early stage, expansion stage, total private equity, fundraising and exits (all relative to GDP) are higher when the prior year's MSCI returns and real GDP growth are higher (and when we are in bubble periods such as 1999-2000), and when there has been greater patent activity in the prior year.

The data also show that legal factors are significant: early stage, expansion stage, total private equity, fundraising and exits (all relative to GDP) are higher when time to discharge in bankruptcy is lower, the EVCA tax and legal index is lower (whereby a lower value for the index indicates a more favourable tax and legal environment for venture capital and private equity funds), and when direct government investment comprises less than 20% of the total private equity market.[29] All of these effects for each variable (with the exception of 3 in the entire matrix) are statistically significant, and most are significant at the 1% level of significance.

Table 2 further explores the relations across the economic and legal variables presented in Table 1, along with country-specific dummy variables. The statistically and economically significant correlations indicated in Table 2 provide strong support for the comparison of means test statistics presented in Table 1.

Table 2 also provides guidance for the simultaneous use of different variables in regression models in the subsection, and for subsets of the data excluding certain countries. Below we present a concise set of regression results that are quite robust to the specification. Additional specifications (above and beyond the ones provided) are not explicitly provided, as the results did not materially change, but are nevertheless available upon request. The empirical methods and test results are discussed further in the next sections.

Table 1. *Summary Statistics and Difference Tests*

This table presents difference of means tests for the size of the venture capital and private equity market for the period 1990-2002 across 15 countries (195 observations): Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, the UK, and the US. The tests are carried out for the total value of venture capital and private equity (early stage investments, expansion stage investments, total private equity investments, total private equity fundraising, and the total values of all "exits" or dispositions) per GDP in the country.

	Early Stage VC / GDP		Expansion Stage VC / GDP		Total Private Equity / GDP	
	Average Value	Difference Test	Average Value	Difference Test	Average Value	Difference Test
MSCI Index Return (lagged 1 year) > 0	2.641E-04	1.219	6.002E-04	2.045**	1.479E-03	2.353**
MSCI Index Return (lagged 1 year) < 0	2.037E-04		4.253E-04		9.548E-04	
Real GDP Growth (lagged 1 year) > 0	2.634E-04	6.481***	5.773E-04	5.220***	1.397E-03	4.679***
Real GDP Growth (lagged 1 year) < 0	6.003E-05		2.443E-04		5.599E-04	
Years 1999 and 2000 Only	6.986E-04	4.607***	1.199E-03	3.690***	3.170E-03	4.435***
All Other Years (1990-2002)	1.646E-04		4.320E-04		9.933E-04	
Self-employment / Population (lagged 1 year) > 0.06	2.695E-04	1.182	6.075E-04	2.203**	1.575E-03	3.819***
Self-employment / Population (lagged 1 year) < 0.06	2.032E-04		4.401E-04		8.560E-04	
Patents (lagged 1 year) > 1000	3.441E-04	3.252***	7.321E-04	3.676***	1.973E-03	5.113***
Patents (lagged 1 year) < 1000	1.650E-04		3.971E-04		7.872E-04	
Time to Discharge in Bankruptcy > 30 years	1.512E-04	-4.048***	3.862E-04	-4.173***	9.272E-04	-4.170***
Time to Discharge in Bankruptcy < 30 years	3.900E-04		7.957E-04		1.930E-03	
EVCA Tax / Legal Index (low number more favorable) > 2	1.863E-04	-2.532**	4.050E-04	-3.658***	9.979E-04	-3.372***
EVCA Tax / Legal Index (low number more favorable) < 2	3.373E-04		7.675E-04		1.824E-03	
Government Funds > 20% Total Private Equity Market	2.188E-04	-0.512	3.661E-04	-2.948***	7.039E-04	-4.266***
Government Funds < 20% Total Private Equity Market	2.551E-04		6.051E-04		1.516E-03	

Note: *, **, *** Significant at the 10%, 5%, and 1% levels, respectively.

Table 1. *Summary Statistics and Difference Tests (continued)*

	Total Fundraising / GDP		Total Dispositions / GDP	
	Average Value	Difference Test	Average Value	Difference Test
MSCI Index Return (lagged 1 year) > 0	2.010E-03	1.712*	6.128E-04	1.264
MSCI Index Return (lagged 1 year) < 0	1.425E-03		4.806E-04	
Real GDP Growth (lagged 1 year) > 0	1.946E-03	5.040***	5.992E-04	2.945***
Real GDP Growth (lagged 1 year) < 0	6.801E-04		3.018E-04	
Years 1999 and 2000 Only	4.109E-03	4.155***	1.014E-03	1.765*
All Other Years (1990-2002)	1.430E-03		4.949E-04	
Self-employment / Population (lagged 1 year) > 0.06	2.261E-03	4.522***	7.036E-04	3.468***
Self-employment / Population (lagged 1 year) < 0.06	1.041E-03		3.287E-04	
Patents (lagged 1 year) > 1000	2.538E-03	3.631***	8.506E-04	4.166***
Patents (lagged 1 year) < 1000	1.258E-03		3.433E-04	
Time to Discharge in Bankruptcy > 30 years	1.323E-03	-3.635***	3.090E-04	-4.928***
Time to Discharge in Bankruptcy < 30 years	2.620E-03		9.735E-04	
EVCA Tax / Legal Index (low number more favorable) > 2	1.510E-03	-2.267***	3.752E-04	-3.579***
EVCA Tax / Legal Index (low number more favorable) < 2	2.340E-03		8.742E-04	
Government Funds > 20% Total Private Equity Market	8.134E-04	-5.486***	2.536E-04	-5.170***
Government Funds < 20% Total Private Equity Market	2.150E-03		6.712E-04	

Note: *, **, *** Significant at the 10%, 5%, and 1% levels, respectively.

Table 2. *Correlation Matrix*

This table presents correlation coefficients across the dependent and independent variables used in Tables 1, and 3 - 6, as well as country-specific dummy variables.

	Early Stage Investments / GDP	Expansion Stage VC / GDP	Total Private Equity / GDP	Fundraising / GDP	Exits / GDP	MSCI Index Return (lagged 1 year)	Real GDP (lagged 1 year)
Early Stage Investments / GDP	1.00						
Expansion Stage VC / GDP	**0.78**	1.00					
Total Private Equity / GDP	**0.71**	**0.85**	1.00				
Fundraising / GDP	**0.52**	**0.58**	**0.79**	1.00			
Exits / GDP	**0.53**	**0.76**	**0.71**	**0.56**	1.00		
MSCI Index Return (lagged 1 year)	**0.16**	**0.14**	**0.21**	**0.17**	0.09	1.00	
Real GDP (lagged 1 year)	**0.17**	**0.18**	**0.15**	**0.15**	0.12	**0.35**	1.00
Dummy Variable for 1999 and 2000	**0.50**	**0.43**	**0.48**	**0.40**	**0.23**	**0.25**	**0.27**
Trend	**0.46**	**0.34**	**0.39**	**0.45**	**0.19**	0.03	**0.18**
Self Employment / Population (lagged 1 year)	**-0.14**	**-0.17**	**-0.19**	**-0.19**	**-0.20**	-0.03	0.12
Patents (lagged 1 year)	**0.34**	**0.39**	**0.25**	0.12	**0.32**	0.02	-0.01
Time to Discharge	**-0.36**	**-0.37**	**-0.34**	**-0.28**	**-0.40**	0.03	**-0.21**
EVCA Tax and Legal Index	**-0.28**	**-0.40**	**-0.41**	**-0.34**	**-0.45**	-0.01	**-0.20**
Dummy Variable for Government VC > 20%	-0.04	**-0.17**	**-0.22**	**-0.24**	**-0.20**	-0.03	-0.05
Austria Dummy Variable	**-0.14**	**-0.19**	**-0.19**	**-0.16**	**-0.16**	-0.06	-0.03
Belgium Dummy Variable	0.03	0.01	-0.05	-0.05	-0.04	0.00	-0.06
Canada Dummy Variable	**0.27**	0.06	0.02	-0.03	-0.06	-0.06	0.00
Denmark Dummy Variable	-0.05	-0.12	-0.13	-0.07	**-0.14**	0.00	-0.06
Finland Dummy Variable	0.06	-0.07	-0.06	0.00	-0.07	0.13	-0.09
France Dummy Variable	-0.05	-0.02	0.00	0.01	0.09	0.00	-0.08
Germany Dummy Variable	-0.01	-0.03	-0.06	-0.08	-0.05	0.01	-0.12
Ireland Dummy Variable	-0.03	0.00	-0.08	-0.04	0.02	0.04	**0.51**
Italy Dummy Variable	-0.11	-0.12	-0.10	-0.11	**-0.14**	-0.06	-0.12
The Netherlands Dummy Variable	0.06	**0.18**	0.12	0.02	**0.17**	0.02	0.01
Portugal Dummy Variable	-0.13	-0.10	-0.13	**-0.15**	-0.09	0.00	0.01
Spain Dummy Variable	-0.13	-0.10	-0.12	-0.13	-0.11	-0.03	0.01
Sweden Dummy Variable	0.04	0.06	**0.25**	**0.29**	0.03	0.01	-0.09
UK Dummy Variable	-0.04	**0.18**	**0.38**	**0.45**	**0.39**	-0.02	0.00
US Dummy Variable	**0.27**	**0.28**	**0.17**	0.05	**0.24**	0.03	0.01

Note: Significant correlations at the 5% level are underlined and in bold.

Table 2. *Correlation Matrix (continued)*

	Dummy Variable for 1999 and 2000	Trend	Employment / Population (Lagged 1 Year)	Patents (Lagged 1 Year)	Time to Discharge	EVCA Tax and Legal Index	Dummy Variable for Government VC > 20%
Early Stage Investments / GDP							
Expansion Stage VC / GDP							
Total Private Equity / GDP							
Fundraising / GDP							
Exits / GDP							
MSCI Index Return (lagged 1 year)							
Real GDP (lagged 1 Year)							
Dummy Variable for 1999 and 2000	1.00						
Trend	**0.40**	1.00					
Self Employment / Population (lagged 1 year)	0.01	0.01	1.00				
Patents (lagged 1 Year)	0.05	-0.14	**0.17**	1.00			
Time to Discharge	-0.10	**-0.14**	**0.17**	**-0.45**	1.00		
EVCA Tax and Legal Index	-0.01	-0.01	0.09	**-0.50**	**0.81**	1.00	
Dummy Variable for Government VC > 20%	-0.02	-0.03	**0.31**	**-0.20**	-0.02	**0.16**	1.00
Austria Dummy Variable	0.01	0.01	-0.13	-0.09	**0.20**	**0.35**	**0.38**
Belgium Dummy Variable	0.00	0.00	-0.05	-0.09	0.08	0.10	-0.05
Canada Dummy Variable	0.01	0.01	**0.15**	-0.09	**-0.43**	**-0.24**	**0.48**
Denmark Dummy Variable	0.01	0.01	**-0.22**	-0.10	**0.19**	**0.32**	-0.11
Finland Dummy Variable	0.01	0.01	-0.03	-0.09	**0.20**	**0.18**	-0.06
France Dummy Variable	0.01	0.01	**-0.21**	-0.02	-0.11	0.07	**-0.15**
Germany Dummy Variable	0.01	0.01	**-0.24**	0.12	0.03	**0.28**	**-0.16**
Ireland Dummy Variable	0.01	0.01	**0.17**	-0.10	**-0.28**	**-0.24**	-0.06
Italy Dummy Variable	0.01	0.01	**0.34**	-0.06	**0.21**	0.00	-0.11
The Netherlands Dummy Variable	0.01	0.01	**-0.15**	-0.08	0.02	-0.11	**-0.16**
Portugal Dummy Variable	0.01	0.01	**0.75**	-0.11	**0.18**	**0.22**	**0.23**
Spain Dummy Variable	0.01	0.01	0.11	-0.10	**0.20**	0.13	0.03
Sweden Dummy Variable	0.01	0.01	-0.10	-0.08	**0.23**	0.08	-0.11
UK Dummy Variable	0.01	0.01	-0.05	-0.04	**-0.40**	**-0.48**	**-0.16**
US Dummy Variable	0.01	0.01	**-0.33**	**0.95**	**-0.44**	**-0.55**	**-0.16**

Note: Significant correlations at the 5% level are underlined and in bold.

5. Empirical methods

In this section we describe the empirical approach to estimating demand and supply reported in subsection 6.1. The data are pooled and stacked by country and year to comprise 195 observations in total. To study the flow of funds between venture capital / private equity funds and entrepreneurial firms (the

dependent variable), we use three-stage least squares to estimate the following two equations:[30]

> (1) Demand for Capital = $\alpha_1 + \beta_{11}$ MSCI Public Market Return (lagged 1 year) + β_{12} Real GDP Growth (lagged 1 year) + β_{13} Dummy Variable for 1999 and 2000 + β_{14} Trend + β_{15} Self Employment / Working Population (lagged 1 year) + β_{16} Patents (lagged 1 year) + β_{17} Time to Discharge in Bankruptcy + ε_1

> (2) Supply of Capital = $\alpha_2 + \beta_{21}$ MSCI Public Market Return (lagged 1 year) + β_{22} Real GDP Growth (lagged 1 year) + β_{23} Dummy Variable for 1999 and 2000 + β_{24} Trend + β_{25} EVCA Tax and Legal Index (where a lower value is better) + β_{26} Government Programs + ε_2

Consistent with Gompers and Lerner (1998), Black and Gilson (1998) and Jeng and Wells (2000), there is a close connection between venture capital markets and stock markets, as both venture capitalists and entrepreneurs typically hope for an IPO exit as a way to liquidate their investment (typically after 3 – 7 years). Similarly, there is a connection between real economic activity and the demand for venture finance. As such, the MSCI return and real GDP growth variables are included (and lagged one year to avoid timing and/or endogeneity problems), and a dummy variable was included for the bubble period. The trend term is included to detrend the data so that spurious correlations are not picked up in the regressions from two or more positively trending time series of data (see e.g. Powell, 1966; Johnson *et al*, 1984). All of these variables affect both the demand for and supply of venture capital, and therefore appear in both equations.

A few variables that are included in the demand equation do not appear in the supply equation, and vice versa, for the purpose of statistical identification. The exclusion of the respective variables is intuitive. On the demand side, an increase in self-employment rates in the prior year and patent activity in the prior year could lead to an increase in the demand for venture capital (and therefore, indirectly, an increase in supply, but this indirect effect does not warrant inclusion of these variables directly in the supply equation).

In the supply equation, we use the EVCA tax and legal index (see section 3.1), for which a lower value indicates a more favourable environment specifically for venture capital and private equity funds. It is noteworthy that other legal indices could be used (see section 2.2), but high correlations prevent use of similar variables. As discussed, the EVCA index is used because it was designed by and for practitioners to assess the overall tax and legal environment as it pertains to setting up a venture capital or private equity fund in a country.

The supply equation also makes use of a dummy variable for government funds that directly invest capital in entrepreneurial firms. The dummy variable takes the value 1 if such funds comprised more than 20% of the overall investment in the particular year in the country, and 0 otherwise. As a result of the definition of this variable, and more generally the incentives for a government to set up and give capital to a private equity fund, this variable for government funds is treated as *endogenous* in the system of equations for all reported estimations.[31] The alternative specifications and estimation results are described below.

Consistently with the theory developed in section 3.3, we include in the demand-side specification a variable denoting the number of years until a discharge from pre-bankruptcy debt is available. Recall that some countries have no time to discharge, others have a specified period prior to discharge, some do not have discharge at all, and others have discretion in discharge.[32] Where no discharge is available, we substitute a measure of average life expectancy, to denote the fact that bankrupt debtors in such jurisdictions face 'social death' for the rest of their lives.[33] Where discharge is available, but only at the discretion of the court, we substitute half the life expectancy, to capture the fact that there is a possibility that the court may refuse to exercise its discretion. Some countries changed their bankruptcy legislation over the 1990 – 2002 period studied. For the period of time in countries that did not enable discharge at all, we used the number of years for average working life expectancy in that country.

It is of course possible that any observed correlation between temperate bankruptcy laws and demand for venture capital finance may be the result of other variables that are correlated with both. For example, it may be that some countries simply have a more 'entrepreneurial culture', which leads them to enact more temperate bankruptcy laws *and* to greater demand for venture capital. We utilise two control variables to check against this possibility: self-employment and patent applications.

6. Empirical results

In subsection 6.1 we describe the estimates of the demand for capital by entrepreneurs and the supply of capital by venture capital and private equity funds. Fundraising vis-à-vis venture capital funds and institutional investors is considered in subsection 6.2. Subsection 6.3 provides a complementary analysis of estimates of the value of exit transactions.

6.1 Demand and supply estimates

This subsection reports the estimates based on the empirical methods outlined above in section 4. The first set of estimates is reported in Table 3 for the value of early stage transactions only (systems (1) and (2)) and expansion stage transactions only (systems (3) and (4)). Systems (1) and (3) make use of the full set of data. Systems (2) and (4) exclude the U.S. observations to illustrate the robustness of the results to a country that is (potentially) an outlier. Each dependent variable is expressed relative to the GDP in the year in the country.

System (1), (2) and (3) in Table 3 indicates strong support for Hypothesis 1 (section 3.1) pertaining to the EVCA tax and legal index. The evidence is statistically significant at the 5% level in system (2) and at the 1% level in systems (1) and (3). The evidence is also economically significant. A one-point decrease (improvement) in the index (e.g. the approximate difference between moving from Spain to the U.K.) gives rise to a 0.036% increase in the amount of early stage venture capital financing per GDP (0.025% in system (2) which excludes the U.S.). For expansion stage investments, the evidence shows greater economic significance at 0.07% in system (3), but is statistically insignificant in system (4) where the U.S. data is excluded.

Regarding government programs (section 3.2), the data strongly support Hypothesis 2b and contradict 2a. That is, government funds appear to crowd private investment. In system (2) excluding the U.S. data, the coefficient is statistically insignificant such that government investment has neither increased nor decreased the total amount of early stage investment. This implies that the investment of public funds has 'crowded out' an equal amount of private funds. In systems (1), (3) and (4), the presence of significant government programs is associated with a reduced overall level of early and expansion stage investment, implying that 'crowding out' in these cases is more than 100%. In terms of economic significance in systems (1), (3) and (4), when government funds comprise more than 20% of a country's market, early stage investment per GDP is 0.04% lower (system (1)), and expansion stage investment is 0.09% lower with the full sample (system (3)) and 0.02% lower when the U.S. data are excluded from the system (system (4)).

The intuition underlying the crowding out phenomenon was discussed above in section 3.2. If the purpose of government programs is to expand the overall size of the pool of investment activity, this evidence suggests that extensive government programs—that is, those that exceed 20% of the size of the total private equity market in the country—actually frustrate this objective rather than fulfil it.[34]

24

Regarding Hypothesis 3 (section 3.3) pertaining to bankruptcy legislation, the data indicate that more severe bankruptcy laws—measured in terms of the number of years to discharge—imply reduced demand for venture capital. In terms of economic significance, a 9-year decrease (i.e. a move from Ireland to the U.K.) in time to discharge increases the amount of early stage venture capital by approximately 0.002% with the full sample (system (1)) and the subsample excluding the U.S. (system (2)). Similarly, the legislative change in The Netherlands in 1997 from no discharge (or discharge in 48 years based on average life expectancy) to 3 years in 1999 lead to an increase in the demand for early stage venture capital transactions by 0.009%. For expansion stage investments, the evidence is less robust in that the effect is significant in system (3) including the U.S. data, but not in system (4) excluding the U.S. data. As expansion stage is less closely connected to the probability of bankruptcy compared to early stage, there are differences across systems (1) and (2) versus systems (3) and (4). This is consistent with Hypothesis 3, which predicts a more pronounced impact on early-stage than later-stage investment.

Many of the control variables for economic effects are also significant, as is the trend term. The results pertaining to the MSCI, real GDP growth and bubble effect depend on which of these variables are included or excluded. That is, when the bubble variable is included, the others are generally insignificant. When the bubble variable is excluded, the other economic effects tend to be positive and significant. Either way, the particular specification in terms of economic control variables does not materially impact the legal variables indicated above. The self-employment variable is positive and significant in system (2) only. The variable for patents is positive and significant in the systems including the U.S. data, but insignificant in the systems excluding the U.S. data. Note that the majority of patent activity is derived from the U.S. (see the extremely large correlation coefficient of 0.97 between the U.S. dummy variable and the patent variable in Table 2).

Table 4 reports similar estimates for the combined value of all early and expansion stage transactions together, and for all types of private equity transactions including venture capital, buyouts and turnaround transactions together. The results are very similar to those discussed in Table 3, and therefore not discussed at length, as the qualitative implications do not change. The similarity in the results across Tables 3 and 4 indicates that the estimates are quite robust to considering different definitions of venture capital and private equity. Please refer to Table 4 for the specific details.

Table 3. *3SLS Estimates of the Demand for and Supply of Early and Expansion Stage Venture Capital, 1990 – 2002*

Explanatory Variables	Dependent Variables: Value of Early Stage or Expansion Stage Investments in each Country in each Year divided by the Country's GDP							
	System (1): Early Stage				System (2): Early Stage, Excluding US			
	Demand		Supply		Demand		Supply	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-1.04E-05	-0.136	0.0009009	4.283***	-0.000121	-1.485	0.0005361	1.970**
MSCI Public Market Return in the Prior Year	0.0015325	1.425	0.0012257	0.875	0.001586	1.567	0.0014403	1.382
Real GDP Growth in the Prior Year	-0.000296	-0.308	-0.002324	-1.770*	-1.5E-05	-0.016	-0.001253	-1.132
Dummy Variable for Years 1999 and 2000	0.0003727	6.022***	0.0004325	5.298***	0.0002957	5.031***	0.000336	5.399***
Trend	2.992E-05	5.069***	2.211E-05	2.684***	3.096E-05	5.538***	2.688E-05	4.075***
Self-employment / Population in Prior Year	0.0003082	0.35	-	-	0.0015134	2.033**	-	-
Patents in Prior Year	5.416E-09	4.661***	-	-	1.238E-08	1.205	-	-
Time to Discharge in Bankruptcy	-2.37E-06	-2.340**	-	-	1.7E-06	-1.726*	-	-
EVCA Tax /Legal Index (lower value is better)	-	-	-0.000359	-4.584***	-	-	-0.000247	-2.475**
Government VC Programs (treated as endogenous)	-	-	-0.000453	-2.223**	-	-	-0.000124	-0.788
Number of Observations	195		195		182		182	
F Statistic	23.59***		3.19***		16.19***		15.57***	
Loglikelihood	5369.989		5317.207		5028.152		5020.919	
Akaike Information Statistic	-54.995		-54.464		-55.167		-55.098	
Adjusted R^2	0.449		0.063		0.370		0.326	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

Table 3. *3SLS Estimates of the Demand for and Supply of Early and Expansion Stage Venture Capital, 1990 – 2002 (continued)*

Explanatory Variables	Dependent Variables: Value of Early Stage or Expansion Stage Investments in each Country in each Year divided by the Country's GDP							
	System (3): Expansion Stage				System (4): Expansion Stage, Excluding US			
	Demand		Supply		Demand		Supply	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.0001299	0.859	0.002018	5.767***	-6.38E-05	-1.181	-0.000193	-1.097
MSCI Public Market Return in the Prior Year	0.0023282	1.215	0.0017722	0.764	0.0008531	1.081	0.0009375	1.203
Real GDP Growth in the Prior Year	0.0009837	0.572	-0.003203	-1.472*	0.000664	0.919	0.0004828	0.601
Dummy Variable for Years 1999 and 2000	0.0005608	5.09***	0.0006793	5.026***	0.000277	5.941***	0.000273	5.789***
Trend	3.206E-05	3.043***	1.517E-05	1.113***	2.685E-05	6.025***	2.558E-05	5.304***
Self-employment / Population in Prior Year	0.0012167	0.723	-	-	-0.000798	-1.244	-	-
Patents in Prior Year	1.167E-08	5.441***	-	-	9.098E-09	1.299	-	-
Time to Discharge in Bankruptcy	-3.34E-06	-1.767*	-	-	7.427E-07	1.017	-	-
EVCA Tax /Legal Index (lower value is better)	-	-	-0.000702	-5.379***	-	-	8.497E-05	1.153
Government VC Programs (treated as endogenous)	-	-	-0.000903	-2.775**	-	-	-0.000213	-1.791*
Number of Observations	195		195		182		182	
F Statistic	16.50***		3.01***		18.63***		22.33***	
Loglikelihood	5257.458		5218.967		4714.687		4714.942	
Akaike Information Statistic	-53.841		-53.456		-55.700		-55.715	
Adjusted R^2	0.359		0.058		0.424		0.432	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

Table 4. *3SLS Estimates of the Demand for and Supply of Early plus Expansion Stage Venture Capital, and All Types of Private Equity, 1990 – 2002*

Explanatory Variables	Dependent Variables: Value of Early Stage or Expansion Stage Investments in Each Country in Each Year divided by the Country's GDP							
	System (1): Early + Expansion Stage				System (2): Early + Expansion Stage, Excluding US			
	Demand		Supply		Demand		Supply	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.000122	0.565	0.002908	5.433***	3.25E-06	0.018	0.000861	1.949*
MSCI Public Market Return in the Prior Year	0.003845	1.411	0.002966	0.832	0.003128	1.512	0.003033	1.554
Real GDP Growth in the Prior Year	0.000715	0.293	-0.00548	-1.64	0.002645	1.384	5.09E-05	0.025
Dummy Variable for Years 1999 and 2000	0.000933	5.945***	0.00111	5.346***	0.000598	4.894***	0.000664	5.622***
Trend	6.2E-05	4.135***	3.72E-05	1.776*	5.29E-05	4.503***	4.18E-05	3.465***
Self Employment / Population in Prior Year	0.001482	0.618	---	---	0.001385	0.757	---	---
Patents in Prior Year	1.71E-08	5.540***	---	---	4.4E-08	2.295**	---	---
Time to Discharge in Bankruptcy	-5.7E-06	-2.107**	---	---	-2E-06	-0.887	---	---
EVCA Tax / Legal Index (lower value is better)	---	---	-0.00105	-5.270***	---	---	-0.00023	-1.259
Government VC Programs (treated as endogenous)	---	---	-0.0014	-2.697***	---	---	-0.00071	-2.387**
Number of Observations	195		195		182		182	
F Statistic	22.53***		2.20**		12.32***		18.81***	
Loglikelihood	5188.619		5135.084		4551.859		4559.785	
Akaike Information Statistic	-53.135		-52.596		-53.773		-53.879	
Adjusted R^2	0.437		0.036		0.320		0.389	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

Table 4. *3SLS Estimates of the Demand for and Supply of Early plus Expansion Stage Venture Capital, and All Types of Private Equity, 1990 – 2002 (continued)*

Explanatory Variables	Dependent Variables: Value of Early Stage or Expansion Stage Investments in Each Country in Each Year divided by the Country's GDP							
	System (3): All Private Equity				System (4): All Private Equity, Excluding US			
	Demand		Supply		Demand		Supply	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-0.00017	-0.543	0.002935	4.154***	-0.00085	-1.579	0.00434	3.443***
MSCI Public Market Return in the Prior Year	0.012991	2.512**	0.011991	2.547**	0.01318	2.513***	0.012526	2.594***
Real GDP Growth in the Prior Year	-0.0007	-0.152	-0.00688	-1.559	0.00267	0.552	-0.00934	-1.822*
Dummy Variable for Years 1999 and 2000	0.001462	4.911***	0.001656	6.038***	0.001129	3.707***	0.00144	4.994***
Trend	0.000135	4.758***	0.000111	4.028***	0.000132	4.529***	8.86E-05	2.900***
Self Employment / Population in Prior Year	0.004094	1.048	---	---	0.009213	1.877*	---	---
Patents in Prior Year	1.83E-08	3.427***	---	---	1.44E-07	2.657***	---	---
Time to Discharge in Bankruptcy	-7.6E-06	-1.651*	---	---	-3.4E-06	-0.582	---	---
EVCA Tax / Legal Index (lower value is better)	---	---	-0.00119	-4.527***	---	---	-0.00165	-3.581***
Government VC Programs (treated as endogenous)	---	---	-0.00117	-1.706*	---	---	-0.00184	-2.537**
Number of Observations	195		195		182		182	
F Statistic	13.85***		25.75***		7.85***		15.46***	
Loglikelihood	5063.691		5080.920		4728.708		4741.910	
Akaike Information Statistic	-51.853		-52.040		-51.876		-52.032	
Adjusted R^2	0.317		0.434		0.209		0.324	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

6.2. Fundraising estimates

In this subsection we assess the determinants of the flow of funds from institutional investors to venture capital funds ("fundraising"), as distinct from the flow of capital vis-à-vis entrepreneurial firms and venture capital funds. Somewhat similar to the methodology employed by Gompers and Lerner (1998) and Jeng and Wells (2000) to study fundraising,[35] in this subsection we use OLS and 2SLS (the 2SLS estimates are provided to consider the potential endogeneity of the government programs variable). Following the same methodology used by Gompers and Lerner (1998) and Jeng and Wells (2000), we do not use a system of equations to study fundraising, because demand and supply factors can be contemporaneously considered in the same equation for fundraising (this is distinct from and unlike the issue of investing, or the flow of funds between venture capital funds and entrepreneurial firms as studied in subsection 6.1 and Tables 3 and 4). The fundraising estimates are provided to complement the analyses in Tables 3 and 4 provided above. The fundraising results are presented in Table 5.

The evidence on fundraising in Table 5 is generally consistent with and supportive of the evidence on investing in Tables 3 and 4 pertaining to both the legal variables[36] (Hypotheses 1 – 3) and the economic control variables. With the detrended data, that is, specifications that include a trend term to avoid spurious correlations between the left- and right-hand-side variables, the main economic factor driving fundraising across countries over the 1990-2002 period was the bubble period. There is, unexpectedly, some evidence of a negative relation between fundraising and patent activity; however, this evidence is not robust to the particular specification. Similarly, there is unexpected evidence of a negative relation between self-employment and fundraising. This latter finding is probably attributable to a comparative dearth of pension fund capital—the largest contributor to venture capital funds in Europe and North America—amongst countries with higher levels of self-employment.

The legal and institutional variables have much more robust and stronger economic effect on venture fundraising. The estimates on the impact on fundraising from the EVCA index and the bankruptcy index are sensitive to the simultaneous inclusion of both of these right-hand-side variables; therefore, we provide alternative specifications. Venture fundraising is much greater among countries and time periods with shorter times to discharge in bankruptcy. In particular, a reduction in time to discharge in bankruptcy by one year increases fundraising/GDP by approximately 0.03%. Similarly, an improvement (reduction) in the EVCA index by 1 point on the 3-point scale increases fundraising/GDP by approximately 0.3%.

The impact of government support programs on venture fundraising activity is negative and significant in all specifications, which implies crowding out—that is, substitution for, or deterrence of, private investment by public investment— by *more than 100%.*[37] Countries and time periods for which government programs are more than 20% of the market reduce overall industry fundraising/GDP by approximately 0.05% to 0.1%. These estimates are very robust to the potential endogeneity of the government programs variable, as shown by the similarity of the OLS and 2SLS estimates in Table 5, and robust to the inclusion/exclusion of the US observations in the sample.[38] These fundraising estimates are consistent with the investment estimates discussed above in subsection 6.1.

6.3 Disposition (Exits) estimates

To further complement the investment (Tables 3 and 4) and fundraising (Table 5) evidence, we provide estimates of the legal variables pertaining to Hypotheses 1 – 3 on the total value of exits (dispositions or sale transactions) per GDP in Table 6.

The data indicate industry dispositions are significantly higher among countries with more favourable tax and legal environments (a 1 point decrease (improvement) in the EVCA index increases total dispositions per GDP by 0.08%). The data also show that the presence of government programs that exceed 20% of the private equity market reduces industry dispositions per GDP by 0.03%. Unfavourable bankruptcy legislation further reduces industry dispositions. An increase in the time to discharge by 10 years reduces dispositions per GDP by 0.015%. One explanation for this result is that marginal entrepreneurs with risky but potentially very valuable projects do not want to start up a firm because of unfavourable bankruptcy laws. Note that the effects from legal variables are much more robust and indicate greater statistical and economic significance relative to the economic control variables.

It is noteworthy that the results in Table 6 are consistent with similar evidence of lower venture capital returns in Canada relative to the U.S. (Cumming and MacIntosh, 2003a), and in Europe relative to the U.S. (Hege *et al*, 2003; Schwienbacher, 2002). Cumming and MacIntosh, and Hege *et al* and Schwienbacher, however, do not consider industry-wide dispositions. Moreover, Hege *et al*, and Schwienbacher do not control for differences across different European countries. Table 6 therefore builds on prior work by providing a first-ever look at industry-wide dispositions across a large number of different countries.

Table 5. *OLS and 2SLS Estimates of Venture Capital and Private Equity Fundraising, 1990 – 2002*

Explanatory Variables	Dependent Variable: Total Value of Fundraising from Institutional and Other Investors							
	(1) OLS		(2) OLS		(3) 2SLS Govt VC Endogenous		(4) 2SLS Govt VC Endogenous	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.002223	4.531***	0.006801	5.716***	0.002035	4.203***	0.006688	5.364***
MSCI Public Market Return in the Prior Year	0.015456	1.808*	0.015813	1.894*	0.014104	1.645	0.015226	1.819*
Real GDP Growth in the Prior Year	-0.00523	-1.082	-0.01086	-2.057**	-0.00407	-0.818	-0.00999	-1.856*
Dummy Variable for Years 1999 and 2000	0.001519	2.642***	0.001722	3.355***	0.001593	2.764***	0.001752	3.383***
Trend	0.000211	5.257***	0.00024	6.155***	0.00021	5.194***	0.00024	6.037***
Self Employment / Population in Prior Year	-0.01423	-3.360***	-0.022	-3.939***	-0.01267	-2.758***	-0.02281	-3.792***
Patents in Prior Year	-1.4E-08	-1.189	-3.5E-08	-2.568**	-1.3E-08	-1.072	-3.4E-08	-2.454**
Time to Discharge in Bankruptcy	-2.96E-05	-2.976***	---	---	-2.9E-05	-2.923***	---	---
EVCA Tax / Legal Index (lower value is better)	---	---	-0.00258	-5.209***	---	---	-0.00255	-4.974***
Government VC Programs	-0.00106	-5.127***	-0.00071	-3.788***	-0.00116	-5.615***	-0.0005	-2.338**
Number of Observations	195		195		195		195	
F Statistic	14.21***		20.86***		14.06***		20.14***	
Loglikelihood	4987.957		5003.887		4987.548		5002.270	
Akaike Information Statistic	-51.066		-51.230		-51.062		-51.213	
Adjusted R^2	0.353		0.450		0.350		0.441	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

32

Table 5. *OLS and 2SLS Estimates of Venture Capital and Private Equity Fundraising, 1990 – 2002 (continued)*

Explanatory Variables	Dependent Variable: Fundraising, Excluding US Observations							
	(5) OLS		(6) OLS		(7) 2SLS Govt VC Endogenous		(8) 2SLS Govt VC Endogenous	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.002673	5.246***	0.007163	6.260***	0.002387	4.825***	0.007023	5.877***
MSCI Public Market Return in the Prior Year	0.016109	1.788*	0.016346	1.866*	0.014555	1.609	0.015773	1.794*
Real GDP Growth in the Prior Year	-0.0062	-1.269	-0.01052	-1.989**	-0.00454	-0.907	-0.00951	-1.762*
Dummy Variable for Years 1999 and 2000	0.001245	2.184**	0.00143	2.853***	0.001322	2.301**	0.001457	2.869***
Trend	0.000207	4.984***	0.00023	5.914***	0.000206	4.939***	0.000231	5.819***
Self Employment / Population in Prior Year	-0.01604	-3.765***	-0.02231	-3.952***	-0.01419	-3.045***	-0.02307	-3.824***
Patents in Prior Year	-5.9E-08	-1.105	-5.6E-09	-0.147	-4.1E-08	-0.768	4.85E-09	0.127
Time to Discharge in Bankruptcy	-3.39E-05	-3.442***	---	---	-3.24E-05	-3.330***	---	---
EVCA Tax / Legal Index (lower value is better)	---	---	-0.00271	-5.545***	---	---	-0.00269	-5.310***
Government VC Programs	-0.00112	-5.475***	-0.00071	-3.802***	-0.00117	-5.876***	-0.00046	-2.171**
Number of Observations	182		182		182		182	
F Statistic	12.88***		20.07***		12.59***		19.25***	
Loglikelihood	4656.814		4674.035		4656.042		4672.224	
Akaike Information Statistic	-51.075		-51.264		-51.066		-51.244	
Adjusted R^2	0.344		0.457		0.339		0.447	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

Table 6. *OLS and 2SLS Estimates of Venture Capital and Private Equity Exits, 1990 - 2002*

| Explanatory Variables | Dependent Variable: Total Value of All Dispositions | | | | | | | |
| | (1) OLS | | (2) OLS | | (3) 2SLS Govt VC Endogenous | | (4) 2SLS Govt VC Endogenous | |
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.000955	4.408***	0.002131	6.917***	0.000917	4.302***	0.002089	6.209***
MSCI Public Market Return in the Prior Year	0.002568	1.222	0.002313	1.137	0.002239	1.063	0.002138	1.056
Real GDP Growth in the Prior Year	-0.00081	-0.271	-0.00183	-0.602	-0.00052	-0.168	-0.00158	-0.502
Dummy Variable for Years 1999 and 2000	0.000315	1.233	0.000377	1.495	0.000337	1.321	0.000387	1.542
Trend	2.06E-05	1.476	2.98E-05	2.042**	2.03E-05	1.442	2.97E-05	1.985**
Self Employment / Population in Prior Year	-0.00188	-1.351	-0.00425	-2.538**	-0.00148	-0.995	-0.00436	-2.324**
Patents in Prior Year	5.35E-09	0.5	9.53E-10	0.09	5.65E-09	0.532	1.31E-09	0.124
Time to Discharge in Bankruptcy	-1.3E-05	-4.290***	-2.4E-06	-0.63	-1.4E-05	-4.328***	-2.5E-06	-0.62
EVCA Tax / Legal Index (lower value is better)	---	---	-0.00072	-5.182***	---	---	-0.00071	-4.507***
Government VC Programs	-0.00033	-4.453***	-0.00022	-2.778***	-0.00037	-4.846***	-0.00018	-1.905*
Number of Observations	195		195		195		195	
F Statistic	8.17***		8.71		8.17***		8.51***	
Loglikelihood	5175.354		5180.442		5175.360		5179.774	
Akaike Information Statistic	-52.988		-53.030		-52.988		-53.023	
Adjusted R^2	0.228		0.265		0.228		0.258	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

Table 6. *OLS and 2SLS Estimates of Venture Capital and Private Equity Exits, 1990 – 2002 (continued)*

Explanatory Variables	Dependent Variable: Dispositions, Excluding US Observations							
	(5) OLS		(6) OLS		(7) 2SLS Govt VC Endogenous		(8) 2SLS Govt VC Endogenous	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.001249	7.079***	0.002401	9.129***	0.001177	7.027***	0.002379	8.301***
MSCI Public Market Return in the Prior Year	0.003237	1.674*	0.002838	1.587	0.002838	1.460	0.002631	1.483
Real GDP Growth in the Prior Year	-0.00104	-0.37	-0.00148	-0.526	-0.00055	-0.189	-0.00113	-0.385
Dummy Variable for Years 1999 and 2000	6.57E-05	0.506	0.000124	1.026	8.9E-05	0.673	0.000135	1.117
Trend	1.63E-05	1.161	2.43E-05	1.663*	1.59E-05	1.125	2.46E-05	1.639
Self Employment / Population in Prior Year	-0.00296	-2.313***	-0.00473	-3.038***	-0.00252	-1.903*	-0.00495	-2.927***
Patents in Prior Year	-1.5E-08	-1.098	1.24E-08	0.851	-8.6E-09	-0.647	1.75E-08	1.216
Time to Discharge in Bankruptcy	-1.6E-05	-6.018***	-3E-06	-0.759	-1.6E-05	-5.930***	-2.4E-06	-0.561
EVCA Tax / Legal Index (lower value is better)	---	---	-0.0008	-5.230***	---	---	-0.00081	-4.725***
Government VC Programs	-0.00037	-4.975***	-0.00022	-2.710***	-0.00038	-4.866***	-0.00016	-1.526
Number of Observations	182		182		182		182	
F Statistic	10.69***		13.35***		10.34***		12.68***	
Loglikelihood	4894.815		4906.498		4893.831		4904.573	
Akaike Information Statistic	-53.690		-53.808		-53.679		-53.787	
Adjusted R^2	0.300		0.381		0.292		0.367	

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively.

35

This evidence on industry dispositions in Table 6 on the pronounced impact of law on venture finance is consistent with, and provides further support for, the evidence on the effect of law on investing (Tables 3 and 4) and fundraising (Table 5). The fact that industry-wide dispositions are negatively related to government programs, harsh bankruptcy laws, and unfavourable EVCA legal indices, and the fact that these legal effects are much more robust in terms of greater economic and statistical significance relative to the economic variables, highlights the very pronounced role of law in facilitating Silicon Valley-like venture capital markets.

6.4 Limitations and future research

This paper makes use of aggregate annual industry data across 15 nations spanning 13 years (1990 – 2002). There are limitations with the use of aggregate data in terms of details regarding specific micro-level transaction effects. Transaction specific data could be used to explore certain issues raised in this paper in more detail. That type of analysis would be a useful extension and would complement the results presented herein. To assess overall industry effects resulting from the legal environment, however, it is necessary to employ a comprehensive set of data, and such data exist only on an aggregate basis.

Whilst our indices for bankruptcy laws and public funds are true time series, the EVCA index of legal and fiscal measures was first constructed in 2003. Our preliminary consideration of a modified EVCA index with changes over time did not yield material changes to our econometric estimates. The main reason is that, as described above in subsection 3.1, the EVCA index is a weighted average of 10 legal factors; therefore, legislative changes to a subset of the variables are relatively immaterial to the overall index value for a country year index value.[39] By contrast, our public VC funds variable and bankruptcy law index are not averaged values of multiple legal and institutional variables, and therefore we made use of our own variables which do in fact change over time for each of the countries considered in our sample.

Our conclusions in this paper are of course confined to the countries considered. We did consider segregating the sample by dropping countries, but this did not materially affect our presented results. We presented all of the results with and without the U.S. data (as a natural suspect for an outlier country); alternative specifications are available upon request. As datasets become developed over a significantly lengthy period from other countries in developing nations, it would also be quite worthwhile to assess the role of legal systems in facilitating the development of more nascent venture capital markets.

Finally, our findings as to the impact of bankruptcy law pose intriguing questions as to the relative importance of demand versus supply-side factors. Against the background of increasing globalisation of financial markets, it might be thought that demand-side factors would become increasingly important vis-à-vis those that impact solely upon supply, as capital may move more easily across borders than entrepreneurs (Mayer, 2001; Armour, 2003). Whilst we find that the economic significance of bankruptcy law is much less than that of the composite index of supply-side legal measures, this does not provide a genuine test of the 'demand-side hypothesis', for in this study we consider only one demand-side factor, as against the full range of supply-side measures that industry experts consider to be important. Future research might investigate the relative significance of the EVCA index as against a similarly composite index of demand-side factors.

7. Implications and conclusion

Based on aggregate industry venture capital and private equity data spanning the period 1990 – 2002 from Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, the UK, and the US, we show that the legal environment is of paramount importance in measuring the supply of and demand for venture capital. Favourable tax and legal environments facilitate the establishment of venture capital and private equity funds and increase the supply of capital. Similarly, temperate bankruptcy laws stimulate entrepreneurialism and increase the demand for venture capital. Government programs, by contrast, crowd out private equity investment. These effects are both statistically and economically significant, and more pronounced than the effects from control variables pertaining to MSCI returns, real GDP growth, patent activity, among other controls explicitly shown and otherwise, including controls for the endogeneity of government programs. We showed further that these results were supported by alternative estimation methods and an analysis of fundraising across countries.

In the course of our complementary analyses, we demonstrated that industry dispositions per dollar of GDP are enhanced by favourable tax and legal environments for funds, and by temperate bankruptcy laws for entrepreneurs. Government programs, by contrast, significantly reduce overall industry dispositions per dollar of GDP. These results are robust to the endogeneity of the establishment of and support for government programs.

What implications do our results have, both for our understanding of the determinants of venture finance, and for policymakers seeking to replicate the

'Silicon Valley' phenomenon elsewhere? The prevailing wisdom, it will be recalled,[40] has been that deep and liquid *stock markets* are the most important determinant of venture capital investment. Policymakers wishing to foster venture capital markets could therefore do so *indirectly* by implementing legal measures that are 'foundational' for the development of liquid stock markets: disclosure laws, minority shareholder protection, antidirector rights, and so on (La Porta *et al,* 1997, 1998; Black, 2001). An alternative route would be for governments to supply capital themselves, through publicly funded schemes that would seek to 'jump start' private equity markets. This, however, would seem to be a risky use of public funds, the success of such schemes being highly contingent on the appropriate design of incentives (Gilson, 2003).

It appears that the menu for policy-makers seeking to replicate a 'Silicon Valley' type venture capital market contains more options than has previously been imagined. Our results suggest that a range of legal factors may affect venture capital investment *directly*. By using the EVCA legal index, which relates specifically to the factors that matter to venture capital investors, we are able to capture the significance of the most direct impacts made by the legal regime on investment levels. Not only are these relationships statistically significant, but our results suggest that they have considerable economic significance as well. Policymakers wishing to develop VC markets might therefore consider modifying their fiscal and legal environment in accordance with the EVCA index, as an alternative, or in addition to, reforms designed to foster deep and liquid stock markets.

Our results also raise further doubts about the wisdom of publicly funded venture capital funds. Our findings on Hypothesis 2, namely that the presence of public funds tend to reduce overall industry returns, and, what is worse, to 'crowd out' private funds, suggest that most of these schemes have not been designed with appropriate incentives. At best, this implies that the 'engineering problem' for those designing such schemes is a difficult one. At worst, it may imply that the public sector's openness to interest group capture means that it is inherently unsuited to acting in a role where very hard financial discipline is required. Either way, the implication of our results for policymakers is clear, confirming earlier suspicions: publicly funded venture schemes do not appear to have been, in aggregate, an effective way of stimulating venture capital investment.

Our third finding is that a temperate personal bankruptcy law increases demand for VC finance, even controlling for other 'demand-side' factors such as patent activity and levels of self-employment. On one level, this finding is counterintuitive, given that venture capital is *equity* finance. However, the result

supports our theory, based on the idea that the process of *seeking* venture capital itself is costly and that bankruptcy law thereby affects the numbers of entrepreneurs willing (marginal entrepreneurs) or able (inframarginal entrepreneurs) to incur these 'pre-seed' search costs. This is reinforced by the fact that the correlation is statistically more significant for early-stage than expansion stage finance amongst the subset of data excluding the US, consistent with the idea that personal bankruptcy law's impact is disproportionately loaded onto the very earliest stages of entrepreneurial activity. The finding is also consistent with existing research that has shown temperate personal bankruptcy law to be an important determinant of levels of entrepreneurship in general. The immediate implication for policymakers wishing to foster national venture capital markets is clear: it is possible for the legal environment to enhance not only the attractiveness of a jurisdiction for investors, but also the numbers of individuals willing to engage in entrepreneurial activity,[41] and one way to do this is to make bankruptcy laws less penal.

At a more general level, our results may also have implications for our understanding of the complementarities between venture capital and other elements of financial systems. The dominant classification categorises financial systems as 'insider' or 'outsider', according to the ownership and governance structure of their public firms. The divide is correlated with the strength of the protection afforded to shareholders in public firms (La Porta *et al*, 1997). Following Black and Gilson (1998), venture capital activity is thought to be directly linked to stock markets, and thus map directly across this divide. Insider systems, this might imply, are not going to develop VC markets without stock markets. However, whilst the most attractive *exit* from a VC investment, namely an IPO, might be most readily available in an outsider system, the essence of the VC relationship *whilst it subsists* in fact owes more to the governance strategies employed by public company blockholders in insider systems (Allen and Song, 2003). The relationship involves rich flows of information and active governance activity. The fact that there are legal determinants of VC activity, which are independent of, and not correlated with, stock market activity, provides further support for the view that venture capital's position is not 'naturally' situated in outsider governance regimes.

Overall, the policy implications from the data indicate the road to establishing a Silicon Valley-like private equity market outside the U.S. is paved with favourable tax laws and legal structures that accommodate the establishment of private equity funds, temperate bankruptcy laws that provide little or no time to discharge for entrepreneurs, and at most only a very small scope for direct government investment programs.

Notes

[1] Practitioner summaries of public policy initiatives are available on links from www.evca.com (for Europe), www.ventureeconomics.com (for the US) and www.cvca.ca (for Canada). Various policy initiatives are summarized in Gilson (2003), Cressy (2002), Armour (2002, 2003), Cosh and Wood (1998), and Cumming (2003).

[2] For seminal studies, see Sahlman (1990); Black and Gilson (1998) and Gompers and Lerner (1999). The literature is reviewed by Klausner and Litvak (2001); Gompers and Lerner (2001) and Armour (2003).

[3] For example, see Poterba (1989a,b), Gompers and Lerner (1998), Lerner (1999, 2002a,b), Keuschnigg and Nielsen (2001, 2003a,b).

[4] Specifically: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, the UK, and the US.

[5] That is, we divide the relevant figure by the same country's GDP in the same year.

[6] We follow the terminology of the European Venture Capital Association (www.evca.com), and apply similar definitions to the U.S. and Canadian markets (definitions in other countries may vary). Thus 'early stage' investment refers to investment in 'idea' type entrepreneurial companies without positive earnings, 'expansion stage' investment refers to investment in companies that could be earning profits but need significant capital inflows for plant expansion, marketing, and to initiate product commercialization, and 'total private equity' include early and expansion stage venture capital, along with all other forms of private equity finance, such as late stage, buyout and turnaround investments. We study these venture capital and private equity sectors both together and separately in order to consider explicitly the robustness of the results to different definitions of venture capital and private equity.

[7] That is, governments may introduce or add to programs in response to low levels of venture capital and private equity in their country.

[8] The 'engineering' terminology is due to Gilson (2003).

[9] The ways in which venture capitalists in the US, UK and elsewhere overcome these agency problems by contracting and monitoring has been extensively studied empirically. See e.g. Sahlman (1990); Gompers and Lerner (1999) (US venture capitalists); Reid (1998) (UK venture capitalists); and Cumming (2002) (European venture capitalists, excluding the UK).

[10] Kortum and Lerner (2000) and Tykvová (2000) provide evidence that venture capital is disproportionately linked to innovative activity in the US and Germany respectively; see also Lerner (2002b), and Lerner *et al.* (2002).

[11] Requiring regular interest payments and the use of collateral are ways in which lenders can overcome the problems stemming from the fact that entrepreneurs have private information about the quality of their projects and about the way in which they are being carried out. See e.g. Hart (1995); Berger and Udell (1998).

[12] The 'arm's length' vs. 'relationship' finance terminology is taken from Rajan (1992).

[13] Other studies suggest that differences in corporate and tax law may result in differences in transaction structure, but not necessarily affect overall investment levels (Gilson and Schizer, 2003; Lerner and Schoar, 2003).

[14] Crucial to the success of private venture funds is the use of appropriate contractual technology, both in the design of financial instruments so as to minimise agency costs in the portfolio company-VC relationship, but also at the logically prior stage of the covenants granted by general partners in VC funds to their investors. These ensure that the VCs themselves are appropriately incentivised to select good investments and to keep up their monitoring efforts so as to ensure that the maximum return is achieved on them in due course (Sahlman, 1990; Gompers and Lerner, 1999; Gilson, 2003).

[15] The poor design of fund manager incentives, owing to mandatory rules, may, it appears, have similarly affected returns in UK (Cumming, 2003) and Canadian publicly funded schemes (Cumming and MacIntosh, 2003b).

[16] The authors are indebted to Ralph Winter for this suggestion.

[17]   Although many end-investors (e.g. US pension funds) are tax-exempt, a significant proportion are taxable (see e.g. Gomper and Lerner, 1998).

[18]   This could happen if, for example, the governance of such funds is mandated by the relevant legislation, as opposed to being agreed by contract as with private funds. The covenants agreed by private venture funds are capable of being customised to suit different circumstances, and of evolving over time. These attributes are not shared by mandatory rules prescribed by legislation.

[19]   Leleux and Surlemount (2003), by contrast, do not find crowding out in a study of investment data from 15 European countries in the early 90s. Leleux and Surlemount argue that their results support the view that public funds 'signal' the state's commitment to support the venture capital industry, and therefore encourage private investment. Leleux and Surlemount's dataset, however, comprises the period 1990-1996, and it is therefore worthwhile to explore this issue further over at least one full business cycle.

[20]   Jeng and Wells (2000) consider that bankruptcy law is likely to be an important legal determinant of venture capital investment, but do not outline a theory and do not test for links, citing lack of legal data on relevant bankruptcy laws.

[21]   This can be understood as a response to a collective action problem (Jackson, 1982). When a debtor becomes insolvent, creditors have incentives to engage in a 'run on the bank', enforcing their individual claims as quickly as possible, even if this results in a reduced overall value being obtained for the debtor's assets. Bankruptcy law, by providing a mandatory collective process, removes the incentives to engage in such a wasteful 'race'. That said, many of the difficulties may be solved by private contracting in advance—for example, through the use of appropriately structured secured credit agreements. These and other aspects of bankruptcy law theory are reviewed in Armour (2001).

[22]   In almost all jurisdictions, a debtor may emerge from bankruptcy by entering into a 'composition' with his creditors, whereby he agrees to repay a proportion of the face value of his debts and the rest is treated as discharged. The difference between this and the 'fresh start' discussed in the text is, however, that a composition requires the agreement of a

majority of the debtor's creditors. A 'fresh start' regime on the other hand entitles the debtor to be discharged against the wishes of creditors.

23   Another route is to obtain finance from a 'business angel', that is, a former entrepreneur who assists others by providing pre-seed funding. However, this is not a universal phenomenon. In many cases, would-be entrepreneurs do not have access to 'angel' networks. In others, the angels may engage in such sophisticated screening that the entrepreneur will need to spend similar amounts on 'pre-seed' as if they had approached a VC directly.

24   Or if venture capital is raised and the business subsequently fails: simply because venture capital is invested in the business does not mean the entrepreneur's personal finances will have been restored to their previous position.

25   Anecdotal evidence suggests that at least some portion of 'start-up' entrepreneurs rely on credit card borrowing in order to finance the 'pre-seed' stage. See e.g. Tim Huber, 'Building a House of (Credit) Cards: credit cards finance the growth of small business startups', *Minneapolis-St. Paul Business Journal* 7 October 1996; Rodney Ho, 'Investor Finances His Dream with Plastic', *WSJ.com Startup Journal* 1 May 1999 (www.startupjournal.com/financing/trends/199905011027-ho.html); Matthew Pfeffer, 'Entrepreneur Profile: Dave McClure', *Startup Failures* (http://www.startupfailures.com/Feature_stories/EProfile_Dave_McClure .htm); Jill Andresky Fraser, 'It's Not Just for Credit Cards Anymore', *Inc.com* April 2002; Kate Milani, 'Startups Often Say Charge It', *Baltimore Business Journal* 2 August 2003.

26   Making bankruptcy less unpleasant for debtors also has an adverse impact on the *supply* of credit to small businesses (Berkowitz and White, 2002), but it appears that this is dominated by the demand effect (Fan and White, 2002; Berkowitz and White, 2002; cf. Georgellis and Wall, 2002).

27   Existing studies (Fan and White, 2002; Georgellis and Wall, 2002) have focused on cross-state comparisons within the US, where a 'fresh start' is uniformly available under Federal law as soon as the proceedings have finished.

28   See *supra*, note 1, for links to the associations' Internet web pages.

[29] 20% is used because it is considered to be a pronounced level of government support in EVCA practitioner discussions (see www.evca.com). We considered other "cut-off" points other than 20%. Notably, a cut-off level of only 5% government support is associated with a much smaller material affect on the VC industry in a country.

[30] As discussed herein, the results are quite robust to alternative specifications. Some robustness checks are provided in the tables; alternative specifications not reported are available upon request.

[31] The only exceptions where this variable is considered exogenous is in models 1, 2, 5 and 6 in Tables 5 and 6, where the exogenous specification is provided to illustrate robustness alongside the specification that accounts for the potential bias that is associated with endogeneity.

[32] Legal data on personal bankruptcy laws are set out in Armour (2002).

[33] The figure used is national life expectancy minus 30 years, to simulate the impact on a relatively young entrepreneur. The results are robust to alternative specifications.

[34] When the government variable is defined at the 5% cut-off point, the coefficient is insignificant (as the other variables do not materially change). See also *supra* note 22 and accompanying text.

[35] Gompers and Lerner (1998) employ U.S. fund-specific data while Jeng and Wells (2000) use industry-wide data across countries. See also Cumming *et al.* (2004) for a fund-specific analysis of fundraising in Australia. Our approach is more similar to that used by Jeng and Wells, as we also make use of cross-country industry-wide data. Cross-country fund-specific data are generally unavailable (as the details in the data differ across countries), and fund-specific datasets within any given country do not provide 100% coverage of all funds. Our interest is in an industry-wide analysis of fundraising across countries.

[36] Note that regressions (3) and (4) and (7) and (8) show that the significance of the EVCA tax and legal index and the government VC program variable depend on the inclusion of both simultaneously when 2SLS is used (unlike the OLS estimates). It is for this reason that the numerous alternative specifications are provided.

[37] A finding of no crowding out would require the government variable to be positive and significant. When the government variable is specified as a dummy equal to one at the level of 5% of the market (instead of the reported specification of 20% of the market), the estimated coefficient is statistically insignificant (instead of negative and significant); see also *supra* notes 22 and 27.

[38] The results are also quite robust to the different instruments, including country dummy variables to pick up political incentives to set-up government funds, as well as the EVCA index (countries with inhospitable laws for VC funds may feel a need to compensate with more direct government support), among other things.

[39] An absence in time variation in a legal index is of course shared with all studies that employ La Porta *et al.* (1997, 1998) legality variables in relation to time series financial data. We did not employ a modified EVCA index, mainly because the weighting and rankings across each of the 10 factors that comprise the EVCA index involves some subjectivity (unlike our bankruptcy index and public funds indicator variables).

[40] See *supra* section 2.2.

[41] *Cf* Gilson (2003), who emphasises the importance of supply-side factors.

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