

# **BANKRUPTCY LAW AND ENTREPRENEURSHIP**

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by

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**Abstract**

Entrepreneurs, catalysts for innovation in the economy, are increasingly the object of policymakers' attention. Recent initiatives both in the UK and at EU level have sought to promote entrepreneurship by reducing the harshness of the consequences of personal bankruptcy law. Whilst there is an intuitive link between the two, little attention has been paid to the question empirically. We investigate the link between bankruptcy and entrepreneurship using data on self employment over 13 years (1990-2002) and 15 countries in Europe and North America. We compile a new index of the level of how 'forgiving' personal bankruptcy laws are, reflecting the time to discharge. This measure varies over time and across the countries studied. We show that bankruptcy law has a more statistically and economically significant effect on self employment rates relative to GDP growth, MSCI stock returns, and a variety of other legal and economic factors. The results have clear implications for policymakers.

**Keywords:** Personal Bankruptcy Law, Entrepreneurship

**JEL Classification:** K35, M13

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## 1. Introduction

Entrepreneurs are thought to act as catalysts for change in the economy through their capacity for innovation and risk-taking. As economies have become increasingly ‘knowledge-driven’, policymakers have embraced the idea of ‘entrepreneurship policy’ with enthusiasm. One mechanism by which governments have sought to implement such policies has been through bankruptcy law. A ‘forgiving’ personal bankruptcy law, it is thought, will increase the supply of would-be entrepreneurs. Based on such thinking, the UK has recently lowered the time before a bankrupt may be discharged from pre-bankruptcy indebtedness from three years to just one year.<sup>1</sup> Similarly, an EU initiative has recommended the ready availability of a ‘fresh start’ through personal bankruptcy laws as a driver for entrepreneurship (Philippe & Partners, 2002; European Commission Best Project Expert Group, 2003). Perhaps surprisingly, little attention has been paid to whether or not this intuitive relationship is borne out empirically, and in particular whether the direction of causality is as posited.

This paper reports empirical findings that demonstrate clearly that such a link exists. We investigate entrepreneurship using data on self-employment for 15 countries from Europe and North America over 13 years, covering an entire business cycle. We develop a new index of the ‘severity’ of personal bankruptcy laws that turns on the number of years a bankrupt must wait until he may be discharged (if ever) from pre-bankruptcy indebtedness. Controlling for a range of other legal, economic and social factors that may affect national levels of entrepreneurship, we show that bankruptcy law has a very pronounced effect on levels of entrepreneurship. The paper has generalisable lessons for law reform.

In particular, we show bankruptcy laws have the most statistically and economically significant effect on levels of self employment across countries. In regards to the economic significance, a 10 year reduction in the time to discharge gives rise to an increase in self employment rates by approximately 1.5% of the average level of self employment per population in the countries considered (based on both the Eurostat and Compendia considered herein). Changes in bankruptcy laws in Belgium, Germany and The Netherlands, for example, changed drastically in the 1990s. Based on a move from no discharge and average life expectancies in these countries, we estimate the bankruptcy legislation changes increased self employment per population by 0.006 in Belgium (4% of the average level of self employment per population in Belgium), 0.008 in Germany (9% of the average level of self employment per population in Germany), and 0.009 in The Netherlands (8% of the average level of self employment per population in The Netherlands).

The rest of the paper is structured as follows. Section 2 reviews the literature on entrepreneurship and its determinants, explaining why the subject is of interest and what is known already about its incidence. Section 3 outlines theories about how bankruptcy law might affect individuals' propensity to engage in entrepreneurial business activity. Section 4 reports the results of our empirical tests, having first described our data and methodology. Section 5 concludes with a discussion of the implications.

## **2. Entrepreneurship and its determinants**

### *2.1 What is entrepreneurship?*

The term 'entrepreneurship' is used in a range of contexts with widely varying meanings. In the neoclassical economic tradition, an 'entrepreneur' is simply the owner-manager of a (small) business. Such a person receives the residual returns from the business' operations and therefore has the appropriate incentives to monitor the agency costs that would otherwise arise from internal team production (Alchian and Demsetz, 1972). However, in the neoclassical tradition entrepreneurship ultimately tends to obsolescence, for economies of scale dictate increasing firm size to the point large amounts of outside capital must be raised, 'closed' ownership is no longer feasible, and the ownership structure shifts towards the more diffuse 'Berle-Means' model (Berle and Means, 1932). This allows for economies of specialisation to be captured in the separation of risk-bearing and control (Easterbrook and Fischel, 1991).

Until the mid-1970s, this thinking driven by economies of scale predicted economic development in the Western world quite well. Firm size tended to increase over time, and a smaller and smaller proportion of GDP and employment were tied up with small owner-managed businesses. All this began to change, however, by the end of that decade. The logic of globalisation meant that worldwide, large corporations began to shift their core plants to countries with lower labour costs. Rather, developed nations—now fast becoming 'post-industrialised'—found that their comparative advantage no longer lay in traditional manufacturing but in 'knowledge-based' industries—services and 'high-tech' industry (Audrestch, 1995). Strikingly, the share of GDP and employment derived from smaller firms began once more to grow. In these areas, the traditional economics of oligopolistic competition was less effective at predicting development. Rather, the Schumpeterian view of the entrepreneur as the agent of 'creative destruction' seems more apt. Within this framework, entrepreneurs are agents who test the limits of knowledge and market structure, pushing against weaknesses in the hope of breakthroughs that redefine the landscape.

An important threshold question is why such ‘new knowledge’ tends to be brought to the marketplace by individual agents organising small independent firms, as opposed to R&D labs in larger organisations. Insofar as this process is understood, it appears that the reasons have to do with organisational culture. Larger organisations tend to be more bureaucratic, less flexible and less willing to engage in risk-taking. Successful entrepreneurs tend to be individuals who flout ‘conventional wisdom’ exhibiting excessive, almost irrational, optimism in their own abilities and in the projects which they back. Most ideas developed by such individuals do not succeed, and an organisational culture that carefully scrutinises projects against objective benchmarks is unlikely to back any of them. Smaller organisations have no reputational capital (individual or organisational) to be lost should an idea fail and are able to adapt and respond to developments in fast-emerging technologies more rapidly. Thus placing *control* in the hands of individual entrepreneurs thereby fosters innovation. Moreover, a model of ‘clusters’ of such small firms in Brownian motion allows for rapid *cross-fertilisation* of ideas across teams and technologies, in a way that a larger but more narrowly focused organisation cannot emulate successfully (Saxenian, 1994). Related and also important factors concern *compensation*, as the successful development of a new idea often requires Herculean effort, and the prospect of retaining the residual returns is an important part of the equation.

The shift from manufacturing to knowledge based economies has thus brought with it a shift from static to dynamic models of economic activity. Within those of the latter that admit the possibility of ‘true’ uncertainty, the existence of entrepreneurs is crucial to the stimulation of innovation. Indeed, a number of empirical studies have demonstrated the links between small entrepreneurial firms and risk-taking, innovation and employment growth. Governments throughout the developed world have now begun to allocate resources to ‘entrepreneurship policy’, designed to stimulate and reinforce the process of ‘creative destruction’.

## *2.2 What are the determinants of entrepreneurship?*

The existing literature has identified a number of determinants of entrepreneurial activity, which can usefully be categorised as (i) individual; (ii) cultural; (iii) economic; (iv) geographic and (v) legal factors.

At the *individual* level, risk tolerance is likely to affect willingness to engage in entrepreneurship, which intuition has received support from empirical studies (Wagner and Sternberg, 2002). Entrepreneurship will tend to be more attractive to individuals with lower risk or loss aversion, given the high variability in outcomes. To put the matter another way, individuals who exhibit highly

optimistic thinking are more likely to become entrepreneurs, as they systematically overestimate the likelihood of success (Venkataraman and Lee, 2001; Landier and Thesmar, 2003). Similarly, those who place a high value on autonomy will find entrepreneurship relatively attractive, given the associated freedom.

The individual's personal endowment of wealth is also a significant determinant of entrepreneurial activity (Holtz-Eakin *et al.*, 1993; Blanchflower and Oswald, 1997; Van Praag, 2003). At least two complementary interpretations may be given to this result. On the one hand, a personal wealth allows a putative entrepreneur to overcome external financing constraints, if these exist. On the other hand, the overall riskiness of entrepreneurship is lower for a wealthy individual given the diminishing marginal utility of wealth.

Propensity to engage in entrepreneurial activities is linked to an individual's educational and employment history. Levels of education and training—often bundled together in the literature and referred to as 'human capital'—are associated with entrepreneurship. In particular, education, which can increase the ability of an individual to identify and develop an innovation, is important for 'high-tech' entrepreneurship (Backes-Gellner and Werner, 2003), whereas an employment history of working in small, entrepreneurial firms can endow an individual with a sufficiently 'well-rounded' skill-set to engage in the successful subsequent start-up of her own firm (Lazear, 2002; Wagner, 2003, 2004). Moreover, the opportunity cost of entrepreneurial activity will be affected by an individual's current employment status—thus unemployment (Wagner and Sternberg, 2002), or dissatisfaction with paid employment (Noorderhaven *et al.*, 2003), are likely to be determinants of subsequent entrepreneurial endeavour.

Whilst the 'individual' level looks to a person's particular endowments of certain things, *cultural* factors consider factors that vary systematically between national or ethnic groups. Here, attitudes to risk and the social (dis)approbation of entrepreneurial (failure) success can have a general effect on the willingness of individuals to engage in entrepreneurial activity, even controlling for differences in individual factors (Hofstede *et al.*, 2002; Giannetti and Simonov, 2003).

Relevant *economic* factors include those which affect the availability of opportunities to engage in entrepreneurial activity. At the macro level, these include growth in the economy as a whole (Berkowitz and White, 2004; Landier, 2002; Fan and White, 2003) and the proportion of the economy which is 'post-industrialised'. More micro-institutional factors include the availability of finance for small firms (in particular, venture capital finance).

*Geography* is also relevant for entrepreneurial activity, because of the striking effects of positive agglomeration externalities between ‘clusters’ of small firms engaged in the development of innovative high-tech products (Krugman, 1991; Saxenian, 1994).

Finally, a number of *legal* variables may be expected to affect the level of entrepreneurial activity in an economy. These include the availability, and cost of gaining access to, limited liability corporations to limit downside risk, and the completeness of the shield they provide (Djankov *et al.*, 2002). The legal protection of intellectual property is without doubt of considerable importance, although controversy reigns as to the precise way in which IP rights affect incentives (Lerner, 2002; Bigus, 2004). Similarly, the enforceability of covenants not to compete is thought to be a significant factor, for enforceability reduces the speed at which new ideas may be transmitted from one firm to another (Gilson, 1999). Labour market regulation may have an impact on the viability of small firms. Taxation, in particular the relative levels of income tax (for employees) and CGT (for entrepreneurs’ shares in their businesses), is clearly significant in affecting the ‘upside’ of the risk-reward calculus for potential entrepreneurs (Poterba, 1989a,b; Rees and Shah, 1994; Gompers and Lerner, 1998; Poutziouris *et al.*, 2000). Similarly, bankruptcy law will affect the risk-reward ratio from the ‘downside’ perspective (Fan and White, 2003; Georgellis and Wall, 2002; Ayotte, 2003).

We might categorise these factors in a slightly different way, as determinants of the supply of and demand for entrepreneurial talent (Audretsch, 2002). The *demand* for entrepreneurial activity will be a function of the opportunities available in the marketplace—economic growth, nature of the economy, availability of finance. The *supply* of such talent will be a function on the one hand of cultural and individual factors affecting willingness to take risks and endowments of knowledge and expertise, and on the other hand of legal and fiscal measures that modify the risk-reward calculus made by potential entrepreneurs.

### 3. Bankruptcy law and entrepreneurship: theory

#### 3.1 What is bankruptcy?

Bankruptcy occurs when a debtor is unable to pay their debts. It is a collective enforcement procedure whereby the debtor's assets are liquidated and the money raised is used to pay creditors.<sup>2</sup> In many jurisdictions different bankruptcy procedures are available for corporate and individual debtors.<sup>3</sup> In addition to collective enforcement, bankruptcy procedures open to individuals ('personal bankruptcy law') serve an important social function of punishing or rehabilitating financially distressed individuals.

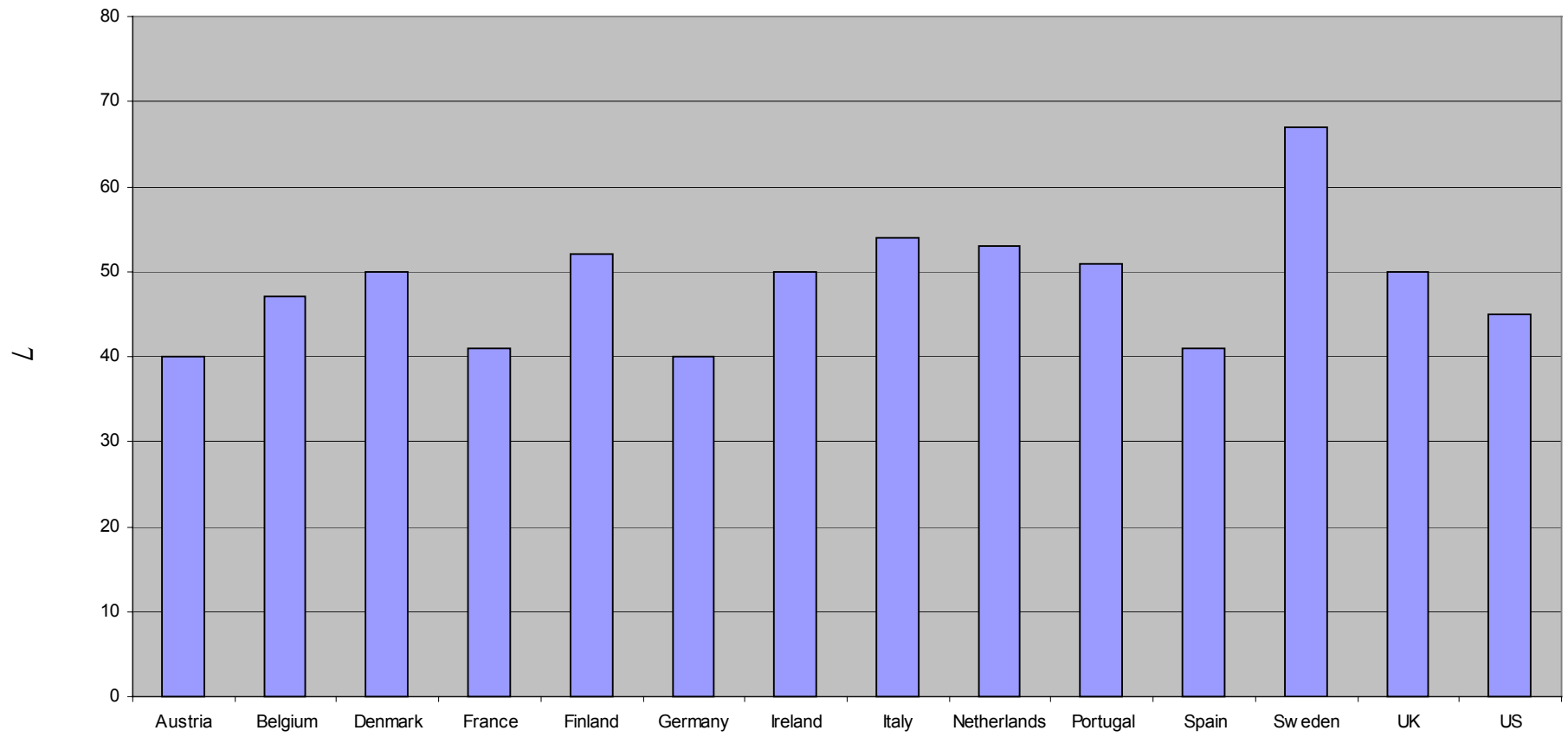
Generally speaking, personal insolvency proceedings result in a *divestment* of the debtor's ownership of her assets in favour of an official Trustee, who will liquidate them in order to raise money to pay creditors. Whilst the individual remains 'in bankruptcy', any assets that fall into her patrimony will automatically also pass to the Trustee. Thus future income earned by the debtor will also be available for distribution to creditors. Moreover, the debtor is typically subjected to a range of legal *disabilities*, being barred, for example, from obtaining credit, running a company, or running for political office.

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.<sup>4</sup> Secondly, 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. Many jurisdictions do not permit a discharge of debts following insolvency. 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.<sup>5</sup>

In addition to the legal consequences of bankruptcy, the circumstance of 'being bankrupt' or 'having been bankrupt' typically carries with it *social* stigmatisation. Bankruptcy in most places is viewed as a signal of financial irresponsibility, and, even after a legal 'fresh start', individuals who have been bankrupt often find it difficult to obtain credit. Furthermore, there may be a loss of esteem from other individuals associated with this public signal of failure. These effects will mean that the adverse consequences of bankruptcy to an individual may extend for much longer than the formal legal proceedings. There is evidence to suggest, however, that such social attitudes to bankruptcy vary across countries.



Figure 1: % who would not order goods from a merchant who had previously failed



Source: Flash Eurobarometer Entrepreneurship Survey (2004)

Figure 1 shows data from a recent *Eurobarometer* survey, in which respondents were asked to state whether they would not order goods from a merchant who had previously failed. Similar differences in national attitudes show up in responses to questions about whether bankrupts should be given a second chance, attribution of blame and the like.

### 3.2 How might bankruptcy law affect entrepreneurship?

There is an obvious intuitive link between the consequences of failure and the willingness of *marginal* individuals to engage in entrepreneurship. Starting one's own business involves shouldering risk. Bankruptcy law dictates the severity of the consequences of failure. Hence we might expect that a bankruptcy law which is more forgiving will, *ceteris paribus*, make marginal individuals more likely to engage in entrepreneurship. Indeed, Eurobarometer survey results show that the fear of bankruptcy is one of the most important reasons given by individuals for not forming their own business, although once again the extent of the deterrent effect varies across countries.

Of course most entrepreneurs will incorporate their business as a limited liability company. Hence it might be thought that ease of access to—and security of—the limited liability ‘shield’ would be a more important determinant of the behaviour of marginal individuals. To be sure, these factors matter (Djankov *et al.*, 2002), yet even with easy access to limited liability, personal bankruptcy law may be expected to make a difference. This is because creditors, particularly larger ones, frequently demand personal guarantees from owner-managers, thus sidestepping the legal shield of an incorporated business.

The ‘marginal effect’ would imply that a less ‘severe’ personal bankruptcy law would, all other things being equal, be associated with greater incidence of entrepreneurship. Such ‘severity’ could be measured by reference to availability of, and time to, discharge from pre-bankruptcy debts, the level of legal disabilities imposed in the interim, and the value of exemptions of personal assets from the claims of creditors. Fan and White (2003) and Georgellis and Wall (2002) find empirical support for the posited ‘marginal effect’ from US data. US Federal Bankruptcy law allows for an immediate discharge under Chapter 7 proceedings. However, the level of exemptions for the debtor's home is left to state law, and varies widely across the US. These authors demonstrate that the size of the ‘homestead exemption’ is positively associated with levels of entrepreneurship, as might be expected.

On the other hand, we might expect a corresponding supply-side effect: that marginal entrepreneurs find it more difficult to borrow in an environment where

bankruptcy law is less severe on debtors. In environments where borrowers have better information than lenders about the quality of their projects and the effort they apply, a ‘forgiving’ bankruptcy law will make lenders less willing to lend. Consider first that an unforgiving bankruptcy law can act as a ‘screening’ mechanism, allowing a borrower with a good project to signal credibly the quality of their information. A forgiving bankruptcy law means that borrowers with poor quality projects will also come forward. Moreover, once credit has been advanced, an unforgiving bankruptcy law will give borrowers a stronger incentive to work hard to repay the loan, whereas a forgiving bankruptcy law may induce moral hazard. Lenders can, of course, accommodate such problems to a certain extent by screening and monitoring themselves, but where such activity is costly credit rationing will result (Stiglitz and Weiss, 1981). Empirical studies (Berkowitz and White, 2004; Georgellis and Wall, 2003) have documented that such a ‘supply-side’ effect exists: larger homestead exemptions in US states—an indicator of less severe bankruptcy laws—are correlated with greater incidence of credit rationing by lenders to small businesses. However, Berkowitz and White (2004) conclude that this supply-side effect is dominated by the demand-side effect documented in Fan and White (2003).

How these findings are interpreted depends in part upon how seriously the notion of ‘uncertainty’ is taken. From a neoclassical perspective admitting only asymmetry of information, borrowers always know *ex ante* whether their projects are worthwhile. Thus the marginal entrepreneurs who are induced to seek credit by a relaxation in bankruptcy laws will tend also to have more marginal projects. Diluting the quality of the signal may mean that overall a social *loss* is sustained: if lenders’ screening and monitoring technology is inferior, it may be that the overall cost of borrowing by inframarginal entrepreneurs with good projects increases, or worse still, that some are unable to obtain credit. On the other hand, if it is accepted that potential entrepreneurs, particularly those developing new technologies, do not know *ex ante* the quality of their projects, then increasing the overall levels of entrepreneurship is more likely to be socially beneficial.

A related demand-side effect concerns *inframarginal* entrepreneurs. Assume that if an entrepreneurial project fails, it may either be because the entrepreneur lacks talent, or because she suffered bad luck in its implementation. If such projects fail because of bad luck—a plausible enough intuition—then a forgiving bankruptcy law, in particular one that offers a ‘fresh start’ from pre-bankruptcy debts—will permit inframarginal entrepreneurs to re-enter the economy. In contrast, an unforgiving bankruptcy law, with no discharge from pre-bankruptcy debts, will consign the entrepreneur to the economic dustbin, as she must pay over the majority of her future income to past creditors. The

existence of such an effect has not been tested empirically, for the US studies have been done in the context of a bankruptcy law in which immediate discharge is available.

It is intuitively obvious that a supply-side effect on credit would also be expected for such inframarginal entrepreneurs—that is, they will find it more difficult to borrow ‘second time round’. However, there are reasons for thinking it would be less pronounced than for marginal, first-time entrepreneurs. This is because the fact that an individual has been bankrupt at some point is usually a matter of public record, and so lenders will be able to use this as a screening mechanism. So long as some entrepreneurs fail because of bad luck, lenders may be expected to be willing to advance credit to such individuals provided that the borrower is able to give a convincing explanation for why their earlier failure was beyond their control.

Moving beyond the level of the individual, changes in bankruptcy law might be expected to have an impact on the social ‘meaning’ of business failure. This is because in legal systems where bankruptcy is more forgiving, more debtors are likely to become bankrupt. Over time, this will mean that bankruptcy becomes a less clear signal of financial irresponsibility. Hence the social stigmatization of bankrupts as irresponsible might be expected to decrease, initiating a feedback effect whereby the negative social consequences of bankruptcy are thereby reduced still further.

#### **4. Bankruptcy law and entrepreneurship: an empirical test**

##### *4.1 Operationalising an empirical test*

The general hypothesis from the preceding section is that, all other things being equal, a more forgiving bankruptcy law will tend to stimulate entrepreneurship. In this section, we discuss its operationalisation for an empirical test. In constructing such a test, it is important to take into account the possibility of reverse causality—that any correlation between forgiving bankruptcy laws and levels of entrepreneurship might arise simply because in countries with higher levels of entrepreneurship, lobby groups representing entrepreneurs’ interests are better-funded and more readily able to persuade legislatures to pass laws that favour their interests. In order to counter this, it is important that the study include an intertemporal component, so as to see how changes in the independent variable (severity of bankruptcy) affect the dependent variable (levels of entrepreneurship). The appendix of this paper considers this causality issue in further detail.

It is first necessary to devise a method of comparing the ‘severity’ of bankruptcy laws across countries. A survey of the personal bankruptcy laws of developed nations reveals that the dimension across which they differ most significantly is that of *time to discharge* (Armour, 2004). For example, the US Bankruptcy Code (which is federal law) permits debtors an immediate discharge under Chapter 7. In the UK, a discharge was permitted after three years until 1 April 2004, that period now having been lowered to 1 year. In Germany, no discharge was available until 1999, when a seven-year discharge period was introduced, subsequently lowered to six years in 2001. In many European nations, including Spain and Italy, no discharge from personal indebtedness is available at all.<sup>6</sup> We employ a measure of ‘severity’ of bankruptcy that is based upon the number of years to discharge. Where no discharge is available, we substitute a number based on average life expectancy, to capture the notion that the individual can expect to spend the rest of her life paying pre-bankruptcy creditors.<sup>7</sup> This measure has the merit of providing a cardinal scale of ‘severity’ that can be used as an independent variable in regression analyses. Moreover, legal data are available to document changes in this measure over time.

Whilst of course bankruptcy laws vary in other respects, we consider that the measure we employ will provide a satisfactory test of the hypothesis for the following reasons. First, the other ways in which bankruptcy laws vary are likely to be dominated in their significance, at least in international comparisons, by that of time to discharge. Levels of *exemptions* of assets from the claims of creditors do not vary significantly outside the US. Within the US, there is significant variation in the value of assets that may be retained under the ‘homestead’ exemption. However, in other developed nations the law uniformly permits debtors to retain little more than personal effects, tools of her trade and a subsistence allowance. Whilst the scope and range of the legal *disabilities* imposed on debtors does vary across jurisdictions, we consider that its significance is likely to be dominated by that of time to discharge. This is because even if undischarged bankrupts are not legally restricted from engaging in business enterprise, the fact that they have not been discharged from pre-bankruptcy indebtedness will act as a significant practical restraint on their ability to do so. This is because any income that they generate above the subsistence measure must be paid over to the Trustee for the benefit of their creditors. Secondly, given that the impact of bankruptcy law on entrepreneurship depends in part upon the social meaning of bankruptcy—and associated stigmatization of failure—any measure derived from bankruptcy law will necessarily be a *proxy* for the total severity of the consequences of bankruptcy for individuals. Again, given the significant cross-country variance in time to discharge, we consider that this measure will provide a meaningful proxy for the social significance of bankruptcy.

A range of possible proxies for ‘entrepreneurship’ might be employed as dependent variables. In this study, we use measures of self-employment. These are frequently used as proxies for entrepreneurship in the literature, because of the close association that has been established between entrepreneurship and owner-managed businesses. Moreover, in contrast to other possible proxies for entrepreneurship—such as surveys of ‘entrepreneurial spirit’ and the like, self-employment data are readily available in time-series format, permitting panel data on bankruptcy and self-employment to be assembled. This allows for regression results to provide an indication of the direction of causality. Self-employment data are notoriously difficult to compare across countries because of differing measurement criteria (Van Stel, 2003). In particular, those who are owner-managers of companies are in some countries reported as ‘employees’ (of their companies) and in others as ‘self-employed’. To ensure that our results are robust to such differences in measurement, we use two separate measures of self-employment. The first is derived from EUROSTAT data on self-employment, which we use (along with OECD population data) to create a figure for ‘ratio of total population in self-employment’. This gives a ‘raw’ measure of self-employment. The second measure is taken from the COMPENDIA 2000.2 dataset (Van Stel, 2003), which seeks to harmonize cross-country reporting differences so as to provide a more accurate picture of self-employed persons *including owner-managers*—thus being particularly appropriate as a proxy for entrepreneurship.

As discussed in section 2, entrepreneurship is affected by a range of other factors other than bankruptcy law. One way to control for these factors is to use a ‘country fixed effects’ specification in the regression analyses, which we employ. For robustness, we cross-check the results with a different specification that does not employ country fixed effects, but includes a range of other variables that might be thought to influence levels of entrepreneurship. In particular, we consider:

- *Social factors*: Number of patents applied for (as a measure of the rate of ‘idea generation’ in a society);
- *Legal factors*: Ease of founding a limited liability company and intensity of labour law regulation: data from Djankov *et al.* (2002); EVCA ‘investor-friendliness’ index (EVCA, 2003);
- *Economic factors*: GDP growth, stock market performance, and related measures.

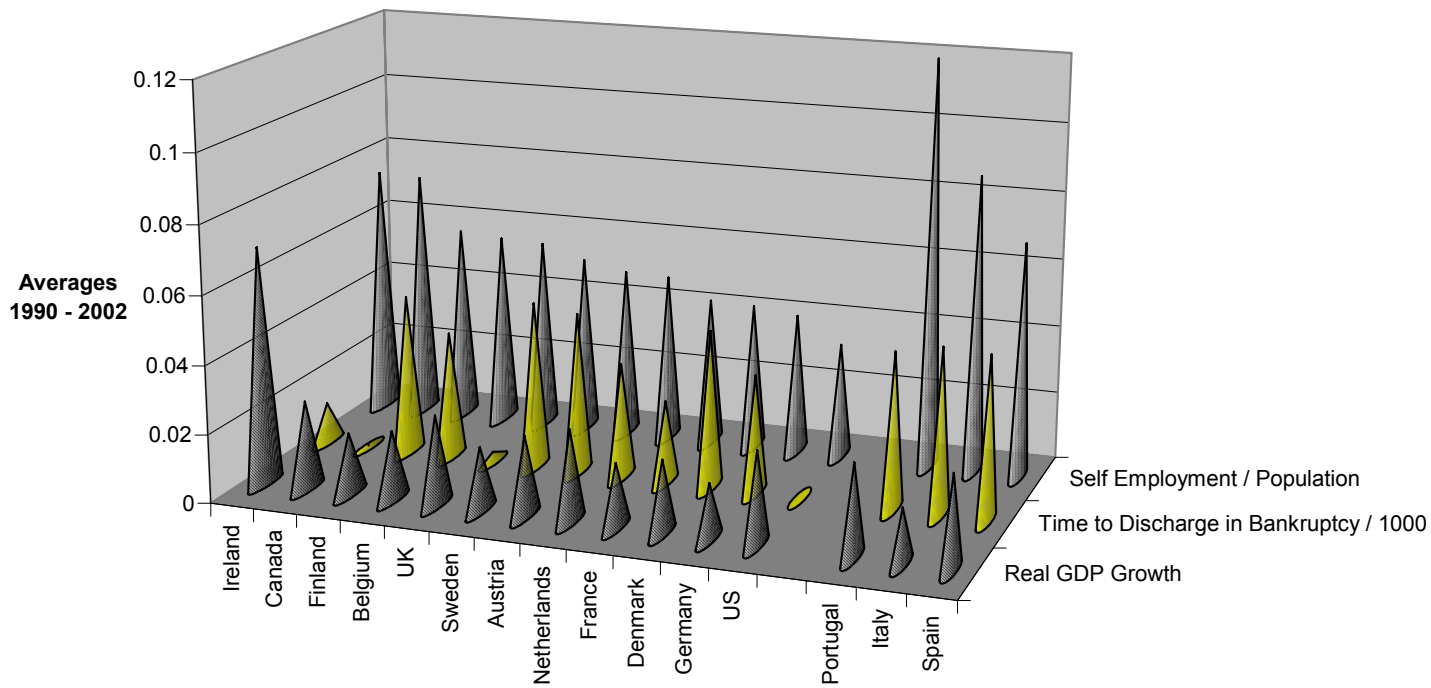
By specifying our test in these various ways, we can be confident that it will be robust to alternative proxies for entrepreneurship and its determinants.

#### 4.2 An overview of the data

We study data on bankruptcy law and self-employment over 13 years (1990 – 2002) 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.<sup>8</sup>

The data are graphically summarized in Figure 2. Figure 2 indicates self employment / population for each country averaged over the 1990-2002 period.<sup>9</sup> Figure 2 also presents the time to discharge (which is scaled in the Figure by dividing by 1000 for comparability in the Figure) and real GDP growth rates, both averaged over the 1990-2002 period for each country. Three countries stand out in the data with comparatively high self-employment rates relative to their real GDP growth rate and time to discharge in bankruptcy: Italy, Portugal and Spain [hereafter the “outlier countries”]. As such, these countries are presented separately in Figure 2. Considering the three outlier countries, a graphical inspection of the data is suggestive of a negative relation between self-employment rates and time to discharge in bankruptcy, and a positive relation between self employment rates and real GDP growth rates.

Figure 2. Self Employment / Population, 1990 - 2002





Summary statistics and comparison tests are provided in Table 2, based on the variables as defined in Table 1. Twenty tests are provided in Table 1 for different potentially relevant variables that may account for changes in the rates of self employment. We present the data and tests with and without inclusion of the three outlier countries. The three outlier countries have a material impact on the conclusions in many of the comparison of means tests. Test 1 indicates no significant difference in regards to real GDP growth. Test 2 indicates higher Morgan Stanley Capital International (MSCI) stock market returns facilitate self employment in the full sample, but not in the subsample excluding the outlier countries. Unexpectedly, self-employment is negatively associated with patent activity (Test 3), which suggests intellectual property rights are utilized by larger corporations than self employed persons. Self employment rates were not materially different in the Internet bubble period (Test 4).

Table 2 indicates a comparatively greater importance of legal factors relative to economic factors in explaining differences in the mean levels of self employment. For the sample excluding the outlier countries, self employment rates are significantly greater for shorter times to discharge in bankruptcy (Test 5), fewer start-up procedures (Test 6), fewer start-up days (Test 7), lower levels of required start-up capital (Test 9), lower values for the indices for employment conditions (Test 10) and hiring and firing flexibility (Tests 11 and 12), and lower values for the indices regarding bankruptcy closing time (Test 14), closing cost (Test 15) and closing courts (Test 17). Excluding the outlier countries, self employment rates are positively associated with the bankruptcy closing court goal index (Test 16), for which higher numbers indicate more unfavourable values. The one unexpected result is that the start-up cost index (Test 9) is positively associated with self employment rates.

Note that when the outlier countries are considered, most of the tests pertaining to law and bankruptcy yield the exact opposite conclusions. We may infer that this indicates a cultural / structural element to determining self employment in Italy, Portugal and Spain.

**Table 1. Variable definitions and Summary Statistics**

This table defines the variables used in the subsequent tables and provides summary statistics across each of the country-years in the dataset. The countries include Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, the UK, and the US. The years span 1990 - 2002. There are 195 observations across all country-years, and the summary statistics in this table are provided for all country-years in the data.

Variable Name	Definition	Source	Mean	Median	Standard Deviation	Minimum	Maximum
Self Employment	The number of self-employed people in a country divided by the population in the country. This variable is used in Tables 2 – 4.	<a href="http://europa.eu.int/comm/eurostat/">http://europa.eu.int/comm/eurostat/</a>	0.060	0.055	0.021	0.030	0.129
Self-Employed Business Owners / Total Labour Force	The number of Self-Employed Business Owners / Total Labour Force, as defined by Compendia. This variable is used in Table 5 as a robustness check.	<a href="http://www.eim.net/Compendia_Inter/Start.htm?">http://www.eim.net/Compendia_Inter/Start.htm?</a>	0.134	0.12	0.043	0.075	0.243
MSCI	The country-specific Morgan Stanley Capital International annual index returns for the country-specific stock markets.	<a href="http://www.msci.com">www.msci.com</a>	0.007	0.008	0.019	-0.031	0.085
GDP Growth	The country-specific real GDP growth from the prior year to the current year.	<a href="http://europa.eu.int/comm/eurostat/">http://europa.eu.int/comm/eurostat/</a>	0.025	0.024	0.023	-0.064	0.111
Patents	The total number of patents generated by a country based on domicile of inventor, lagged by 1 year	<a href="http://www.oecd.org">www.oecd.org</a>	1709.648	468.770	2686.054	2.000	11386.533
EVCA Tax and Legal Index	The EVCA index of tax and legal environment for VC funds (a lower number indicates a better environment). It 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 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.	<a href="http://www.evca.com">www.evca.com</a>	1.974	2.090	0.435	1.100	2.530
Time to Discharge	The time to discharge in bankruptcy (where, if there is no discharge, the average working life-expectancy in the country is used).	Bankruptcy legal documents for each of the 15 countries considered.	31.498	46.300	19.958	0.000	49.200
Income - Capital Gains Tax	The difference between income and capital gains taxes.	<a href="http://www.oecd.org">www.oecd.org</a>	26.418	27.000	10.155	7.000	54.000
Various other Legal Variables	Number of Start-up procedures, start-up costs, start-up minimum capital, hiring and firing flexibility, and various other legal indices pertaining to small firms.	The World Bank <a href="http://rru.worldbank.org">http://rru.worldbank.org</a>					
Trend	A variable equal to 1 for 1990, 2 for 1991, 3 for 1992, etc., for each country in the data.						
Bubble	A dummy variable equal to 1 for the bubble years 1999 and 2000, and zero otherwise.						
Country Dummy Variables	A dummy variable equal to 1 for each of the countries in the data.						

**Table 2. Summary Statistics and Difference Tests**

This table presents difference of means tests comparison of means tests for the level of self employment as a proportion of the country's population 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 comparison tests are based on different values of variables (approximately around the mean) that were defined in Table 1. Test 18 with the EVCA index excludes the data from Canada and the U.S. \*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% levels, respectively.

Test #	Self Employment/Population Full Sample Including All Countries		Self Employment/Population All Countries, Excluding Italy, Portugal, and Spain		Test #	Self Employment/Population Full Sample Including All Countries		Self Employment/Population All Countries, Excluding Italy, Portugal, and Spain			
	Average Value	Difference Test	Average Value	Difference Test		Average Value	Difference Test	Average Value	Difference Test		
1	Real GDP Return > 0	0.060	0.374	0.052	0.126	11	Hiring Flexibility > 52	0.067	4.199***	0.049	-3.537***
	Real GDP Return < 0	0.059		0.052			Hiring Flexibility < 52	0.054		0.054	
2	MSCI Index Return > 0	0.060	2.659***	0.052	-0.568	12	Firing Flexibility > 30.5	0.068	4.782***	0.050	-2.221**
	MSCI Index Return < 0	0.053		0.053			Firing Flexibility < 30.5	0.054		0.054	
3	Patents > 1000	0.054	-4.397***	0.050	-3.141***	13	Employment Index > 46	0.066	5.767***	0.054	1.202
	Patents < 1000	0.068		0.056			Employment Index < 46	0.051		0.051	
4	Years 1999 and 2000 Only	0.060	0.053	0.053	0.061	14	Closing Time > 1.75	0.057	-1.622	0.044	-9.520***
	All Other Years (1990-2002)	0.060		0.052			Closing Time < 1.75	0.063		0.058	
5	Time to Discharge > 30 Years	0.064	3.045***	0.050	-3.000***	15	Closing Cost > 8.5	0.060	-0.087	0.047	-5.166***
	Time to Discharge < 30 Years	0.055		0.055			Closing Cost < 8.5	0.060		0.054	
6	# Start-up Procedures > 6.5	0.064	3.074***	0.048	-4.628***	16	Closing Goal Index > 77	0.055	-3.923***	0.055	7.464***
	# Start-up Procedures < 6.5	0.056		0.056			Closing Goal Index < 77	0.068		0.045	
7	# Start-up Days > 34.5	0.066	2.189**	0.047	-4.329***	17	Closing Court Index > 35	0.055	-3.125***	0.050	-1.671*
	# Start-up Days < 34.5	0.057		0.054			Closing Court Index < 35	0.062		0.053	
8	Start-up Cost > 7.5	0.076	9.055***	0.060	4.850***	18	EVCA Tax & Legal Index > 2	0.059	-1.040	0.049	-3.834***
	Start-up Cost < 7.5	0.050		0.050			EVCA Tax & Legal Index < 2	0.062		0.057	
9	Start-up Minimum Capital > 44	0.054	-3.471***	0.048	-4.736***	19	Income-Cap.Gains Tax > 25 %	0.066	4.769***	0.051	-0.973
	Start-up Minimum Capital < 44	0.064		0.056			Income-Cap.Gains Tax < 25%	0.053		0.053	
10	Employment Conditions > 57	0.071	7.243***	0.012	-4.990***	20	Legality Index > 20	0.051	-8.343***	0.051	-2.261***
	Employment Conditions < 57	0.051		0.051			Legality Index < 20	0.078		0.058	

Tests 18 and 20 indicate that self-employment rates are generally higher for lower (more favourable) EVCA tax and legal index values, but less favourable (lower) legality indices (La Porta *et al.*, 1997, 1998; Berkowitz *et al.*, 2003). These differences suggest that legal indices specific to entrepreneurship (such as the EVCA tax and legal index) are able to account for higher levels of self employment; that is, the expected relation holds for higher levels of self-employment in more entrepreneur-friendly countries. However, more generally defined legality indices such as the legality index (Berkowitz *et al.*, 2003) give rise to an unexpected relation between self-employment and law quality. This latter result is in part attributable to the broad definition of ‘legality’, but also perhaps due to the correlation between legal and other social environment factors across countries, as discussed in further in subsection 4.5 below. Finally, note that in test 18, countries have higher self employment where the difference between income and capital gains taxes<sup>10</sup> are higher for the full sample of all countries, but these differences are reversed (although statistically insignificant) when the outlier countries are removed.

Correlation matrices are provided for the full sample (Table 3a) and subsample excluding the outlier countries (Table 3b). These correlations and test statistics are generally consistent with the empirics provided in Table 2, and provide a univariate measure of the relative importance of each of the effects. For instance, Table 3b indicates self employment is significantly and positively associated with real GDP growth, and negatively associated with more unfavourable legal systems for entrepreneurial activity. By contrast, with consideration to the outlier countries (Table 3a), some of the legal indices (such as those pertaining to bankruptcy laws) appear to have the opposite effect such that more severe bankruptcy laws yield higher levels of self employment. As such, given the outlier countries in the data, we control for country effects in the multivariate empirical tests.

**Table 3. Correlation Matrix**

Panel A. Full Sample with All Countries Included

This table presents correlation coefficients across selected variables. All countries included. Sample period 1990 - 2002; 195 observations. Coefficients greater than 0.14 in absolute value are significant at the 5% level, and highlighted in bold and underline font.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Self Employment / Population	1.00											
(2)	Real GDP Growth	0.12	1.00										
(3)	Time to Discharge in Bankruptcy	<b><u>0.17</u></b>	<b><u>-0.20</u></b>	1.00									
(4)	Start-up Number of Procedures	<b><u>0.26</u></b>	<b><u>-0.17</u></b>	<b><u>0.38</u></b>	1.00								
(5)	Start-up Number of Days	<b><u>0.44</u></b>	-0.08	<b><u>0.40</u></b>	<b><u>0.77</u></b>	1.00							
(6)	Start-up Cost	<b><u>0.54</u></b>	0.05	<b><u>0.40</u></b>	<b><u>0.58</u></b>	<b><u>0.48</u></b>	1.00						
(7)	Start-up Minimum Capital	<b><u>-0.18</u></b>	<b><u>-0.20</u></b>	<b><u>0.55</u></b>	<b><u>0.42</u></b>	0.11	<b><u>0.18</u></b>	1.00					
(8)	Closing Time	<b><u>-0.22</u></b>	<b><u>-0.16</u></b>	<b><u>0.16</u></b>	0.09	<b><u>-0.08</u></b>	<b><u>-0.21</u></b>	0.04	1.00				
(9)	Closing Cost	0.10	-0.07	<b><u>0.22</u></b>	<b><u>0.50</u></b>	0.13	<b><u>0.24</u></b>	<b><u>0.32</u></b>	0.00	1.00			
(10)	EVCA Tax & Legal Index	0.09	<b><u>-0.20</u></b>	<b><u>0.80</u></b>	<b><u>0.42</u></b>	<b><u>0.44</u></b>	<b><u>0.19</u></b>	<b><u>0.72</u></b>	<b><u>0.16</u></b>	<b><u>0.30</u></b>	1.00		
(11)	Income - Capital Gains Tax	<b><u>0.19</u></b>	-0.12	<b><u>0.36</u></b>	<b><u>0.45</u></b>	<b><u>0.48</u></b>	<b><u>0.47</u></b>	<b><u>0.30</u></b>	<b><u>-0.28</u></b>	<b><u>0.16</u></b>	<b><u>0.29</u></b>	1.00	
(12)	Legality Index	<b><u>-0.72</u></b>	-0.11	<b><u>-0.18</u></b>	<b><u>-0.64</u></b>	<b><u>-0.67</u></b>	<b><u>-0.74</u></b>	<b><u>0.17</u></b>	<b><u>0.15</u></b>	<b><u>-0.44</u></b>	-0.08	<b><u>-0.25</u></b>	1.00
(13)	Austria	-0.13	-0.01	<b><u>0.21</u></b>	<b><u>0.21</u></b>	-0.05	-0.03	<b><u>0.66</u></b>	-0.12	<b><u>0.48</u></b>	<b><u>0.34</u></b>	-0.04	0.12
(14)	Belgium	-0.05	-0.06	0.08	0.03	<b><u>0.18</u></b>	<b><u>0.14</u></b>	<b><u>0.21</u></b>	<b><u>-0.22</u></b>	<b><u>-0.21</u></b>	0.10	<b><u>0.73</u></b>	0.13
(15)	Denmark	<b><u>-0.22</u></b>	-0.06	<b><u>0.19</u></b>	<b><u>-0.24</u></b>	<b><u>-0.25</u></b>	<b><u>-0.28</u></b>	0.06	<b><u>0.66</u></b>	-0.01	<b><u>0.31</u></b>	<b><u>-0.27</u></b>	<b><u>0.25</u></b>
(16)	Finland	-0.03	-0.10	<b><u>0.21</u></b>	<b><u>-0.24</u></b>	-0.01	<b><u>-0.16</u></b>	-0.08	<b><u>-0.22</u></b>	<b><u>-0.36</u></b>	<b><u>0.17</u></b>	-0.08	<b><u>0.24</u></b>
(17)	France	<b><u>-0.21</u></b>	-0.08	-0.10	<b><u>0.30</u></b>	<b><u>0.15</u></b>	<b><u>-0.17</u></b>	-0.08	<b><u>0.18</u></b>	<b><u>0.48</u></b>	0.07	<b><u>0.15</u></b>	-0.06
(18)	Germany	<b><u>-0.24</u></b>	-0.09	0.04	<b><u>0.21</u></b>	0.09	-0.06	<b><u>0.40</u></b>	<b><u>-0.14</u></b>	-0.01	<b><u>0.27</u></b>	-0.07	0.06
(19)	Ireland	<b><u>0.17</u></b>	<b><u>0.54</u></b>	<b><u>-0.27</u></b>	<b><u>-0.33</u></b>	<b><u>-0.19</u></b>	<b><u>0.11</u></b>	<b><u>-0.30</u></b>	<b><u>-0.36</u></b>	-0.01	<b><u>-0.24</u></b>	-0.12	<b><u>-0.19</u></b>
(20)	Italy	<b><u>0.34</u></b>	-0.12	<b><u>0.22</u></b>	<b><u>0.21</u></b>	-0.09	<b><u>0.62</u></b>	0.04	-0.12	<b><u>0.48</u></b>	-0.01	<b><u>0.17</u></b>	<b><u>-0.47</u></b>
(21)	The Netherlands	<b><u>-0.14</u></b>	0.02	0.03	0.03	<b><u>-0.19</u></b>	<b><u>0.23</u></b>	<b><u>0.18</u></b>	<b><u>0.23</u></b>	<b><u>-0.36</u></b>	-0.11	0.02	<b><u>0.27</u></b>
(22)	Portugal	<b><u>0.74</u></b>	0.00	<b><u>0.19</u></b>	<b><u>0.39</u></b>	<b><u>0.50</u></b>	<b><u>0.19</u></b>	0.00	<b><u>0.23</u></b>	-0.01	<b><u>0.21</u></b>	0.09	<b><u>-0.48</u></b>
(23)	Spain	0.11	0.02	<b><u>0.21</u></b>	<b><u>0.39</u></b>	<b><u>0.66</u></b>	<b><u>0.42</u></b>	<b><u>-0.17</u></b>	-0.06	-0.01	0.12	0.09	<b><u>-0.49</u></b>
(24)	Sweden	-0.10	-0.08	<b><u>0.23</u></b>	<b><u>-0.33</u></b>	<b><u>-0.15</u></b>	<b><u>-0.25</u></b>	-0.02	0.07	-0.01	0.07	0.04	<b><u>0.25</u></b>
(25)	UK	-0.05	-0.04	<b><u>-0.39</u></b>	-0.06	<b><u>-0.14</u></b>	<b><u>-0.24</u></b>	<b><u>-0.30</u></b>	<b><u>-0.20</u></b>	-0.01	<b><u>-0.48</u></b>	0.09	0.06
(26)	US	<b><u>-0.34</u></b>	0.04	<b><u>-0.43</u></b>	<b><u>-0.15</u></b>	<b><u>-0.25</u></b>	<b><u>-0.26</u></b>	<b><u>-0.30</u></b>	<b><u>0.34</u></b>	<b><u>-0.21</u></b>	<b><u>-0.54</u></b>	<b><u>-0.41</u></b>	0.13
(27)	Canada	<b><u>0.17</u></b>	0.02	<b><u>-0.42</u></b>	<b><u>-0.42</u></b>	<b><u>-0.26</u></b>	<b><u>-0.26</u></b>	<b><u>-0.30</u></b>	<b><u>-0.25</u></b>	<b><u>-0.21</u></b>	<b><u>-0.29</u></b>	<b><u>-0.39</u></b>	<b><u>0.18</u></b>

**Table 3. Correlation Matrix**

Panel B. Subsample Excluding Italy, Portugal and Spain

This table presents correlation coefficients across selected variables. All countries included except Italy, Portugal and Spain. Sample period 1990 - 2002; 156 observations. Coefficients greater than 0.16 in absolute value are significant at the 5% level, and highlighted in bold and underline font.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Self Employment / Population	1.00											
(2)	Real GDP Growth	<b><u>0.32</u></b>	1.00										
(3)	Time to Discharge in Bankruptcy	<b><u>-0.24</u></b>	<b><u>-0.20</u></b>	1.00									
(4)	Start-up Number of Procedures	<b><u>-0.53</u></b>	<b><u>-0.21</u></b>	<b><u>0.20</u></b>	1.00								
(5)	Start-up Number of Days	<b><u>-0.16</u></b>	<b><u>-0.20</u></b>	<b><u>0.33</u></b>	<b><u>0.71</u></b>	1.00							
(6)	Start-up Cost	<b><u>0.20</u></b>	<b><u>0.22</u></b>	<b><u>0.17</u></b>	<b><u>0.33</u></b>	<b><u>0.31</u></b>	1.00						
(7)	Start-up Minimum Capital	<b><u>-0.33</u></b>	<b><u>-0.21</u></b>	<b><u>0.64</u></b>	<b><u>0.64</u></b>	<b><u>0.46</u></b>	<b><u>0.41</u></b>	1.00					
(8)	Closing Time	<b><u>-0.70</u></b>	<b><u>-0.19</u></b>	<b><u>0.18</u></b>	0.07	<b><u>-0.32</u></b>	<b><u>-0.30</u></b>	0.04	1.00				
(9)	Closing Cost	<b><u>-0.19</u></b>	-0.01	0.12	<b><u>0.56</u></b>	<b><u>0.34</u></b>	-0.15	<b><u>0.35</u></b>	0.06	1.00			
(10)	EVCA Tax & Legal Index	<b><u>-0.20</u></b>	<b><u>-0.22</u></b>	<b><u>0.82</u></b>	<b><u>0.37</u></b>	<b><u>0.49</u></b>	0.14	<b><u>0.78</u></b>	0.13	<b><u>0.35</u></b>	1.00		
(11)	Income - Capital Gains Tax	0.06	-0.11	<b><u>0.30</u></b>	<b><u>0.43</u></b>	<b><u>0.74</u></b>	<b><u>0.51</u></b>	<b><u>0.32</u></b>	<b><u>-0.30</u></b>	0.09	<b><u>0.27</u></b>	1.00	
(12)	Legality Index	<b><u>-0.24</u></b>	<b><u>-0.38</u></b>	<b><u>0.41</u></b>	<b><u>-0.24</u></b>	<b><u>-0.28</u></b>	<b><u>-0.21</u></b>	<b><u>0.22</u></b>	<b><u>0.41</u></b>	<b><u>-0.48</u></b>	<b><u>0.23</u></b>	-0.12	1.00
(13)	Austria	-0.06	-0.02	<b><u>0.28</u></b>	<b><u>0.38</u></b>	0.09	0.12	<b><u>0.66</u></b>	-0.12	<b><u>0.59</u></b>	<b><u>0.39</u></b>	-0.01	0.00
(14)	Belgium	0.10	-0.07	0.14	0.15	<b><u>0.53</u></b>	<b><u>0.43</u></b>	<b><u>0.20</u></b>	<b><u>-0.23</u></b>	<b><u>-0.20</u></b>	0.14	<b><u>0.79</u></b>	0.02
(15)	Denmark	<b><u>-0.24</u></b>	-0.07	<b><u>0.27</u></b>	<b><u>-0.21</u></b>	<b><u>-0.32</u></b>	<b><u>-0.31</u></b>	0.05	<b><u>0.69</u></b>	0.03	<b><u>0.35</u></b>	<b><u>-0.25</u></b>	<b><u>0.30</u></b>
(16)	Finland	0.13	-0.11	<b><u>0.28</u></b>	<b><u>-0.21</u></b>	0.15	-0.11	-0.09	<b><u>-0.23</u></b>	<b><u>-0.37</u></b>	<b><u>0.21</u></b>	-0.05	<b><u>0.27</u></b>
(17)	France	<b><u>-0.23</u></b>	-0.09	-0.06	<b><u>0.50</u></b>	<b><u>0.48</u></b>	-0.12	-0.09	<b><u>0.19</u></b>	<b><u>0.59</u></b>	0.10	<b><u>0.19</u></b>	<b><u>-0.42</u></b>
(18)	Germany	<b><u>-0.28</u></b>	-0.10	0.10	<b><u>0.38</u></b>	<b><u>0.35</u></b>	0.08	<b><u>0.40</u></b>	-0.15	0.03	<b><u>0.31</u></b>	-0.04	-0.13
(19)	Ireland	<b><u>0.53</u></b>	<b><u>0.57</u></b>	<b><u>-0.24</u></b>	<b><u>-0.32</u></b>	<b><u>-0.19</u></b>	<b><u>0.37</u></b>	<b><u>-0.32</u></b>	<b><u>-0.37</u></b>	0.03	<b><u>-0.23</u></b>	-0.09	<b><u>-0.70</u></b>
(20)	The Netherlands	-0.08	0.01	0.09	0.15	<b><u>-0.21</u></b>	<b><u>0.59</u></b>	<b><u>0.17</u></b>	<b><u>0.24</u></b>	<b><u>-0.37</u></b>	-0.09	0.05	<b><u>0.34</u></b>
(21)	Sweden	-0.01	-0.10	<b><u>0.31</u></b>	<b><u>-0.32</u></b>	-0.13	<b><u>-0.26</u></b>	-0.03	0.08	0.03	0.10	0.07	<b><u>0.30</u></b>
(22)	UK	0.09	-0.05	<b><u>-0.37</u></b>	0.03	-0.09	<b><u>-0.25</u></b>	<b><u>-0.32</u></b>	<b><u>-0.20</u></b>	0.03	<b><u>-0.47</u></b>	0.13	-0.14
(23)	US	<b><u>-0.48</u></b>	0.03	<b><u>-0.41</u></b>	-0.09	<b><u>-0.32</u></b>	<b><u>-0.27</u></b>	<b><u>-0.32</u></b>	<b><u>0.36</u></b>	-0.20	<b><u>-0.53</u></b>	<b><u>-0.40</u></b>	0.03
(24)	Canada	<b><u>0.53</u></b>	0.01	<b><u>-0.40</u></b>	<b><u>-0.44</u></b>	<b><u>-0.34</u></b>	<b><u>-0.27</u></b>	<b><u>-0.32</u></b>	<b><u>-0.26</u></b>	-0.20	<b><u>-0.28</u></b>	<b><u>-0.38</u></b>	0.14

### 4.3 Multivariate Empirical Methods

Our multivariate tests make use of the panel dataset presented in subsection 4.2. The left-hand-side variable is the rate of self-employment (from Eurostat; see Table 1) in each econometric model presented in Table 4. As a further robustness check, we use a similar measure of self-employment in Table 5 based on the Compendia data (see Table 1). The right-hand-side variables include real GDP growth, MSCI returns, patents (lagged by 1 year), income–capital gains taxes, a time trend, a dummy variable for the Internet bubble, and the time to discharge in bankruptcy (as discussed in section 4, each variable is explicitly defined in Table 1).

Given the presence of outliers in the data, as discussed, we are sensitive to the use of country fixed-effects. The use of country-fixed effects captures the importance of a multitude of legal variables in the analysis which do not change over time (unlike the variables included). Legal indices that do not have a time series variation (i.e., those that only vary across countries) cannot simultaneously be included in specifications with country fixed effects. Hence, the exclusion of the range of legal indices available from La Porta *et al.* (1997, 1998) and social indices<sup>11</sup> that do not change over time does not limit the robustness of our results because the country fixed-effects used in our regressions simultaneously captures each of these legal and social differences across countries. In fact, the high adjusted  $R^2$  values from the regressions in Tables 4 and 5 are attributable to the country-fixed-effect specification.

**Table 4. Regression Analyses of Self Employment / Population**

This table presents OLS estimates of the level of Self Employment / Population (from *Eurostat*). Variables are as defined in Table 1. The explanatory variables are as defined in Table 1. Country fixed effects are used in all models. The sample comprises 195 observations for 1990-2002 and 15 countries, as described in Table 1. White's (1980) HCCME used. \*, \*\*, \*\*\* Significant at the 10%, 5% and 1% levels, respectively.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Country Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time to Discharge	-0.000091***	-0.000093***	-0.000095***	-0.000095***	-0.000095***	-0.000108***	-0.000116***
Real GDP Growth		0.02246*	0.02195*	0.02197*	0.02137*	0.02797**	0.02978**
MSCI Index			4.22E-03	4.24E-03	5.67E-03	5.00E-03	4.14E-03
Patents				-4.98E-09	-7.83E-08	-4.78E-08	1.84E-08
Income - Capital Gains Tax					1.02E-04	1.19E-04	1.42E-04
Dummy for 1999 and 2000						-0.00097*	-8.55E-04
Time Trend							-5.34E-05
Number of Observations	195	195	195	195	180	156	195
Adjusted R <sup>2</sup>	0.98	0.98	0.98	0.98	0.98	0.98	0.98
F-Statistic	608.06***	579.21***	542.44***	509.41***	481.70	460.54	437.51
Loglikelihood Function	862.22	864.28	864.34	864.34	864.71	865.86	866.18
Akaike Information Statistic	-8.68	-8.69	-8.68	-8.67	-8.66	-8.67	-8.66



**Table 5. Further Robust Checks: Regression Analyses of Self-Employed Business Owners / Total Labour Force**

This table presents OLS estimates of the level of Self Employed Business Owners / Labour Force (from *Compendia*). This table serves as a robustness check for an alternatively defined dependent variable relative to that used in Table 4. The dependent variable is as defined by the Compendia dataset <[http://www.eim.net/Compendia\\_Inter/Start.htm?>](http://www.eim.net/Compendia_Inter/Start.htm?>). There are 105 observations in the regressions in this table because the Compendia dataset presents information on self-employed business owners for every second year only; the sample comprises the period 1990-2002. The explanatory variables are as defined in Table 1. Country fixed effects are used in all models. White's (1980) HCCME used. \*, \*\*, \*\*\* Significant at the 10%, 5% and 1% levels, respectively.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Models (7)
Country Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time to Discharge	-0.00016***	-0.00015***	-0.00018***	-0.00019***	-0.00019***	-0.00022***	-0.00034***
Real GDP Growth		-0.03529	-0.06258	-0.06146	-0.05767	-0.02146	-0.02273
MSCI Index			0.07675*	0.08524*	0.08251*	0.06102	0.08503*
Patents				-0.000001**	-0.000001*	-0.000001	0.0000001
Income - Capital Gains Tax					-0.00023	-0.00014	0.00015
Dummy for 1999 and 2000						-0.00333	-0.00064
Time Trend							-0.00075***
Number of Observations	105	105	105	105	105	105	105
Adjusted R <sup>2</sup>	0.97	0.97	0.97	0.97	0.97	0.97	0.97
F-Statistic	203.50***	189.77***	182.42***	172.56***	162.15***	155.15***	166.03***
Loglikelihood Function	369.30	369.60	-9.56	371.94	372.12	373.09	379.67
Akaike Information Statistic	-6.73	-6.72	-6.73	-6.72	-6.71	-6.71	-6.81

#### *4.4 Multivariate Empirical Results*

The Eurostat data and multivariate tests highlight the importance of two primary variables in driving the levels of self employment per population: real GDP growth, and time to discharge in bankruptcy. The Compendia data similarly highlight the importance of the MSCI index and time to discharge in bankruptcy. All of the other variables are generally statistically insignificant and/or not robust to the specification of the model. As discussed below, time to discharge in bankruptcy is the most economically and statistically significant variable.

In Table 4 with the Eurostat measure of self employment, real GDP growth is positive and statistically significant (at the 10% levels in Models 2 – 5, and the 5% least in Models 6 – 7) in each of the specifications. In terms of economic significance, a 10% increase in real GDP growth accounts for an increase in self employment per population by approximately 0.00025, which is about a 0.4% increase in the rate of self employment per population for the average level of self employment in the countries considered (based on the Eurostat average indicated in Table 1). In other words, real GDP growth is a statistically significant driver of Eurostat self employment rates across countries, but the economic significance of this effect is not large. The MSCI index is insignificant in Table 4.

In Table 5 with the Compendia measure of self employment, real GDP growth is statistically insignificant, but the MSCI index is statistically significant (at the 10% level in Models 4, 5 and 7). In other words, the differences in real GDP growth versus stock market growth as economic drivers in self-employment are attributable to the definition of self employment. The more business-owner/manager oriented definition from Compendia is more closely connected with the MSCI stock market returns. Regarding the economic significance of this effect in Table 5, a 10% increase in stock market returns gives rise to an increase in self employment rates by 0.008, which is about a 6% increase in the rate of self employment for the average level of self employment in the countries considered (based on the Compendia average indicated in Table 1). In other words, the MSCI index is a statistically significant driver of Compendia self employment rates across countries, and the economic significance of this effect is meaningful.

The time to discharge in bankruptcy is negative and significant in all of the specifications at the 1% level of significance in both Tables 4 and 5. In regards to the economic significance in Tables 4 and 5, a 10 year reduction in the time to

discharge gives rise to a increase in self employment rates by 0.001 in Table 4 and 0.002 in Table 5, which is about a 1.5% increase in the rate of self employment for both Tables 4 and 5 for the average level of self employment in the countries considered (based on the Eurostat and Compendia averages indicated in Table 1).

The economic significance of the effect of bankruptcy can useful be illustrated with the examples of Belgium, Germany and The Netherlands, which had reductions in the average time to discharge (based on a change in the no discharge rule) of 24 years (Belgium), 40 years (Germany) and 45 years (The Netherlands) in the 1990s. These changes are consistent with an increase in self employment per population by 0.006 in Belgium (4% of the average level of self employment in Belgium), 0.008 in Germany (9% of the average level of self employment in Germany), and 0.009 in The Netherlands (8% of the average level of self employment in The Netherlands) using the Compendia data (the Eurostat data indicated almost identical effects). Overall, therefore, bankruptcy is a statistically and economically important determinant of self employment rates.

As mentioned, all of the regressions make use of country fixed effects, which capture differences in self-employment attributable to other legal and institutional determinants of self employment rates across countries. The other variables in the regression models included were not statistically significant (or in the odd case where they were, they were not robust).

#### *4.5 Limitations and Directions for Future Research*

Our results clearly support the hypothesis that the posited ‘demand-side’ relationship between forgiving bankruptcy law and entrepreneurship exists across countries, and being panel data we are able to provide clear evidence supporting our inferences as to causality (see also the appendix below). However, the results should be interpreted sensitively to the existence of a number of limitations. First, for reasons of data availability, we do not measure the existence of any effects of bankruptcy on the supply of credit across countries. It may be that this would counteract the positive impact on demand. More significantly, we are unable to provide any insight as to the relative *quality* of the projects that are ‘brought to market’ by entrepreneurs in systems with forgiving bankruptcy laws as opposed to those with harsh consequences for defaulters. Finally, we are unable to specify the precise channel through which the observed demand-side effect operates—that is, whether changes in the law are sufficient directly to affect the incentives of potential entrepreneurs, or

whether the most significant impact is through the modification of social attitudes and hence the ‘social penalty’ of business failure.

## **5. Conclusion and Implications**

Based on aggregate self-employment 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 determining self-employment rates across countries. We develop a new index of the ‘severity’ of personal bankruptcy laws that turns on the number of years a bankrupt must wait until he may be discharged (if ever) from pre-bankruptcy indebtedness. This paper provides the first look at bankruptcy laws and self employment in an international setting, thereby extending seminal single country studies (e.g., Fan and White, 2003; Berkowitz and White, 2004).

Controlling for a range of other legal, economic and social factors that may affect national levels of entrepreneurship, we show that bankruptcy law has a very pronounced effect on levels of entrepreneurship. In fact, bankruptcy laws have the most statistically and economically significant effect on levels of self employment across countries, and matter more than economic determinants such as real GDP growth and MSCI stock market returns. For example, we show that changes in bankruptcy laws in Europe in the 1990s are consistent with an increase in self employment per population by 0.006 in Belgium (4% of the average level of self employment per population in Belgium), 0.008 in Germany (9% of the average level of self employment per population in Germany), and 0.009 in The Netherlands (8% of the average level of self employment per population in The Netherlands). Policy implications are straightforward: bankruptcy laws are the most significant policy instrument for enhancing entrepreneurial activity.

We explicitly showed robustness of our results to the inclusion of a variety of explanatory variables, as well as alternative measures of self employment (Eurostat versus Compendia). We also identified outlier countries (in particular, Italy, Spain and Portugal). Our analysis of bankruptcy laws does not explain those outliers; rather, we used statistical techniques to control for these outliers. Further research could explore more fully why self employment rates are so much higher in those countries. Further research could also investigate bankruptcy and entrepreneurship across other countries around the world.

## Appendix

In this appendix we briefly consider causality tests in the spirit of Granger (1969). We report regressions of current self employment / population with lagged bankruptcy index values in on regression, and compare those regressions of current bankruptcy index values on lagged values of self employment / population. We do not make use of lagged dependent variables in these regressions primarily due to the high degree of serial correlation in the variables. As explained below, this is not a significant limitation as causal inferences can be drawn from the regressions as specified. The regression results are reported in Table 6.

<b>Table 6. Causality Analysis</b>				
This table presents causality tests of the relation between Bankruptcy Laws and Self Employment / Population with both the Eurostat and Compendia Data. Estimates of the lagged bankruptcy law index are used to estimate current rates self employment, and then lagged self employment rates are used to estimate current bankruptcy law index values. There are 195 observations in the Eurostat data, and 105 observations in the Compendia data because the Compendia data comprises observations every two years. The sample comprises the period 1990-2002. The explanatory variables are as defined in Table 1. Country fixed effects are used in all models. White's (1980) HCCME used. *, **, *** Significant at the 10%, 5% and 1% levels, respectively.				
	Eurostat Data		Compendia Data	
	Model (1): Dependent Variable: Self Employment / Population	Model (2): Dependent Variable: Time to Discharge	Model (3): Dependent Variable: Self Employment / Population	Model (4): Dependent Variable: Time to Discharge
Country Fixed Effects?	Yes	Yes	Yes	Yes
Time to Discharge (Lagged)	-0.0001***		-0.0003***	
Self Employment (Lagged)		-627.215***		-291.399***
Real GDP Growth	0.028**	66.342***	-0.041	54.542
MSCI Index	0.006	49.727**	0.097**	64.733
Patents	-8.75E-09	1.30E-03	-8.51E-08	5.73E-05
Income - Capital Gains Tax	0.0001	0.648***	0.00006	0.754***
Dummy for 1999 and 2000	-0.0005	-3.792*	0.001	-2.975
Time Trend	-0.00004	-0.762***	-0.0007***	-0.788***
Number of Observations	195	195	105	105
Adjusted R <sup>2</sup>	0.98	0.88	0.97	0.87
F-Statistic	427.81***	67.01***	155.04***	33.15***
Loglikelihood Function	864.03	-643.61	376.16	-344.97
Akaike Information Statistic	-8.64	6.83	-6.75	6.99

The regressions indicate a negative relation between lagged bankruptcy index values and self employment in Tables 6 for both the Eurostat and Compendia data (Models 1 and 3, respectively, in Table 6), consistent with Tables 4 and 5. This indicates that a lower time to discharge in bankruptcy from a prior year is associated with higher rates of self employment in the subsequent year, as expected. This is consistent with Tables 4 and 5. The difference in Tables 4 and 5 was that contemporaneous levels for bankruptcy laws and self employment rates were used based on the view that self employment decisions in a current year were based on the bankruptcy laws in that current year, while Table 6 treats the decision with the lagged values for the bankruptcy index.

In Table 6 (Models 2 and 4) the data also indicate a negative relation between lagged self-employment and current bankruptcy index values. This suggests that lower rates of self employment cause policy makers to increase the time to discharge in bankruptcy. If so, that would be completely counter to policy makers' intentions. If policies regarding time to discharge in bankruptcy were driven by historical self employment rates then the relation would be the exact opposite: we would expect policy makers would lower the time to discharge when self employment rates were lower (i.e., the coefficient on lagged self-employment on Models 2 and 4 would be positive, not negative). Therefore, the observed negative coefficient in Models 2 and 4 suggest that bankruptcy laws are not 'caused' by historical self employment rates since the sign on the coefficient, while statistically significant, has the incorrect sign. In other words, the observed negative relation between current levels of the bankruptcy index and historical self employment rates is misleading<sup>12</sup> since it seems implausible that policy makers would respond to low levels of self employment rates by subsequently increasing the time to discharge in bankruptcy. Statutory changes in bankruptcy laws are therefore better explained by factors other than historical rates of self employment (possibly including, but not limited to, expertise of the policy makers, lobby groups, etc.). In short, the data do not indicate a reason to believe the results relating bankruptcy laws to self employment as reported in this paper are subject to an endogeneity bias.

## Notes

<sup>1</sup> Enterprise Act (UK) 2002.

<sup>2</sup> Bankruptcy law solves a collective action problem. 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. In response, bankruptcy law provides a mandatory and orderly mechanism for the realisation of the insolvent’s assets (Jackson, 1982).

<sup>3</sup> 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.

<sup>4</sup> 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.

<sup>5</sup> 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.

<sup>6</sup> To be sure, the bankruptcy laws of all developed countries permit a debtor to be freed from pre-bankruptcy indebtedness with the consent of a majority of their creditors, through a *composition* arrangement. However, we consider that the existence or otherwise of a non-consensual discharge is crucial, because it will inevitably strengthen the bargaining position of a debtor in negotiations for any such composition.

<sup>7</sup> Our measure assumes that the bankrupt is 30 years old: that is, the measure is average life expectancy minus 30 years. The results reported are robust to a range of different specifications of this age.

<sup>8</sup> The data sources are explicitly indicated in Table 1. Other data sources include the U.S. patent office, the European Venture Capital Association, the Canadian Venture Capital Association, and Venture Economics.

<sup>9</sup> For three countries (Austria, Finland and Sweden), Eurostat data on self employment are not available for the period 1990-1994. As such, to maintain a uniform panel (which is desirable but not essential), we used linear interpolation to infer the self employment rates for these countries in those years. In total,

this amounts to 15 observations of 195 in our panel dataset. In the empirical analysis with the Eurostat data, the inclusion/exclusion of these 15 observations does not materially affect the empirical tests and/or conclusions.

<sup>10</sup> Income and capital gains taxes are just one of many aspects of a tax system, and it is extremely difficult to identify a country-year with a single number. The income and capital gains tax rates are often graduated so that they depend on levels and the inclusion rates (the amounts and type of capital gains subject to tax) can vary. Each country typically has special exclusions for different industries, including high-tech industries in which VCs often invest. As such, our tax figures are at best proxies for everything that is going on in the tax environment with regard to self employment. Limited degrees of freedom prevent inclusion of additional tax variables in our estimates.

<sup>11</sup> See, e.g., [http://www.geert-hofstede.com/hofstede\\_dimensions.php](http://www.geert-hofstede.com/hofstede_dimensions.php) for a variety of social indices that do not change over time, but could be used to explain international differences in levels of entrepreneurship.

<sup>12</sup> The implausible relations in Models 2 and 4 in Table 6 are primarily related to the high degree of serial correlation in levels of self employment per population.

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