Bankruptcy Law and Entrepreneurship

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Recent initiatives in a number of countries have sought to promote entrepreneurship through relaxing the legal consequences of personal bankruptcy. Whilst there is an intuitive link, relatively little attention has been paid to the question empirically, particularly in the international context. We investigate the relationship between bankruptcy laws and entrepreneurship using data on self-employment over 16 years (1990–2005) and fifteen countries in Europe and North America. We compile new indices reflecting how "forgiving" personal bankruptcy laws are. These measures vary over time and across the countries studied. We show that bankruptcy law has a statistically and economically

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significant effect on self-employment rates when controlling for GDP growth, MSCI stock returns, and a variety of other legal and economic factors. (*JEL* K35, M13)

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 around the world 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 (Insolvency Service (UK), 2001; European Commission, 2003). Based on such thinking, a European Union initiative has recommended the ready availability of a "fresh start" through personal bankruptcy laws as a mechanism for fostering entrepreneurship (European Commission, 2003). Several European countries, including Germany, the Netherlands, and UK, have recently changed their laws to introduce a "fresh start" or to make one available more quickly.[1] Similarly, USA has an extremely "forgiving" bankruptcy regime for small-business debtors, who were specifically excluded from a recent change in US bankruptcy law that made it more difficult for individuals to obtain a discharge from indebtedness.[2] In light of this seeming consensus amongst policymakers, it is surprising that relatively little attention has been paid to whether or not this intuitive relationship is borne out empirically across countries.

This paper reports empirical findings that support the existence of such a link. We investigate entrepreneurship using data on self-employment for fifteen countries from Europe and North America over 16 years, covering an entire business cycle. We develop new indices of the "severity" of personal bankruptcy laws that capture the extent to which bankrupt debtors are "punished" or "forgiven" by the legal process. An important part of this involves the number of years a bankrupt must wait until he may be

1. See *Insolvenzordnung* (Insolvency Code) 1994, in force January 1, 1999 (Germany); *Wet Schuldsanering Natuurlijke Personen* (Natural Persons Debt Rescheduling Act) 1998, in force December 1, 1998 (Netherlands); Enterprise Act 2002 § 256, in force April 1, 2004 (UK).

2. Bankruptcy Abuse Prevention and Consumer Protection Act 2005, Pub. L. No. 109–8, 119 Stat. 23 (2005), in force October 17, 2005 (US).

discharged (if at all) from pre-bankruptcy indebtedness. Controlling for a range of other economic and institutional factors that may affect national levels of entrepreneurship, we show that bankruptcy laws have both statistically and economically significant effects on levels of self-employment. In the Netherlands and Germany, for example, laws permitting discharge from personal indebtedness were introduced for the first time during the period we study. In the Netherlands, a discharge after three years was introduced at the end of 1998, and in Germany, a discharge after seven years was introduced in 1999, which was reduced to six years in 2001. This paper provides indices explicitly indicating the changes in the personal bankruptcy laws over the period 1990–2005. We show changes that make bankruptcy laws more "forgiving" are associated with increases in the self-employment rate—that is, the proportion of the population self-employed. The effects are consistently statistically significant and economically large. The magnitude of the economic significance depends on the particular index used, as detailed in the empirical analyses herein.

The rest of the paper is structured as follows. Section 2 reviews prior literature on the legal determinants of entrepreneurship, focusing in particular on the role of bankruptcy law. From this, our empirical hypothesis is formulated. Section 3 describes our empirical methodology and data, and Section 4 reports the results of our tests. Section 5 concludes with a discussion of the implications.

2. Literature Review

In this section, we review relevant prior literature and formulate general hypotheses concerning the impact of changes in bankruptcy law on entrepreneurship. We begin by considering what is meant by "entrepreneurship"; we then turn to ways in which law in general, and bankruptcy law in particular, may affect its incidence.

The term "entrepreneurship" is used in a range of contexts with widely varying meanings. In the neoclassical 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). From a Schumpeterian perspective, entrepreneurs are primarily innovators, who dissociate from existing organizations in order to be free to pursue radical ideas that may

bring about breakthroughs in the process of "creative destruction." A number of empirical studies demonstrate links between small entrepreneurial firms and risk-taking, innovation, and employment growth (e.g. Kortum and Lerner, 2000; Tykvová, 2000). Focusing on these potentially beneficial aspects of entrepreneurship, policymakers in developed countries have become increasingly concerned with initiatives calculated to promote its incidence.

A number of legal and institutional variables have been shown to affect the incidence of entrepreneurship.[3] One is taxation: in particular, high levels of income tax (borne by employees) and lower levels of capital gains tax (for entrepreneurs' shares in their business) are robustly associated with greater incidence of entrepreneurship both in single-country (Poterba, 1989; Gompers and Lerner, 1998; Poutziouris *et al.*, 2000) and cross-country studies (Fölster, 2002; Parker and Robson, 2003). A second concerns the protection of property rights—in particular, intellectual property. Strong intellectual property rights enhance or protect the expected rewards to innovation, and are reported to be positively associated with entrepreneurship and innovation (Lerner, 2002; Claessens and Laeven, 2003; Bigus, 2006).

Labor market regulation might also be expected to impact the incidence of entrepreneurship, although the precise channel is likely to be sensitive to the context. On the one hand, labor and social security laws that impact small firms disproportionately may deter entrepreneurs from founding a firm (Parker and Robson, 2003); on the other hand, labor law obligations that apply only to larger firms may encourage the formation of smaller firms, as appears to be the case in some Southern European countries such as Italy (Lodovici, 1999).

Another important aspect of the legal environment is bankruptcy law. 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.[4] The "severity" with which bankruptcy law deals with persons who have become unable to pay their debts—in particular, the level of "punishment" or "forgiveness" that a debtor

3. For reviews, see Audretsch (2002); Storey (2003); Licht (2007); and Parker (2007).

4. 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 realization of the insolvent's assets (Jackson, 1986).

receives—is one factor that determines the consequences of failure. A more forgiving bankruptcy law can be understood as offering entrepreneurs partial insurance against the consequences of failure (Jackson, 1985; Adler, Polack, and Schwartz, 2000; Lee *et al*., 2007). By lowering the necessary threshold of risk tolerance, this may be expected to stimulate entry at the margin by "latent," entrepreneurs who would otherwise be too risk-averse to start their own business.[5]

In many jurisdictions, different bankruptcy procedures are available for corporate and individual debtors.[6] In this paper, we focus on the impact of the regime applicable to individuals—"personal bankruptcy laws." Of course, entrepreneurs are likely to seek to incorporate their business as a limited liability company. Indeed, the cost of incorporating a business—in particular, minimum capital requirements—have been shown to be negatively correlated to the incidence of entrepreneurship (Klapper *et al*., 2006; Klapper *et al*., 2007; van Stel *et al*., 2007).[7] Yet even with easy access to limited liability, personal bankruptcy law may be expected to make a difference. This is because creditors frequently demand personal guarantees from owner-managers, which constitute a "contracting out" of the liability shield incorporation otherwise gives to the entrepreneur.

One way in which the "severity" of treatment of debtors by personal bankruptcy law may vary is with the extent to which certain assets may be treated by the debtor as *exempt* from the process of seizure. Empirical studies find support for the posited "insurance effect" from US data in relation to this measure (Fan and White, 2003; Georgellis and Wall, 2006). Whilst bankruptcy law in USA is federal, the level of exemptions in relation to the debtor's home is left to state law, and there is considerable state-level variation. These studies report that larger "homestead exemptions" are positively associated with levels of entrepreneurship, in line with intuition.

5. Grilo and Thurik (2005) document latent entrepreneurship as measured by the incidence of individuals who state a preference for self-employment, but are employed by someone else.

6. In USA, 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.

7. The studies cited report differing findings over the significance of administrative requirements concerning starting a business, but both report a negative association between minimum capital requirements and entrepreneurship.

The availability of finance for small business has also been shown by a number of studies to be a determinant of entrepreneurial activity (Freear and Wetzel, 1990; Carpenter and Petersen, 2002; van Praag *et al*., 2005).[8] The severity of bankruptcy law's treatment of debtors may itself have an impact on the availability of credit for small firms. An unforgiving bankruptcy law can allow a would-be entrepreneur with a good project to signal credibly the quality of their project, by seeking credit. Conversely, a forgiving bankruptcy law means that borrowers with poor quality projects will also come forward, and may induce moral hazard *ex post*. Lenders can, of course, accommodate such problems to a certain extent by screening and monitoring, but where such activity is costly, credit rationing will result (Stiglitz and Weiss, 1981). Empirical studies find that such a "credit supply" effect exists: Berkowitz and White (2004) show that 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.[9]

The predicted impact of the "insurance" and "credit supply" effects of bankruptcy law on entrepreneurship levels cut in different directions, and so the *net* effect of a change in bankruptcy law depends on their relative size. Fan and White (2003) report that greater state-level exemptions in bankruptcy law in USA are associated with an increase in overall entrepreneurship, implying that the insurance effect dominates; however, Georgellis and Wall (2006) report more mixed findings: for small changes in exemptions, the credit supply effect appears to dominate, but for larger changes, the insurance effect is more important.

Whilst the existing literature has focused on the impact of state-level differences in asset *exemptions* in USA, the severity for an entrepreneur of the legal consequences of bankruptcy vary across a range of other dimensions internationally. A second aspect is that whilst bankruptcy proceedings are ongoing, a debtor may be subjected to a variety of *disabilities*—including being barred, for example, from obtaining credit, running a company, or running for political office. Third, *criminal* sanctions may also be imposed

8. This in turn may be affected by changes in banking regulation: Black and Strahan (2002).

9. Moreover, Persad (2004) uses data on the performance of guaranteed loans in USA to explain this credit rationing as a response to adverse selection (and not simply greater loss given default), by showing that rates of default increase with levels of bankruptcy exemption in US states.

on bankrupts. Fourthly, a bankrupt debtor may be permitted to obtain a "*fresh start*": namely, that after a certain period of time, the debtor is permitted to *discharge* his outstanding credit obligations and emerge from bankruptcy proceedings. Finally, in lieu of a nonconsensual discharge, a debtor may enter into a *composition* with creditors, whereby he agrees to pay a proportion of the face value of his debts and the rest is treated as discharged.[10] Such arrangements may be facilitated by permitting a majority of creditors to bind a dissenting minority—the lower the threshold majority, the easier it will be for a debtor to exit from bankruptcy. Whilst these legal dimensions vary widely across countries (see European Commission, 2003; Armour, 2004), they are all regulated by federal bankruptcy law in USA and hence there is no statewise variation. No study has sought to test the effect of such variation on entrepreneurship across countries (although, see Armour and Cumming, 2006, for an analysis of the effect on the provision of venture capital).

The impact of the availability of a "fresh start" is worth discussing in particular (White, 2005). If an immediate discharge from bankruptcy is not available, the severity of bankruptcy's treatment of debtors will also have an impact on inframarginal entrepreneurs—that is, those who are willing to become entrepreneurs even in the absence of insurance. A forgiving bankruptcy law—in particular one that offers a "fresh start" from prebankruptcy debts—will permit inframarginal entrepreneurs to re-enter the economy rapidly after a business failure (Georgakopoulos, 2002; Landier, 2004; Ayotte, 2007). Such repeat entrepreneurship is in fact common in jurisdictions in which a fresh start is permitted (Baird and Morrison, 2005; Stam *et al.*, 2006). In contrast, an unforgiving bankruptcy law, with no discharge from prebankruptcy debts, will consign the entrepreneur to the economic dustbin, as she must pay over the majority of her future income to past creditors. Of course, re-entering entrepreneurs will find it more difficult to obtain credit "second time round." Yet provided that the number of those who obtain credit is greater than zero, permitting a fresh start may be unequivocally expected to increase total levels of entrepreneurship. Taking this effect into

10. The difference between this and a "fresh start" is, however, that a composition requires the agreement of at least a majority of the debtor's creditors, whereas a "fresh start" offers a discharge even if creditors do not consent. A composition is therefore likely to be attempted by debtors either in jurisdictions in which there is no discharge, or in ones where the time before discharge is permitted is long.

account, a more forgiving bankruptcy law—measured in a way that includes the possibility of a fresh start—may unambiguously be expected to be associated with a greater overall level of entrepreneurship—both by increasing entry at the margin and by increasing re-entry within the margin.

3. Methodology and Hypotheses

3.1. Comparing Bankruptcy Laws

Our general hypothesis is that, all other things being equal, a more forgiving bankruptcy law will tend to stimulate entrepreneurship. In this section, we discuss its operationalization for an empirical test and formulate specific hypotheses. We study data on bankruptcy law and self-employment over 16 years (1990–2005) from fifteen developed economies: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Spain, Sweden, UK, and USA.

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 a dimension across which they differ significantly is the availability of a "fresh start," or automatic discharge (Armour, 2004; Armour and Cumming, 2006). For example, the US Federal Bankruptcy Code permits small business debtors an immediate discharge under Chapter 7.[11] In UK, a discharge was permitted after three years until 2004, that period now having been lowered to one year. In Germany, no discharge was available until 1999, when a seven-year discharge period was introduced, subsequently lowered to six years in 2001. And in many European nations, including Spain and Italy, no discharge from personal indebtedness was available at all for our period of study.[12] We use two variables to capture differences in the treatment of bankruptcy discharge across countries. The first is a simple dummy variable (*discharge available?)*, taking the value 0 if discharge is available, and 1 if it is not available.

11. The Bankruptcy Abuse Prevention and Consumer Protection Act 2005 (*supra* note 2) imposed a means-tested restriction on individual debtors seeking to file for Chapter 7. However, this only applies if the individual's debts are "primarily consumer debts" (11 USC § 707(b)(1)) and so small-business debtors are unaffected.

12. Italy has since introduced a discharge for individual debtors, with effect from 2006.

The second (*time to discharge*) takes the number of years after bankruptcy until an automatic discharge is available. 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.[13] This measure has the merit of providing a cardinal scale of "severity" that can be used as an independent variable in regression analyses, with larger numbers indicating a less forgiving bankruptcy regime.

Of course, bankruptcy laws differ in other respects apart from the treatment of discharge. In order to take such differences into account in our analysis, we construct four additional indices relating to bankruptcy laws, each related to other dimensions across which the "severity" of the law's treatment of debtors varies, as discussed in the preceding section. The values of these various indices for each country during our time period, along with any changes, are set out in table 1. In each case, larger numbers indicate less "forgiving" treatment.

Exemptions relates to assets owned by the debtor at the commencement of bankruptcy, which may be withheld from creditors. The greater the level of exemptions, the more "forgiving" the bankruptcy law. There is considerable homogeneity of treatment of this issue across the countries in our sample: most permit the debtor to retain only modest personal items, along with work tools and equipment. In such circumstances, *exemptions* takes a value of 1. Where more generous exemptions are permitted, the variable takes a value of 0. For example, in USA, a portion of the value of the debtor's home is exempt, which we code as "0" to reflect this more generous treatment.[14] Some jurisdictions impose "negative" exemptions—that is, drawing assets into the bankrupt estate, which under marital property regimes belong in part to the debtor's spouse. Where assets not originally in the debtor's beneficial

13. Our measure assumes that the bankrupt is 40 years old: that is, the measure is average life expectancy minus 40 years. The results reported are robust to a range of different specifications of this age. See also Armour and Cumming (2006) for the use of a similar variable.

14. In USA, debtors are also allowed to retain an interest in their homes, although the maximum value of this "homestead exemption" varies from state to state. Recent reforms to the Bankruptcy Code have limited this to a maximum value of $125,000 where the debtor acquired the property within the 3 years prior to bankruptcy. Although there is statewise variation in the size of these exemptions within USA, we use country-level dependent variables and so the coding represents an aggregate measure.

Table 1. Summary Statistics for Bankruptcy Indices

	Discharge available?[a]	Discharge years?[a]	Minimum capital[b]	Exemptions[c]	Disabilities[d]	Composition[e]
Austria	1990–1994: 1; 1995–2005: 0	1990–1994: 37; 1995–2005: 7	1990–2005: €35000	1990–2005: 2	1990–2005: 0	1990–2005: 1.25
Belgium	1990–1997: 1; 1998–2005: 0	1990–1997: 37; 1998–2005: 0	1990–1998: €6174; 1999–2005: €18500	1990–2005: 1	1990–2005: 3	1990–1997: 1.25; 1998–2005: 1
Canada	1990–2005: 0	1990–1992: 1; 1993–2005: 0.75	1990–2005: €0	1990–2005: 0	1990–2005: 2	1990–2005: 1.16
Denmark	1990–2004: .5; 2005: 0	1990–2004: 5; 2005: 3	1990–1991: €10732; 1992–1996: €26831; 1997–2005: €16769	1990–2005: 1	1990–2005: 3	1990–2004: 1.4; 2005: 1.35
Finland	1990–1992: 1; 1993–2005: 0	1990–1992: 37; 1993–2005: 5	1990–2005: €2500	1990–2005: 1	1990–2005: 3	1990–2005: 0.8
France	1990–1993: 0; 1994–2005: .5	1990–2005: 0	1990–2002: €7500; 2003–2005: €0	1990–2005: 2	1990–1994: 1; 1995–2005: 2	1990–2005: 0
Germany	1990–1998: 1; 1999–2005: 0	1990–1998: 37; 1999–2000: 7; 2001–2005: 6	1990–2005: €25000	1990–2005: 0	1990–1998: 3; 1999–2005: 1	1990–1998: 1.25; 1999–2005: 1
Greece	1990–2005: 1	1990–2005: 20	1990–1992: €587; 1993–1998: €8804; 1999–2002: €17608; 2003–2005: €18000	1990–2005: 1	1990–1997: 4; 1998–2005: 3	1990–2005: 1.46
Ireland	1990–2005: 0	1990–2005: 12	1990–2005: €0	1990–2005: 1	1990–2005: 2	1990–2005: 1
Italy	1990–2005: 1	1990–2005: 38	1990–2003: €10300; 2004–2005: €10000	1990–1992: 2; 1993–2005: 1	1990–2005: 3	1990–2005: 1.16
Netherlands	1990–1998: 1; 1999–2005: 0	1990–1998: 38; 1999–2005: 3	1990–2005: €18000	1990–2005: 2	1990–2005: 0	1990–1994: 1.46; 1995–2005: 1
Spain	1990–2005: 1	1990–2005: 15	1990–2005: €3000	1990–2005: 1	1990–2005: 3	1990–2003: 1.1; 2004–2005: 0.5

(*continued*)

Table 1. (*Continued*)

Sweden	1990–2005: 1	1990–2005: 10	1990–2005: €10749	1990–2005: 1	1990–2005: 2	1990–2005: 2
UK	1990–2005: 0	1990–2003: 3; 2004–2005: 1	1990–2005: €0	1990–2005: 1	1990–2005: 2	1990–2005: 1
USA	1990–2005: 0	1990–2005: 0	1990–2005: €0	1990–2005: 0	1990–2005: 1	1990–2005: 1

This table summarizes the bankruptcy indices used in the empirical analyses in the subsequent tables for each country and each years. Sources: compiled from the bankruptcy statutes from each country.

[a] **Discharge** concerns discharge from prebankruptcy indebtedness available for an entrepreneur who has either been trading as a sole proprietor or guaranteed debts of a closely-held private company: **Discharge available?** takes value 0 if discharge available, 1 if not available; **Discharge years?**, if discharge is available, takes value of number of years until typical discharge; if discharge is unavailable, value is life expectancy minus 40.

[b] **Minimum capital** to form private company, in 2005, was Euros (1/E).

[c] **Exemptions** relates to prebankruptcy assets that are exempted from the bankrupt estate and are so retained by the debtor. Takes value 1 if exemptions of assets from the bankruptcy estate cover only personal items, tools of trade, etc. Takes value 0 if exemptions are more generous. Takes value 2 if exemptions are "negative," (i.e., spousal property can be pulled into the estate).

[d] **Disabilities** relates to restrictions on the debtor's civil and economic rights related to bankruptcy. Takes value 0 if no disabilities other than loss of power to deal with assets in bankrupt estate; takes value 1 for civic disabilities (i.e., loss of right to vote, hold elected office, or membership of professional groups); takes value 2 for economic disabilities (i.e., restrictions on obtaining credit or being involved in the management of a company); takes value 3 for interference with mail and/or travel (i.e., prohibition on travel without consent or mail opened by trustee); takes value 4 if debtor may be incarcerated for non-payment of debts.

[e] **Composition** relates to the possibility of agreeing a composition with creditors as a means of terminating an existing bankruptcy proceeding. The variable takes a value between 0 and 2, and it is the sum of (v + c), where v is proportion of face value of existing creditors' claims and c is proportion of number of creditors, who must vote in favour to effect a compromise.

ownership may be made available to his creditors, *exemptions* takes the value of 2.[15]

Disabilities relates to restrictions imposed on the debtor's civil and economic rights during the period of bankruptcy. It takes a value of 0 if a bankrupt debtor incurs no disabilities other than loss of power to deal with their assets; 1 if a bankrupt suffers civic disabilities (such as the loss of the right to vote, or hold elected office); 2 if a debtor suffers economic disabilities (for example, restrictions on obtaining credit, or on being involved in the management of a company); 3 if a bankrupt suffers interference with privacy and/or liberty (for example, restrictions on travel, interception of mail); and a value of 4 if a debtor may be incarcerated for nonpayment of debts.

Composition represents the level of difficulty a debtor will face in achieving a discharge by agreement with creditors. This might be sought either if a nonconsensual "fresh start" is not available, or if the debtor wishes to exit bankruptcy sooner than a fresh start will be permitted. All our jurisdictions permit debtors to enter into compromises with creditors (often called "compositions") to this effect, and most facilitate this by providing a legal mechanism whereby a majority of creditors wishing to make such an agreement can bind a dissenting minority. These are typically conditional on a specified majority by value of the creditors voting in favor, and sometimes on a specified minimum proportion of the creditors' claims being paid. Our variable captures differences in the majority voting requirements, both as regards number of creditors and value of claims. It takes a value between 0 and 2, and is the sum of $(v + c)$, where v is proportion of the face value of existing creditors' claims and c is proportion of the number of creditors, who must vote in favor to effect a compromise. For example, in UK, a simple majority of creditors, both by value and by number, must vote in favor to confirm a composition, so *composition* takes a value of 1.

The legal data were gathered principally from written materials available in English. For jurisdictions where the primary sources are not available in

15. We do not include here the possibility of revesting of assets following the avoidance of prebankruptcy transactions. All jurisdictions have such a claim available to the trustee running a bankruptcy proceeding in the case of "fraudulent conveyances," where the debtor's assets are divested in order to put them beyond the reach of creditors. Such actions *revest* property that initially belonged to the debtor. In contrast, what we term "negative exemptions" relate to assets that were never (entirely) the property of the debtor.

English, advice was sought from experts in bankruptcy laws in the relevant jurisdiction to confirm our assessment of the legal rules. The variables *time to discharge* and *composition* are cardinal indices, as they relate exactly to the dimension of interest in the legal sources. The rules underlying *exemptions* and *disabilities* are more open-textured, and hence ordinal indices were appropriate (as in La Porta *et al.*, 1997, 1998). A full account of the relevant sources used can be found in the Appendix on sources of legal data.[16]

As each of our bankruptcy law variables is coded such that larger numbers are associated with a more "severe" bankruptcy law. Our general hypothesis can therefore be reformulated more precisely:

H1: The five bankruptcy law variables (*discharge, time to discharge, exemptions, disabilities, and composition*) are expected to be negatively associated with entrepreneurship.

3.2. Minimum Capital Requirements

As discussed in Section 2, prior studies have found that ease of access to limited liability, and in particular, minimum capital requirements, have an impact on entrepreneurship (Klapper *et al.*, 2006; van Stel *et al.*, 2007). We collect data on minimum capital requirements for limited liability business entities in our sample jurisdictions during the period under study. These also summarized in table 1. We anticipate minimum capital to affect entrepreneurship both independently of, and in interaction with, personal bankruptcy laws. First, the expected consequences of personal bankruptcy laws for individual debtors are mitigated to some extent by ready access to limited liability, predicting minimum capital requirements to be negatively correlated with entrepreneurship. Second, limited liability partially deflects the downside consequences of bankruptcy for entrepreneurs, we would expect there to be an interaction between minimum capital requirements and the severity of bankruptcy laws.

16. In an earlier version of this paper, we also included a variable for "Crimes." *Crimes* reflect the criminal consequences, if any, of bankruptcy. It takes the value of 0 if there are criminal penalties for fraud, but not for simple negligence, by the debtor in the prebankruptcy period, and a value of 1 if there are criminal penalties for fraud *or* for simple negligence under such circumstances. There was not significant variation in this variable over the time period and countries considered, and as such it was statistically insignificant in our multivariate empirical tests. Details are available on request from the authors.

H2: Minimum capital requirements will be negatively correlated with entrepreneurship.

H3: There will be a negative interaction between the severity of personal bankruptcy laws and minimum capital requirements.

3.3. Entrepreneurship

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" (e.g., Bosma *et al*., 2008), or firm registration data (e.g. Klapper *et al*., 2007), self-employment data are readily available in long time-series format, permitting panel data on time-varying bankruptcy laws and self-employment rates to be assembled for a period covering a full business cycle. This allows for regression results that enable inferences about causality that are more precise relative to, for example, periods over which bankruptcy laws did not change. Our data on self-employment are derived from the European Union's statistical agency, EUROSTAT, which we use to create a figure for ratio of self-employment to total population.

Self-employment data are, however, notoriously difficult to compare across countries because of differing measurement criteria (van Stel, 2005). To ensure that our results are robust to such differences in measurement, we make use of several alternative measures of self-employment. First, we cross-check using data on self-employment and population from an alternative data source, the OECD. Second, it might be argued that a more meaningful denominator is not total population, but that part of the population, which is, or could be, working. To capture this, we run robustness checks using the ratio of self-employment to, the total labor force. However, this alternative denominator is also potentially subject to differing measurement criteria across countries, which because it is now present in both numerator and denominator makes this measure arguably less reliable than the first.

These problems of cross-country differences have been explicitly addressed by researchers compiling the COMPENDIA dataset of self-employment, which seeks to harmonize reporting so as to provide a more

accurate picture (van Stel, 2005). In particular, all owner-managers of companies are categorized as "self-employed" in this data, correcting for inconsistencies in national figures.[17] We use this measure of self-employment, as a ratio of total population, as our final version of the dependent variable. Unfortunately, the COMPENDIA data are only available biannually, and not for the entirety of our period, so again we use this as a robustness check, rather than our primary dependent variable.

3.4. Control Variables

National levels of entrepreneurship may be affected by a wide range of factors other than bankruptcy law. In order to control for country-level factors which do not change over the time period of our study, we employ a country fixed effects specification in the regression analyses. We also control for spurious trends over time with a time trend variable. Furthermore, our specifications take into account a range of time-variant factors that might be thought to influence levels of entrepreneurship. In particular, we control for economic factors such as GDP growth and stock market returns, which might give an indication of the level of opportunities available in a country at a particular time (Berkowitz and White, 2004; Landier, 2004). We also control for growth in R&D expenditure, as a proxy for the level of "idea generation" and potential externalities from R&D towards spurring more entrepreneurial activities. These variables are each described in section 4 below. Given that the tax environment has been shown to affect entrepreneurship, our specifications also consider tax differences across countries and over time.[18] Other variables, such as lagged unemployment and patents,

17. National statistical agencies in some countries classify owner-managers as "employees" (of their companies); others class them as "self-employed."

18. 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 income 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. 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. We considered a variety of different tax variables and found that regardless of the tax specification considered, the inferences with regard to bankruptcy were not materially impacted by the reported results.

were also considered, but these were immaterial to the relation between bankruptcy law and self-employment in the regressions reported.[19]

4. Results

4.1. Summary Statistics

We pool the data (as described in, e.g., Judge *et al*., 1988) to form a total of two hundred and forty observations. Table 2 presents summary statistics of self employment for different datasets. Table 3 presents summary statistics for the control variables described in subsection 3.4. Table 4 presents a comparison between mean and median tests for levels of self-employment in country-years for which discharge was and was not available. Panel A presents the full sample and panel B presents the subsample for all countries except Greece, Italy, and Spain. Referring back to tables 1 and table 2, Greece, Italy, and Spain stand out in the data with comparatively high self-employment rates relative to their real GDP growth rate and time to discharge in bankruptcy (hereafter we refer to these as the "outlier countries"). We infer that this indicates a cultural/structural element to the determination of self-employment in Greece, Italy, and Spain.[20] The three outlier countries have a material impact on the conclusions in many of the comparison of mean and median tests. As such, these countries are considered separately in the summary statistics presented in Table 4. When the three outlier countries are included, the results suggest a positive relation between self-employment rates and the availability of discharge in bankruptcy; in contrast, excluding the three outlier countries, there is a negative relation between self-employment rates and the availability of discharge in bankruptcy. The evidence in table 4, panel B is quite compelling: all of the comparisons between mean and median tests are statistically significant at least at the

19. Additional specifications are available on request from the authors.

20. Two factors in particular may explain much of this effect. First, these three countries have relatively high levels of agricultural workers, who are classed as self-employed (e.g., Kruppe *et al*., 1998). Entry to this sector will likely be subject to different determinants (e.g., inheritance of family farms) than for nonagricultural self-employment. Second, these countries have restrictive labor laws with exemptions for small firms, thus creating a bias in favor of self-employment (Lodovici, 1999).

Table 2. Summary of self-employment data

	Austria						Ireland					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.051	0.050	0.002	0.049	0.055	16	0.074	0.074	0.003	0.069	0.079	16
OECD proportion of labor force self-employed	0.136	0.136	0.004	0.128	0.144	16	0.206	0.205	0.025	0.175	0.249	16
OECD proportion of population self-employed	0.104	0.105	0.004	0.098	0.113	16	0.079	0.080	0.004	0.073	0.083	16
COMPENDIA business ownership rate	0.116	0.116	0.003	0.110	0.120	8	0.181	0.180	0.017	0.161	0.207	8
	Belgium						**Italy**					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.056	0.056	0.002	0.050	0.058	16	0.089	0.088	0.004	0.085	0.098	16
OECD proportion of labor force self-employed	0.180	0.181	0.008	0.162	0.189	16	0.288	0.288	0.007	0.275	0.302	16
OECD proportion of population self-employed	0.067	0.068	0.001	0.065	0.069	16	0.106	0.106	0.003	0.102	0.112	16
COMPENDIA business ownership rate	0.127	0.128	0.003	0.121	0.131	8	0.208	0.209	0.003	0.203	0.212	8
	Canada						**The Netherlands**					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.074	0.075	0.005	0.067	0.081	16	0.051	0.051	0.005	0.042	0.058	16
OECD proportion of labor force self-employed	0.104	0.104	0.008	0.095	0.118	16	0.119	0.119	0.005	0.111	0.126	16

(*continued*)

Table 2. (*Continued*)

OECD proportion of population self-employed	0.050	0.050	0.003	0.047	0.055	16	0.070	0.070	0.002	0.066	0.074	16
COMPENDIA business ownership rate	0.138	0.136	0.010	0.127	0.156	8	0.159	0.161	0.008	0.147	0.168	8
	Denmark						**Spain**					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.043	0.042	0.003	0.039	0.049	16	0.070	0.069	0.002	0.066	0.075	16
OECD proportion of labor force self-employed	0.096	0.092	0.009	0.087	0.117	16	0.225	0.231	0.031	0.181	0.259	16
OECD proportion of population self-employed	0.037	0.036	0.004	0.032	0.043	16	0.065	0.065	0.001	0.063	0.068	16
COMPENDIA business ownership rate	0.079	0.079	0.004	0.075	0.088	8	0.094	0.094	0.004	0.087	0.098	8
	France						**Sweden**					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.042	0.041	0.004	0.037	0.048	16	0.052	0.050	0.003	0.049	0.055	16
OECD proportion of labor force self-employed	0.103	0.099	0.015	0.088	0.132	16	0.103	0.102	0.006	0.091	0.112	16
OECD proportion of population self-employed	0.040	0.038	0.005	0.035	0.051	16	0.024	0.025	0.002	0.022	0.026	16
COMPENDIA business ownership rate	0.108	0.105	0.012	0.096	0.127	8	0.118	0.119	0.008	0.105	0.129	8

(*continued*)

Table 2. (*Continued*)

	Finland						UK					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.057	0.057	0.001	0.055	0.061	16	0.057	0.057	0.002	0.055	0.062	16
OECD proportion of labor force self-employed	0.144	0.146	0.013	0.127	0.163	16	0.137	0.137	0.010	0.121	0.151	16
OECD proportion of population self-employed	0.056	0.055	0.004	0.053	0.067	16	0.059	0.059	0.002	0.055	0.062	16
COMPENDIA business ownership rate	0.120	0.119	0.008	0.111	0.136	8	0.118	0.119	0.004	0.111	0.122	8
	Germany						**USA**					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.042	0.043	0.004	0.033	0.049	16	0.033	0.033	0.001	0.030	0.035	16
OECD proportion of labor force self-employed	0.109	0.109	0.006	0.098	0.123	16	0.081	0.081	0.006	0.072	0.090	16
OECD proportion of population self-employed	0.047	0.047	0.002	0.044	0.053	16	0.038	0.038	0.002	0.033	0.041	16
COMPENDIA business ownership rate	0.091	0.092	0.006	0.083	0.100	8	0.112	0.114	0.006	0.103	0.120	8

(*continued*)

Table 2. (*Continued*)

	Greece						Full Sample					
	Mean	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**
EUROSTAT proportion of population self-employed	0.121	0.120	0.003	0.116	0.127	16	0.061	0.055	0.022	0.030	0.127	240
OECD proportion of labor force self-employed	0.441	0.449	0.030	0.393	0.477	16	0.165	0.129	0.093	0.072	0.477	240
OECD proportion of population self-employed	0.161	0.162	0.007	0.149	0.171	16	0.067	0.060	0.034	0.022	0.171	240
COMPENDIA business ownership rate	0.299	0.296	0.019	0.272	0.323	8	0.138	0.120	0.055	0.075	0.323	120

This table summarizes the self-employment data from Eurostat <http://europa.eu.int/comm/eurostat/>, OECD <http://www.oecd.com>, and COMPENDIA <http://www.eim.net/Compendia_Inter/Start.htm?>. Eurostat and OECD <http://www.oecd.org> data are annual from 1990–2005, while COMPENDIA data are biannual.

Table 3. Variable definitions and summary statistics for control variables

Variable name	Definition	Source	Mean	Median	Standard Deviation	Minimum	Maximum
GDP growth	The country-specific real GDP growth from the prior year to the current year.	http://europa.eu.int/comm/eurostat/	0.018	0.012	0.102	−0.322	0.494
R&D growth	The country-specific real R&D growth from the prior year to the current year.	http://www.oecd.org/	0.032	0.030	0.087	−0.292	0.576
MSCI growth	The percentage change in the country-specific Morgan Stanley Capital International (MSCI) Stock Market Equity Index Returns from the prior year to the current year.	http://www.msci.com/	−4.368	−0.594	45.580	−687.378	35.936
Income tax per wage	Income tax as a percentage of gross wage for each country-year.	http://www.oecd.org/	18.656	18.150	10.932	0	110.500
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.						

This table defines the control 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, UK, and USA. The years span 1990 – 2005. There are two hundred and forty observations across all country-years, and the summary statistics in this table are provided for all country-years in the data. Various other definitions of variables and other control variables were considered but were immaterial to the results pertaining to bankruptcy law and self-employment.

Table 4. Comparison tests

	Country-years when discharge not available						Country-years when discharge available						Difference tests	
	Mean	**Median**	**Std. Dev**	**Minimum**	**Maximum**	**Cases**	**Mean**	**Median**	**Std. Dev.**	**Minimum**	**Maximum**	**Cases**	**Means**	**Medians**
Panel A: Full sample														
EUROSTAT proportion of population self-employed	0.065	0.054	0.027	0.033	0.127	125	0.054	0.054	0.014	0.030	0.081	142	$P \leq$ 1.844e-05***	$P \leq 0.954$
OECD proportion of labor force self-employed	0.193	0.134	0.117	0.087	0.477	125	0.127	0.119	0.039	0.072	0.249	142	$P \leq$ 6.96e-10***	$P \leq 0.243$
OECD proportion of population self-employed	0.072	0.066	0.043	0.022	0.171	125	0.057	0.053	0.019	0.032	0.106	142	$P \leq 0.0001^{***}$	$P \leq 0.012^{**}$
COMPENDIA business ownership rate	0.144	0.116	0.071	0.075	0.323	65	0.122	0.119	0.029	0.075	0.207	69	$P \leq 0.018^{**}$	$P \leq 0.738$
Panel B: Subsample excluding Greece, Italy, and Spain														
EUROSTAT Proportion of population self-employed	0.047	0.046	0.007	0.033	0.058	77	0.054	0.054	0.014	0.030	0.081	142	$P \leq$ 9.537e-05***	$P \leq 0.003^{***}$
OECD proportion of labor force self-employed	0.116	0.108	0.029	0.087	0.189	77	0.127	0.119	0.039	0.072	0.249	142	$P \leq 0.030^{**}$	$P \leq 0.0008^{***}$
OECD proportion of population self-employed	0.048	0.042	0.023	0.022	0.113	77	0.057	0.053	0.019	0.032	0.106	142	$P \leq 0.004^{***}$	$P \leq 0.0003^{***}$
COMPENDIA business ownership rate	0.111	0.110	0.027	0.075	0.168	41	0.122	0.119	0.029	0.075	0.207	69	$P \leq 0.056^{*}$	$P \leq 0.086^{*}$

Panel A: This table provides summary statistics for the country-years in which discharge was and was not available. The full sample of all countries and all years 1990–2005 is used. Difference of means and median tests are also provided. *, **, *** indicate statistically significant at the 10%, 5%, and 1% levels, respectively.
Panel B: This table provides summary statistics for the country-years in which discharge was and was not available. The subsample of all countries excluding Greece, Italy, and Spain is used, and all years 1990–2005 are used. Greece, Italy, and Spain are excluded as outlier countries with unusually high levels of self-employment per GDP. Difference of means and median tests are also provided. *, **, *** indicate statistically significant at 10%, 5%, and 1% level, respectively.

10 percent level of significance, regardless of the source of data for self-employment.

The comparison between mean and median tests with regard to the three outlier countries is indicative of the importance of using country fixed-effects in the multivariate regression analyses presented below. There are various sources of international differences in law and culture that can influence self-employment aside from bankruptcy law and economic variables discussed above, and the fixed-effects specification controls for those that do not change during our sample period. We additionally control for a number of economic and tax variables.

4.2. Multivariate Empirical Methods

Our multivariate tests in tables 5 and 6 make use of the panel dataset presented in Section 4. The left-hand-side variable is the rate of self-employment (table 2) in each econometric model presented in table 5. As a robustness check, we use each of the different measures of self-employment in table 2 as well as the different bankruptcy indices and the minimum capital requirements reported in table 1. The right-hand-side variables include controls for real GDP growth, MSCI returns, R&D growth, income taxes, a time trend, and a dummy variable for the Internet bubble (as discussed above, each variable is explicitly defined in tables 1–3). The sample comprises two hundred and forty observations for 1990–2005 and fifteen countries, as described in table 2.

Table 5, panel A presents Models (1)–(7) where the dependent variable is the Eurostat measure of self-employment. The seven models are presented to highlight robustness to the inclusion/exclusion of different control variables presented in table 3. Table 5, panel B presents Models (8)–(13) where the dependent variable is the Eurostat measure of self-employment and the explanatory variables encompass different measures of the bankruptcy index that were presented in table 1. Table 6 presents Models (14)–(18) where the dependent variable of self-employment is defined differently as in table 2, as indicated adjacent to each model. Also, table 6 presents a difference-in-differences regression in Model (17).

Given the presence of outliers in the data, as discussed in subsection 4.1, we are sensitive to the use of country fixed-effects. The use of country fixed effects captures the importance of a multitude of legal and other variables in the analysis, which do not change over time (unlike the variables

Table 5. Regression analyses of self-employment/population

Panel A. Alternative control variables

	Dependent variable in Models (1)–(7): Eurostat self-employment/population						
	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	−6.38E-05	−6.38E-05	−6.36E-05	−6.40E-05	−6.41E-05	−6.90E-05	−6.31E-05
	(−2.914)***	(−2.918)***	(−2.900)***	(−2.908)***	(−2.914)***	(−3.021)***	(−2.606)***
Real GDP growth		4.35E-05	−4.30E-04	−3.49E-04	−5.26E-04	−1.40E-03	−1.84E-03
		−0.028	(−0.237)	(−0.193)	(−0.286)	(−0.683)	(−0.839)
Real R&D growth			1.35E-03	1.32E-03	1.41E-03	2.46E-03	2.69E-03
			−0.541	−0.529	−0.562	−0.937	−0.994
MSCI growth				−4.11E-06	−4.28E-06	−4.16E-06	−4.39E-06
				(−1.986)**	(−2.043)	(−1.981)**	(−1.968)**
Income taxes on wages					−1.52E-05	−1.75E-05	−1.55E-05
					(−0.888)	(−1.010)	(−0.902)
Dummy for 1999 and 2000						−6.29E-04	−7.02E-04
						(−1.196)	(−1.303)
Time trend							2.81E-05
							−0.457
Number of observations	240	240	240	240	240	240	240
Adjusted R^2	0.981	0.981	0.981	0.981	0.981	0.981	0.98
F-statistic	814.57***	760.25***	713.20***	673.18***	635.74***	603.58***	572.96***
Log-likelihood function	1059.552	1059.553	1059.699	1060.16	1060.324	1060.786	1060.942
Akaike information statistic	−8.696	−8.688	−8.681	−8.676	−8.669	−8.665	−8.658

(*continued*)

Table 5. (*Continued*)

Panel B. Alternative bankruptcy indices						
	Dependent variable in Models (8)–(13): Eurostat Self-Employment/Population					
	Model (8)	**Model (9)**	**Model (10)**	**Model (11)**	**Model (12)**	**Model (13)**
Country-fixed effects?	Yes	Yes	Yes	Legal fixed effects and country dummies	Yes	Yes
Minimum capital to form a private company	−2.50E-07 (−3.491)***	−1.98E-07 (−3.040)***				
Minimum capital to form a private company * Time to discharge		−4.174E-09 (−3.775)***				
Minimum capital to form a private company/GDP			−4.62E-03 (−6.038)***			
Exemption = 0 Dummy				5.934E-02 (18.251)***		
Exemptions = 1 Dummy				5.112E-02 (22.406)***		
Exemptions = 2 Dummy				4.418E-02 (26.658)***		
Disabilities = 2 Dummy					−7.945E-03 (−5.772)***	
Disabilities = 3 Dummy					−4.329E-03 (−3.879)***	

(*continued*)

Table 5. (*Continued*)

Disabilities = 4 Dummy					1.424E-03	
					(0.801)	
Composition						−1.25E-02
						(−5.566)***
Real GDP growth	−1.12E-03	−7.35E-04	−2.16E-03	−7.47E-03	−5.67E-04	−1.17E-03
	(−0.523)	(−0.348)	(−1.024)	(−1.340)	(−0.274)	(−0.547)
Real R&D growth	2.32E-03	2.61E-03	3.31E-03	1.05E-02	2.38E-03	3.54E-03
	−0.909	(1.005)	−1.329	(1.411)	(0.945)	−1.331
MSCI growth	−1.84E-06	−1.98E-06	−3.11E-06	3.30E-06	−5.01E-06	−4.96E-06
	(−0.750)	(−0.934)	(−1.394)	(1.193)	(−2.126)**	(−3.612)***
Income taxes on wages	5.69E-07	−9.67E-06	−4.71E-06	−8.24E-05	3.62E-05	−1.16E-05
	−0.03	(−0.527)	(−0.257)	(−1.916)*	(2.192)**	(−0.731)
Dummy for 1999 and 2000	−2.40E-04	−4.71E-04	4.23E-05	−1.49E-03	−2.67E-04	−6.04E-04
	(−0.455)	(−0.875)	−0.08	(−0.972)	(−0.545)	(−1.153)
Time trend	1.08E-04	4.22E-05	7.04E-05	6.99E-05	1.41E-04	−9.49E-06
	(1.832)*	(0.731)	−1.332	(0.593)	(2.506)**	(−0.169)
Number of observations	240	240	240	240	240	240
Adjusted R^2	0.981	0.982	0.982	0.887	0.983	0.982
F-statistic	587.55***	596.29***	628.90***	105.23***	618.44***	631.47***
Log-likelihood function	1063.906	1071.679	1071.929	848.534	1081.784	1072.41
Akaike information statistic	−8.683	−8.739	−8.749	−6.913	−8.815	−8.753

This table presents OLS estimates of the level of self-employment/population. Variables are as defined in tables 1–3. The sample comprises two hundred and forty observations for 1990–2005 and fifteen countries, as described in table 2. Panel A presents Models (1)–(7) where the dependent variable is the Eurostat measure of self-employment, and different control variables to illustrate robustness. Panel B presents Models (8)–(13) where the dependent variable is the Eurostat measure of self-employment and the explanatory variables encompass different measures of the bankruptcy index. Country-fixed effects are used in all models, with the sole exception of Model (11), which uses fixed effects for different legal dummy variables for exemptions and country dummy variables for ten countries. White's (1980) HCCME is used in all regressions. *t*-statistics are in parentheses. *, **, *** indicate significant at 10%, 5%, and 1% level, respectively.

Table 6. Additional robustness checks

	Model (14)	Model (15)	Model (16)	Model (17)	Model (18)
	Eurostat: Self-employed/population	**OECD: Self-employed/ population**	**OECD: Proportion of labor force, self-employed**	**OECD: Proportion of labor force self-employed**	**COMPENDIA: Business ownership rate (biannual data)**
Country-fixed effects?	Yes	Yes	Yes		Yes
No discharge dummy	−2.56E-03 (−3.299)***	−1.51E-03 (−1.691)*	−1.56E-02 (−6.967)***		−5.24E-03 (−2.056)***
Treatment * after				6.699E-03 (2.562)**	
After				−3.354E-03 (−1.680)*	
Real GDP growth	−1.71E-03 (−0.781)	−2.87E-03 (−1.215)	−2.38E-02 (−2.683)***	−5.44E-03 (−1.745)*	−2.21E-02 (−1.275)
Real R&D growth	2.53E-03	8.67E-04	2.58E-02	8.26E-03	1.68E-02
	−0.931	−0.343	(2.474)**	(2.248)**	−1.079
MSCI growth	−4.41E-06	−4.77E-06	4.01E-06	5.58E-06	−3.12E-04
	(−2.023)**	(−2.848)***	1.06E+00	(1.122)	(−1.006)
Income taxes on wages	−1.06E-05	−4.20E-05	−1.67E-06	−2.63E-05	5.40E-05
	(−0.693)	(−1.974)**	−3.80E-02	(−0.613)	−0.44
Dummy for 1999 and 2000	−7.12E-04 (−1.340)	−2.53E-04 (−0.460)	−7.18E-03 (−4.250)***	−1.25E-03 (−1.318)	−0.00549124 (−1.498)
Time trend	2.06E-05	−3.35E-04	−2.08E-03	−1.48E-03	−0.00069602
	−0.341	(−5.620)***	(−9.334)***	(−7.558)***	(−3.173)***
Number of observations	240	240	240	240	120
Adjusted R^2	0.981	0.991	0.986	0.987	0.977
F-statistic	584.56***	1326.12	776.62***	853.92	243.42***
Log-likelihood function	1063.304	1054.334	748.318	765.623	416.469
Akaike information statistic	−8.678	−8.603	−6.053	−6.189	−6.574

This table presents OLS estimates of the level of self-employment/population. Variables are as defined in tables 1–3. Country-fixed effects are used in all models. The sample comprises two hundred and forty observations for 1990–2005 and fifteen countries, as described in table 2. Model (17) is a difference-in-differences regression where the variable "After" represents the period after the legislative change in bankruptcy laws and the variable "Treatment" represents the treatment countries that had changes to their bankruptcy statutes. Not all countries that changed their bankruptcy laws changed them at the same time, but the median and mean year of change was 1998 and as such the variable "After" is defined with "1" post-1998 for the control group in Model (17) (and the results are robust to various other specifications not explicitly presented). The difference-in-difference regression in Model (17) uses the correction for an AR(1) process. In Models (14)–(18), the dependent variable of self-employment is defined differently, as indicated adjacent to each model. White's (1980) HCCME is used in all regressions. The t-statistics are in parentheses. *, **, *** denote significant at 10%, 5%, and 1% level, respectively.

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 (e.g., Hofstede *et al.*, 2002) 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 5 and 6 are attributable to the country-fixed-effect specification.

4.3. Multivariate Empirical Results

The Eurostat data and multivariate tests highlight the importance of one primary variable in driving the levels of self-employment per population: time to discharge in bankruptcy. All of the other variables are generally statistically insignificant and/or not robust to the specification of the model.

In table 5, panel A, with the Eurostat measure of self-employment, the time to discharge in bankruptcy is negative and significant in all of the specifications at the 1 percent level of significance. As regards the economic significance in table 5, panel A, a 10-year reduction in the time to discharge is associated with an increase in self-employment rates of approximately 0.0006, which is about a 1.03 percent increase in the rate of self-employment for the countries considered (based on the Eurostat average for all countries indicated in table 2). A move from the least generous (Italy) to the most generous (USA), a difference of 38 years on our measure, would therefore be associated with an overall increase in the average rate of self-employment of around 3.9 percent. This provides strong support for our principal hypothesis (H1).

The economic significance of the effect of bankruptcy can be usefully illustrated by reference to examples of European nations that introduced discharges from personal indebtedness during the period studied (see table 1). In the Netherlands, a discharge from bankruptcy after three years was introduced in 1997, and in Germany, a discharge after seven years was introduced in 1999, being reduced to six years in 2001 (see table 1). These changes are consistent with increases in self-employment per head of population by approximately 0.002, or 4.5 percent of the average rate of self-employment in Germany and 4.3 percent of the average rate of self-employment in the Netherlands (table 2). Overall, therefore, table 5, panel A, time to discharge

in bankruptcy is a statistically and economically important determinant of self-employment rates.

Table 5, panel B reports the results of regressions designed to test the effect of differences in access to limited liability and other differences in bankruptcy laws across countries on self-employment. Models (8)–(10) include minimum capital as a right-hand-side variable, expressed first as an absolute figure in Model (8), then with an interaction term with time to discharge in Model (9), and then as a proportion of GDP in Model (10). Models (10)–(13) include one each of three additional bankruptcy variables; respectively, *exemptions, disabilities, and composition*. Overall, the results indicate that the bankruptcy indices are statistically and economically important determinants of self-employment, and minimum capital requirements are negatively correlated with self-employment. Model (8) indicates a reduction in the minimum capital required to operate a private company by €7500 (as in the case of France in 2002) is consistent with an increase in self-employment/population by 0.0019, which is 4.5 percent of the average rate of self-employment in France (table 2) and 3.1 percent of the average rate of self-employment for all the country-years in the data. Model (9) includes an interaction term (minimum capital $*$ time to discharge), which is included to test whether the effect of these variables is cumulative (see Hypotheses 2 and 3 and the accompanying text). The coefficient for the interaction term is negative and statistically significant at the 1 percent level. The size of the coefficient for minimum capital in Model (9) is approximately 20 percent smaller, but still economically and statistically significant. Model (10) indicates a reduction in minimum capital to operate a private company per € millions of GDP by 0.55 (one standard deviation) gives rise to an increase in self-employment/population by 0.0025, which is 4.2 percent of the average level of self-employment per population across the country-years in the data. These results in relation to minimum capital rules provide support for our subsidiary hypotheses, H2 and H3; namely, that minimum capital requirements are negatively associated with entrepreneurship, and that these effects compounded those of tougher personal bankruptcy laws.

Many of the other bankruptcy indices are positively correlated with the discharge variables, meaning that problems of multicollinearity emerge if more than one of these indices are included in the same regression. Several such specifications were attempted, but in certain cases the estimates

became highly inflated due to collinearity. In one moderately parsimonious specification that worked reasonably well, it was noteworthy that the indices for minimum capital/GDP, disabilities, and composition were all simultaneously statistically significant (but the economic significance was slightly inflated and this is most likely due to collinearity). Under these circumstances, the relative importance of different bankruptcy policy instruments is perhaps best assessed by comparing the regressions reported with the bankruptcy variables used separately in each regression. Models (11), (12), and (13) indicate that harsher treatment of bankrupts along the margins, respectively, of less exemptions, greater disabilities, and more difficulty in obtaining a composition with creditors, are associated with reductions in self-employment. Given that these variables are positively correlated with the discharge variables, we can infer that the impact of greater severity of bankruptcy laws on self-employment is qualitatively similar across these different dimensions of the law.

More specifically, the specification in Model (11) includes three dummy variables for the different status of exemptions as defined in table 1. The exemptions dummy = 1 variable is defined as a dummy variable equal to 1 where exemptions of assets from the bankruptcy estate cover only personal items, tools of trade etc., and 0 otherwise. The exemptions dummy = 0 variable is defined as a dummy variable equal to 1 where exemptions are more generous, and 0 otherwise. The exemptions dummy = 2 variable is defined as a dummy variable equal to 1 where exemptions are "negative" such that spousal property can be pulled into the estate. These dummy variables sum to 1, such that we include all three dummies and employ fixed effects in Model (11). We also include country dummy variables for ten countries in Model (11), and exclude certain country dummies for reasons of collinearity. The fixed effects dummies for the country variables indicate more generous exemptions are associated with higher levels of self-employment, and these effects are statistically significant at the 1 percent level for all three legal dummy variables in Model (11). In particular, the exemptions = 0 dummy variable is 8.223E-03 greater than that of the exemptions = 1 dummy variable and 1.516E-02 greater than the exemptions = 2 dummy variable, while the exemptions = 1 dummy variable is 6.938E-03 higher than the exemptions = 2 dummy variable. Relative to the average level of self-employment in the country-years in the sample (table 2), this indicates a move from exemptions that cover personal items, tools of trade

etc., to more generous exemptions increases self-employment/population by 13.4 percent, while a move to less generous "negative" exemptions reduces self-employment/population by 11.4 percent, and a move from the negative exemption level to the more generous exemption level increases self-employment/population by 24.9 percent. In comparison, Fan and White (2003, p. 556) show with a US sample that the probability of owning a business increases by 35 percent by moving from the lowest to the unlimited exemption level.

In Model (12) we use dummy variables for the disabilities as indicated in table 1. The disabilities = 2 dummy variable is defined as a dummy variable equal to one where there are economic disabilities (i.e., restrictions on obtaining credit, being involved in the management of the company etc.), and 0 otherwise. The disabilities dummy = 3 dummy variable is defined as a dummy variable equal to one for interference with mail and/or travel (i.e., prohibition on travel without consent, mail opened by trustee), and 0 otherwise. The disabilities dummy variable = 4 is defined as a dummy variable equal to 1 if the debtor may be incarcerated for nonpayment of debts, and 0 otherwise. We necessarily suppress dummy variables for disabilities = 1 and disabilities = 0 (see table 1 for the definitions) to avoid collinearity problems. We use country-fixed effects in Model (12) and not legal fixed effects as in Model (11) because there are scant country-years for which some of the disabilities dummy variables take the value 1 (for example, there are only eight country-years for which the disabilities = 4 dummy variable takes the value 1 (Greece, 1990–1997), and hence legal fixed effects are not possible). The data in Model (12) indicate that economic disabilities reduce self-employment/population (relative to the average level for all country-years listed in table 2) by 13.0 percent, while interference by mail and/or travel gives rise to a reduction in self-employment by 7.1 percent, and these effects are statistically significant at the 1 percent level. The effect of incarceration is not statistically significant, although this result may be an artifact of the comparative dearth of country-years where there was a possibility of incarceration.[21]

21. Note that in an earlier draft of this paper (available on request), we considered an ordinal ranking of the disabilities variable (based on the definition in table 1), and that specification resulted in a coefficient estimate of −2.614E-03, which was significant at the 1% level, and as such that specification supported the view that each successive

Table 6 reports a series of robustness checks designed to check whether the relation between bankruptcy law and self-employment is robust to different measures of self-employment and difference-of-differences specifications. Table 6 presents five different regressions with differently defined left-hand-side variables as reported in table 2.[22] The bankruptcy variable in table 6 is the dummy variable *discharge*, taking a value of 1 if discharge is not available in a particular country-year, and 0 if it is. As in panels A and B of table 5, the bankruptcy index in table 6 has a robust, statistically and economically significant influence on self-employment. The coefficients on the bankruptcy index are statistically significant at the 10 percent level in Model (15) and at the 1 percent level in Models (14), (16), and (18). The coefficient is largest in Model (16), which indicates the discharge gives rise to an increase in self-employment per population by 0.016, which is 9.5 percent of the average level of self-employment per population based on the OECD self-employment data relative to the labor force. The smallest coefficient for the discharge dummy in table 6 is in Model (15), which indicates discharge gives rise to an increase in self-employment by 0.0015, which is 2.3 percent of the average level of self-employment per population based on the OECD data relative to the IMF population data. The other variables in the regression models included were not statistically significant (or in the odd case where they were, they were not robust).

Model (17) in table 6 uses a Difference-in-Differences regression. The variable "After" represents the period after the legislative change in bankruptcy laws and the variable "Treatment" represents the treatment countries that had changes to their bankruptcy statutes. Not all countries that changed their bankruptcy laws changed them at the same time, but the

disability level further reduced self-employment/population. We further considered a specification in which the dummy variables reported in table 5, panel B. Model (12) were cumulative (e.g., dummy variable disabilities = 4 is equal to 1 for factors that include disabilities = 4 and also disabilities = 1, 2, and 3). That latter specification, however, resulted in collinearity problems across the different dummy variables.

22. We exclude from table 6 two further robustness checks using alternate dependent variables OECD:% of Economically Active Population Self-Employed and OECD:% of Population in Employment Self-Employed. The results based on those regressions, reported in an earlier draft of this paper, are available on request and are consistent with the other specifications already reported.

median and mean year of change was 1998 and as such the variable "After" is defined with "1" post-1998 for the control group in Model (17) (and the results are robust to various other specifications not explicitly presented). The Difference-in-Difference regression in Model (17) uses the Bertrand *et al.* (2004) correction for an AR(1) process.[23] The regression indicates the coefficient on variable of interest, Treatment ∗ After, is statistically significant at the 5 percent level with the expected positive sign. In terms of the economic significance, a change in the bankruptcy law gives rise to a 4.1 percent increase in the average value of self-employment per population in the country-years in the data.

Overall, table 5 panels A and B and table 6 indicate that the effect of changing bankruptcy laws has had a robust, statistically significant, and an economically meaningful effect on self-employment for a very wide variety of ways in which the change in bankruptcy is measured and for different definitions of self-employment.

4.4. Limitations and Directions for Future Research

Our results should be interpreted sensitively to the existence of a number of limitations. First, we do not measure directly the existence of any effects of bankruptcy on the supply of credit across countries. It is to be expected that a more forgiving bankruptcy law will not only stimulate entry by entrepreneurs, but also to induce lenders to tighten credit for small businesses. We may infer from our empirical results that the "demand side" effect tends to be greater than any "supply side" effect, leading to a *net* overall increase in entrepreneurship, but it would be interesting to know how, if at all, the components of this net trend vary across countries and by bankruptcy variable.

It is also worth mentioning that 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

23. The use of the AR(1) correction gave rise to results that were less robust to the particular specification. Alternative specifications without the AR(1) correction (not reported) gave rise to stronger and more robust results showing harsher bankruptcy laws have a negative impact on self-employment.

representing entrepreneurs' interests are relatively better funded and organized, and hence more readily able to persuade legislatures to pass laws that favor 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). One test that was particularly helpful in this regard was the Difference-in-Difference regression in Model (17). Further research may nevertheless explore the institutional and legislative process that leads to changes in bankruptcy statutes across countries around the world.

4.5. Welfare Implications

Our data give us no direct insights 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. In a static neoclassical framework, an entrepreneur is (i) a risk-bearer; and (ii) likely to possess superior information about the quality of her project than is a financier. A more forgiving bankruptcy law, by providing greater insurance, may at the margin induce individuals (i) with lower risk tolerance, and (ii) with lower-quality projects, to seek funding. The welfare implications, which will also depend on the quality of creditors' screening and monitoring technology, are ambiguous. However, recent research on the role of entrepreneurs, and their characteristics, suggests that a dynamic framework may be more appropriate (see Audretsch, 1995). On this view, entrepreneurs (i) are optimists—that is, persons who systematically underestimate the probability of failure (Landier and Thesmar, 2003; Lee and Venkataraman, 2006) and (ii) do not know the quality of their projects unless they are implemented (that is, entrepreneurs operate under "Knightian" uncertainty). This implies that a more lenient bankruptcy law will, at the margin, stimulate entry of persons with lower levels of optimism to become entrepreneurs (Landier, 2004). However, there is no reason for thinking that the quality of their projects will be any less. Moreover, a more lenient bankruptcy law will permit failed entrepreneurs to re-enter the marketplace quickly. If entrepreneurs systematically underestimate the risk of failure, this may well be welfare enhancing (Parker, 2007). If the latter view of entrepreneurship better represents reality, then we consider that the welfare

implications are a more forgiving bankruptcy law are likely to be generally positive.

5. Conclusion and Implications

Based on aggregate self-employment data spanning the period 1990–2005 from Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Spain, Sweden, UK, and USA, we show that the legal environment is significantly related to 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 prebankruptcy indebtedness. This paper provides the first look at bankruptcy laws and self-employment in an international setting, thereby extending single-country studies (e.g., Fan and White, 2003; Georgellis and Wall, 2006).

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 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. Depending on the specification, we show changes in bankruptcy laws that are more entrepreneur friendly give rise to statistically and economically significant increases in self-employment per population. We find, for example, that in relation to the availability of a fresh start, a move from our least generous to most generous jurisdictions (that is, from not permitting a fresh start at all to granting one immediately) is associated with an increase of around 3.9 percent in the average rate of self-employment (self-employment/population) in our countries for the period of our study. We also investigate the links between restrictions on access to limited liability and self-employment. Consistently with Klapper *et al.* (2006), we find such restrictions (as measured by minimum capital requirements) are negatively associated with self-employment, but moreover, we find them to interact with the effect of personal bankruptcy laws: the impact of severe bankruptcy laws is particularly strong when coupled with a high minimum capital requirement for incorporation. The policy implications are seemingly straightforward: forgiving personal bankruptcy laws and ready access

to limited liability offer significant policy instruments for enhancing entrepreneurial activity.

We explicitly demonstrated the robustness of our results to the inclusion of a variety of explanatory variables, as well as a range of alternative measures of self-employment. We also identified outlier countries (in particular, Greece, Italy, and Spain). 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, and also extend the general analysis to links between bankruptcy and entrepreneurship to other countries outside our current sample.

Appendix: Sources of Legal Data

Austria

Legislation. Bankruptcy Act 1914 (*Konkorsordnung* or KO), in force January 1, 1915; Settlement and Recomposition of Debts Act 1914 (*Ausgleichsordnung* or AO), in force January 1, 1915; Bankruptcy Reform Act 1982 (strengthening of rescue elements); Bankruptcy Reform Act 1993 (introducing provisions for consumer bankruptcies) (Payment plan law) 1993, in force January 1, 1995; Bankruptcy Reform Act 1997 (facilitating opening of bankruptcy proceedings); Bankruptcy Reform Act 1999 (remuneration of insolvency administrators); Bankruptcy Reform Act 2002 (extension of public notice provisions for insolvencies).

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King, eds., *Collier International Business Insolvency Guide*, chap. 14A. Newark, NJ: Matthew Bender.

Belgium

Legislation. Commercial Law of April 18, 1851; Arts 437–514; Law of June 29, 1887 (*concordat preventif*) (both repealed in 1997); *Concordat Act* (Law of July 17, 1997) and *Bankruptcy Act* (Law of August 8, 1997); *Collective Debt Rescheduling for Private Persons Act* (Law of July 5, 1998) in Arts 1675/2–17 of the *Judicial Code*; *Companies Code* of March 7, 1999; Law of September 4, 2002.

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Zenner, Alain. 2003. *Faillites et Concordats*. Brussels: Larcier.

Canada

Legislation. Bankruptcy Act 1949 (renamed in 1992 to Bankruptcy and Insolvency Act 1992); amended 1997. See http://laws.justice.gc.ca/en/showtdm/cs/B-3.

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Denmark

Legislation. Act No. 298 of 8 June 1977 (Danish Bankruptcy Act); Act No. 187 of May 9, 1984 on suspension of payments and rescheduling of debts; Act No. 382 of May 22, 1996 (modernising Bankrupcy Act); Act No. 118 of February 4, 1997 (consolidating Bankruptcy Act and amendments); Danish Bankruptcy Act, No. 402 of June 26, 1998.

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Finland

Legislation. Bankruptcy Code (konkurssisääntö 1868/31); Law on Voidable Transactions (laki takaisinsaannista konkurssipesään 1991/758); Law on Priority of Claims (laki velkojien maksunsaantijärjestyksestä 1992/1578); Law on the Adjustment of the Debts of a Private Individual (1993/57); Law on the Reorganisation of an Enterprise (laki yrityksen saneerauksesta 1993/47); Bankruptcy Act (2004/120).

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France

Legislation. Loi no 84–148 du 1er mars 1984 relative à la prévention et au règlement aimable des difficultés des entreprises; Loi no 85–98 du 25 janvier 1985 relative au redressement et à la liquidation judiciares des entreprises; Loi du 31 decembre 1989; Loi 94–475 du 10 juin 1994; Codified into the Commercial Code in 2000: Commercial Code (CC), art. L. 611–1 to 628–3. English translation available at: http://195.83.177.9/code/liste.phtml?lang = uk&c = 32. (French law changed significantly on 1 January 2006).

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Germany

Legislation. Bankruptcy Code (*Konkursordnung* or KO) 1877, promulgated October 1, 1879; Forced Settlement Act (*Vergleichsordnung* or VglO) 1935; Insolvency Code (*Insolvenzordnung* or InsO) 1994, in force from January 1, 1999, amended December 2001 and subsequently (although subsequent amendments not relevant to the enquiry).

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Greece

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Ireland

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Italy

Legislation. *Legge Fallimentare:* Royal Decree of March 16, 1942, n. 267. The law has been amended by Decree-Law of March 14, 2005, n. 35, and Legislative-Decree of January 9, 2006, n. 5 (but neither was introduced before 2006).

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Netherlands

Legislation. Bankruptcy Act 1893 (*Faillissementswet*); Natural Persons Debt Rescheduling (Natural Persons) Act 1998 (*Wet Schuldsanering Natuurlijke Personen*) (in force December 1, 1998).

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Spain

Legislation. Commercial Codes of 1829 (Cco 1829) and 1885 (Cco 1885), Civil Procedure Act of 1881 (*Ley de Enjuiciamiento Civil* or LEC 1881); Civil Code of 1889 (CC 1889). See also Payments Act of July 26, 1922,

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