How does personal bankruptcy law affect start-ups?[*]

Geraldo Cerqueiro
Universidade Católica Portuguesa
geraldo.cerqueiro@fcee.ucp.pt

María Fabiana Penas
Tilburg University - CentER, EBC & TILEC
m.penas@uvt.nl

This draft: November 2010

[*] We are grateful to the Kauffman Foundation for granting us access to the confidential Kauffman Firm Survey data. We would like to thank Neil Bhutta, Martin Brown, Marco Da Rin, Fabrice Cavarretta, William Forster, José Jorge, Judit Montoriol-Garriga, Cláudia Ribeiro, Alicia Robb, and seminar participants at the Kauffman Firm Survey workshop in Lausanne, Faculdade de Economia do Porto, and Kauffman-Atlanta Fed-Dallas Fed Conference on Small Business, Entrepreneurship, and Economic Recovery for valuable comments.

How does personal bankruptcy law affect start-ups?

Abstract

We exploit both cross-sectional and times series changes in U.S. state exemption levels to analyze the effect of debtor protection on a start-up's financing sources. We find that both the equilibrium level of formal debt and the share of formal debt to total financing are lower in states with higher exemption levels. The decrease in debt financing is compensated by an increase in funding from informal sources, such as the firm owners, family, and friends. We also find that firms located in high exemption states start smaller and are more likely to fail. We consider two possible driving forces of our results. The first is a reduction in the supply of credit that more than compensates a potential increase in the demand for credit by risk-averse borrowers. The second is an adverse selection mechanism, whereby low-skilled entrepreneurs are attracted to high exemption states. Our evidence clearly points to a reduction in credit availability as the main driver of our results. Finally, we find that while exemptions negatively affect the supply of credit for both unlimited liability and limited liability start-ups, exemptions positively affect the demand for credit only from unlimited liability start-ups.

Keywords: Debtor protection, bankruptcy, start-ups, credit availability, agency problems.

JEL Classification: G32, G33, K35, M13

I. Introduction

Start-ups have proven to be an important driver of innovation, competition, job creation, and economic growth. Prior research demonstrates that entrepreneurial activity is very sensitive to the legal environment. For instance, Fan and White (2003), and Armour and Cumming (2008) document that generous personal bankruptcy systems increase substantially the probability that an individual becomes self-employed. In light of these findings, one might be tempted to conclude that forgiving personal bankruptcy laws are a useful instrument to enhance entrepreneurial activity and thereby spur job creation and economic growth. This view has become particularly important among policy makers on both sides of the Atlantic, who have been groping toward explicit entrepreneurship policies recently as a means of promoting employment creation and economic growth (Audretsch 2007, and European Comission 2008).[1]

The above view, however, neglects the potential pervasive effects of weak bankruptcy laws on these start-ups' financing opportunities. If the start-ups that are created under generous bankruptcy laws are financially constrained, then they could start smaller and experience both slower growth rates and higher risk of failure (Cabral and Mata 2003, Evans and Jovanovic 1989, and Holtz-Eakin, Joulfaian, and Rosen 1994).

In this paper, we exploit differences in U.S. personal bankruptcy law across states and through time to analyze the effect of debtor protection on the financing structure, entry size, and survival of a representative U.S. sample of start-ups that began operations in 2004.

Debtors who file for personal bankruptcy under Chapter 7 must turn over any unsecured assets they own *above* a predetermined exemption level, while their future earnings are completely exempt from the obligation to repay, the so-called "fresh start"

[1] The European Commission adopted in 2008 the "Small Business Act," which contains ten principles aimed at improving the business environment for SMEs. The second principle clearly reveals the intention to soften bankruptcy laws, by stating that member states should "ensure that honest entrepreneurs who have faced bankruptcy quickly get a second chance."

principle. A higher exemption level provides partial wealth insurance to debtors, reducing the assets that the bank can seize in case of bankruptcy. Personal Bankruptcy Law is mandated by Federal law, and applies throughout the U.S. In 1978, Congress adopted a uniform federal bankruptcy exemption, but gave the states the right to opt out and to adopt their own exemption levels. By the beginning of the 1980s, two-thirds of the states had opted out. The wealth exemptions vary widely across states as a result, ranging from zero to unlimited.

While personal bankruptcy law was designed for consumers, it also affects unlimited liability firms (proprietorships) whose owners are legally liable for the firm's debts. Berkowitz and White (2004), and Berger, Cerqueiro, and Penas (2010) show that it also affects small limited liability firms (corporations). These studies argue that the legal form of a small firm is practically irrelevant in the context of the personal bankruptcy law for two reasons. First, lenders often require the owners of small corporations to personally guarantee their loans. Second, high exemptions may induce owners of small corporations to transfer assets from the company to themselves.

We report a number of novel findings. We analyze the financing structure of start-ups and find that high exemptions induce a substitution from bank financing towards informal sources of funds from the firm owners, family, and friends. Going from the least debtor-friendly (minimum exemption level) to the most debtor-friendly state (maximum exemption level) decreases the bank debt to total financing ratio by almost 5 percentage points. This effect is economically relevant, as the average share of bank financing in our sample is 30%.

The exemptions could affect both the demand and the supply of credit (Gropp, Scholz, and White 1997). On the one hand, wealth insurance makes risk-averse borrowers better off, increasing their demand for credit. On the other hand, banks could reduce credit supply in response to the perverse incentives induced by the exemptions (Fay, Hurst, and

White 2002). Using loan-level data, we show that the cross-sectional decrease in bank financing is partly due to a reduction in credit supply that affects all firms in states with debtor-friendly laws. However, we also find that proprietorships increase their demand for credit in debtor-friendly states, more than offsetting the negative supply effect.

Importantly, using the changes in exemptions that occurred in some states between 2004 and 2008, we show that the decrease in credit availability in high exemption states is not driven by unobserved firm or state heterogeneity. In particular, the panel analysis allows us to rule out that the documented effects on bank financing could reflect the entry of less skilled entrepreneurs who seek to take advantage of the generous bankruptcy exemptions. Consistent with the abovementioned loan-level results, we find that an increase in the exemption level is followed by a decrease in bank financing for the corporations and an increase in bank financing for the proprietorships. The finding of a differential effect between proprietorships and corporations makes it unlikely that our panel results are driven by some omitted state level factor that drives both the increase in exemptions and the change in bank financing.

Finally, we provide evidence on the real effects of the bankruptcy exemptions on start-ups. First, we show that start-ups located in high exemption states are less likely to hire employees, and that, if they do, they hire fewer employees than start-ups located in low exemption states. We argue that these results are consistent with the view that these firms find it more difficult to obtain funding. Constrained firm owners may then prefer to operate on a smaller scale, since hiring involves the commitment to pay salaries.

Second, start-ups born in high exemption states are significantly more likely to fail within their first four years of operation. Notably, we also find that states that increased their exemption values accelerated considerably the failure rate of start-ups. These results hold after controlling for changes in house prices and firm entry rates, as well as several firm and

owner characteristics. We argue that these results could reflect credit constraints preventing entrepreneurs from acquiring the capital necessary to operate the business.

The paper proceeds as follows. Section II describes the dataset and the variables used in our analysis. Section III presents the result. Section IV concludes.

II. Data description

This paper uses confidential data from the Kauffman Firm Survey (KFS). The KFS is a longitudinal survey that collected information for a sample of 4,928 start-ups that began operations in 2004 in the United States. In addition to the 2004 baseline year data, we use four years of follow up data (2005 to 2008). The KFS contains detailed information on the capital injections these firms receive at their inception and in subsequent years. The survey also provides detailed information on the firm, such as its credit history, geographic location, and industry, and on up to ten owners, such as experience, education, gender, race, and age.

We complement the KFS with state-level data collected from various sources. First, we obtain the exemption values for each state from individual state legal codes. There are two types of exemptions. The homestead exemption is the maximum home equity value that a debtor can exempt when filing for personal bankruptcy under Chapter 7. For the personal property exemption we include the following assets: jewelry, motor vehicle, cash and deposits, and a "wildcard" (an exemption that applies to any property).[2] Table 1 displays the state bankruptcy exemptions in 2004 and 2008.

We supplement these data with the following state level controls. First, we obtain from the U.S. Census Bureau the rate of unemployment and per capita GDP to control for differences in economic conditions, and the % change in the number of establishments due to

[2] The personal property exemption may include several other assets, such as the Bible, musical instruments, family portraits, burial plots, clothing, guns, pets, cattle, and food. In many states, however, the law leaves unspecified the value of some assets. Our measure of personal property exemptions comprises only assets that have specific dollar amounts in all states.

births to control for firm entry. Second, we collect from the FDIC the number of banks across different asset size categories to control for differences in the structure of the banking industry. Third, we collect average state house prices from the FHFA to control for changing conditions in the real estate markets.

Table 2 provides definitions of all variables used in this study and some summary statistics (means and standard deviations) for the 2004 baseline survey. We group our variables into four types: financing sources (expressed both in levels and as percentage of total financing), state variables, owner characteristics, and firm characteristics. Below, we describe the variables in each group.

a. Financing sources

The detailed financing information in the KFS allows us to examine how debtor protection affects the capital structure of start-ups. We split a firm's total initial financing into four separate sources: financial institutions, firm owners, other informal sources, and other formal sources.

The first source, financial institutions, comprises both personal and business loans, lines of credit, and credit cards obtained from financial institutions. For brevity, we will refer to this category as bank financing. In our sample bank financing amounts to 30% of the total initial financing and it is the most important category in terms of mean amount (more than $60,000). Our interest lies particularly in this category. Higher debtor protection could lead to moral hazard problems and opportunistic behavior on the borrower's side, thereby inducing financial institutions to reduce their credit supply *ex ante*. High exemptions could also increase the demand of credit from risk-averse borrowers. As a result, we expect bank financing to be lower in high exemption states as long as supply effects dominate demand effects.

The second source, firm owners, refers to all capital injections made by the owners of the firm, including both debt and equity. As noted in Robb and Robinson (2010), firm owners supply most of the initial funding for their businesses. In our sample, on average owners' funds amount to $58,000 and represent about 60% of the total financing obtained.

The third category, other informal sources, refers to capital injections made by non-financial entities that are related to either the firm or the owner, including loans from the owner's family (parents and spouse), friends, and employees of the firm. Informal sources of financing should especially be relevant if firm owners are unable to raise external capital and if firm owners are wealth-constrained. In our sample, the average amount of financing from these informal sources is about $37,000.

The fourth category, other formal sources, pertains to financing provided by non-financial entities that are independent from both the firm and its owners. These other formal sources include debt and equity injections by other companies, angels, venture capitalists, government, and other business loans. This is the least common source of financing in our sample, amounting on average to only 3% of total financing. However, this is a very important source of financing among those (few) firms who receive it, amounting to an average of $825,000 for this group.

b. State variables

Our main variable of interest is the state exemption value. The exemption value is the sum of the homestead exemption and the personal property exemption. For states with unlimited homestead exemptions, we assign an exemption value of $1 million. In our empirical analysis, we also use a dummy that indicates whether the firm is located in a state with high exemptions. High exemptions refer to exemptions above the 75^{th} percentile in 2004, which corresponds to a dollar amount greater than $160,000. Sixteen states have

exemption values above this threshold, and 28% of the firms in our sample are located in high exemption states.[3]

To address the concern that the states can vary systematically along other dimensions, we control for additional state-level characteristics. First, we include the rate of unemployment and the per capita GDP to control for state differences in economic conditions. Second, we control for differences in banking size structure across states with the variable *% Small banks*, which measures the percentage of state banks with asset size below $100 million. Previous research suggests that large banks could be at a disadvantage in lending to small opaque firms on a relational basis (Berger et al. 2002, and Berger et al. 2005). Third, we include state average house prices to control for differences in real estate values across states. The inclusion of the average house prices allows us to interpret the homestead exemptions in term of real amounts of debtor protection offered.[4] Fourth, when analyzing the real effects of the exemptions, we control for the % change in the number of establishments due to births. Fan and White (2003) document that higher exemption levels are associated with higher probabilities of households owning businesses. Higher entry rates could per se affect the distribution of firm size (Cabral and Mata 2003) and survival through increased firm competition and churning entry (Ramana and Nanda 2009).

[3] In unreported regressions, we also add a dummy for "low exemptions" – i.e., exemptions below the 25th percentile, in which case the base category comprises exemption levels within the interquartile range. This variable, however, turns out not be relevant in our regressions. For brevity, we report our results only with the dummy *High exemptions*. We also note that our results are qualitatively similar if we employ the actual exemption values.

[4] To illustrate this point, consider the examples of California and North Dakota. In 2004 the homestead exemption in North Dakota was $10,000 higher than in California (the exemption values are $80,000 and $70,000, respectively). However, the $10,000 difference in nominal exemption levels underestimates the effective differences of debtor protection across the two states, for real estate prices differed significantly. In fact, average real estate prices in North Dakota were about one fifth of those in California (the average house values are $109,000 and $510,000, respectively).

c. Firm characteristics

We include the firm's revenues to control for size. This variable is highly skewed and therefore we take the log of one plus total revenues expressed in thousands of dollars. We also include the commercial credit score class of the firm from Dun & Bradstreet (D&B), a categorical variable that ranges from 1 (minimum risk) to 5 (maximum risk). The credit scores are not available for about one fourth of our sample. As a result, in our regression analysis, we additionally include a dummy indicating whether the credit score is missing, in which case we impute a value of three for the credit score, the median value in our sample.

We control for the legal form of the firm with a dummy that indicates whether the firm is a proprietorship (i.e., has unlimited liability form, and therefore includes some partnerships), as opposed to a corporation (i.e., has limited liability form, which includes some partnerships, limited liability companies, and both C- and S- corporations). Finally, all regressions include nine one-digit industry dummies (not shown in the tables for brevity).

d. Owner characteristics

We include several characteristics of the firm's principal owner. For the one third of the firms in our sample with multiple owners, we designate the principal owner by largest equity share. In cases where two or more owners have similar equity shares, we identify the primary owner according to a number of other characteristics, such as the number of hours worked (see Robb and Robinson 2010 for a detailed description of this methodology).

There is ample evidence that successful entrepreneurship is largely determined by the perseverance, experience, and education of the entrepreneur (see, e.g., Sorensen and Chang 2006 for a review). Accordingly, we include a variable that measures the number of hours worked weekly, the log of the owner's age, a dummy that equals one if the owner started businesses previously in the same industry, and three dummies for the maximum level of

education attainment. The three education degrees are: high school, college (or equivalent), and graduate. The mean entrepreneur in our sample works 42 hours per week and is aged 45. Less than 20% of the entrepreneurs have previous start-up experience in the same industry, and 44% holds a college degree.

Finally, we include a dummy indicating whether the owner is from a minority group (black, Asian, or Hispanic), and a dummy indicating whether the owner is female.[5]

III. Results

a. Univariate tests: Low versus high exemption states

Table 3 reports differences of means tests between high exemption states (exemptions are higher than $160,000) and low exemption states (exemptions are lower than $160,000).

The share of bank financing, is on average 2.4 percentage points lower in high exemption states and the difference is statistically significant at the 10% level, suggesting that exemptions may reduce the availability of bank financing to start-ups.

In terms of state characteristics, GDP per capita, unemployment rates and house prices are significantly lower in high exemption states than in low exemptions states. The structure of the banking industry also differs across these states. While nearly half of the banks located in high exemption states hold assets below $100 million, low exemption states are predominantly populated by larger banks. These patterns highlight the importance in our analysis of controlling for these state-level differences to correctly identify the effect of the exemptions.

Next, we analyze differences in owner and firm characteristics between high and low exemption states. On the one hand, we suspect that average firm quality may be lower in high exemption states, since exemptions may foster the creation of marginal firms by low-

[5] Coleman and Robb (2009) and Robb et al. (2010) document large gender and race differences in the financing patterns of start-ups.

skilled individuals who have less to lose by becoming entrepreneurs. On the other hand, the previous effect may be largely offset if credit market discipline prevents these less skilled individuals from obtaining the necessary funds to start a business (Nanda 2009).

The evidence from our univariate tests is somewhat mixed. While in high exemption states owners are more likely to have a college degree than in low exemption states, the opposite is true for graduate degrees. Owners in high exemptions states are more likely to have past experience in the same industry. We consider that missing credit scores are associated with more opaque start-ups. In fact, D&B reports that occasionally it is not possible to produce a rating on a customer because enough information on that specific company is not available. Interestingly, the frequency of missing credit ratings is significantly lower in high exemptions states. Overall, these tests seem to reject the idea that less experienced entrepreneurs are more likely to operate in high exemption states. We will come back to these results in the next section.

b. Debtor protection and start-up financing sources: Multivariate analysis

There is growing evidence that a start-up's initial capitalization has long-lasting effects on its subsequent choices and performance (e.g., Cooper et al. 1994, and Farinha and Santos 2006). In Table 4 we use the baseline 2004 KFS to examine how the exemptions affect start-ups' sources of financing, while controlling for other state level variables, and for firm and owner characteristics. To this end, we estimate seemingly unrelated regression (SUR) models[6] for the three following sources of finance: loans from financial institutions (*Banks*), owner equity or debt (*Owners*), and other informal debt or equity (*Informal*). In panel A we report results for the log of one plus the level of each source.[7] In panel B, we

[6] In the appendix we provide more information about the econometric models used.

[7] We use the logarithmic transformation in order to reduce the skewness of the original financing variables. Since sometimes firms report zero amounts on some sources of financing, we add one before taking the log

express each source of financing as a percentage of the total financing obtained, so that we can analyze more closely the trade-offs between the different sources of financing. In panel B the omitted category is other formal sources of finance.

We expect exemptions to have a negative effect on the funding from financial institutions, and to induce substitution from bank financing towards more informal financing sources. Our results match both expectations. First, we find a negative and statistically significant effect of high exemptions on the level of bank financing, which is 11% lower in high exemption states (Panel A). In terms of the ratio of bank financing to total financing (Panel B), moving from a low exemption state to a high exemption state decreases this ratio by 4.5 percentage points. This effect is economically relevant, given that the average bank financing to total financing is 30%. Second, the decrease in bank financing seems to be compensated mostly by capital injections by both the owner and other informal sources. We do not find evidence of a substitution towards more formal equity financing (the omitted category), as the estimated increase of this ratio of about 0.3 percentage points in Panel B is not significant.

With respect to the control variables, we note that larger firms – measured by total revenues – have lower ratios of owner financing, which is primarily compensated by an increase in the share of bank financing (Panel B). Firms with owners that belong to a minority group depend more heavily on the owners' funds, suggesting that these companies may find it difficult to get external financing. Both education and age increase significantly the level and ratio of the owner's personal funds, while at the same time they decrease reliance on other informal sources of finance. These variables are probably capturing the higher wealth of older and more educated entrepreneurs. Finally, start-ups with worse credit ratings or missing credit ratings obtain less initial financing, and this decrease is shared

across all sources of financing shown. In relative terms, however, bank financing is the source with the strongest decline (across the three sources) in reaction to worse credit scores.

The decrease in bank financing in high exemption states that we documented is consistent with a reduction in credit supply in those states. There are, however, at least two important limitations in our analysis. First, our reduced forms are capturing only the net effect of debtor protection on bank financing. As argued in Gropp et al. (1997), bankruptcy exemptions could also affect the demand for credit, since they provide entrepreneurs with wealth insurance. If such demand effects are important, then we could be seriously underestimating the true effect of the exemptions on credit supply.

Second, another potential explanation for our results is that our explanatory variables do not properly account for differences in state, firm, or owner characteristics between high and low exemption states. For instance, our results could be simply reflecting a change in the pool of entrepreneurs instead of an actual reduction of credit availability. Specifically, it could be that high exemption states have (or attract) less skilled entrepreneurs who *ex ante* benefit more from the insurance provided by the exemptions, and that banks have proprietary information regarding entrepreneurial quality that our owner and firm control variables fail to capture. The fact that states with high exemptions might attract lower quality entrepreneurs also raises doubts regarding the exogeneity of the location of the firms that populate our sample.

We address all these issues in the next two sections.

c. Loan-level analysis: Demand versus supply

The bankruptcy exemptions should affect the supply and demand for credit (Gropp et al. 1997). On the supply side, we expect exemptions to reduce credit availability, as financial institutions protect themselves against the perverse incentives induced by debtor protection.

On the demand side, we expect that risk-averse agents will increase their demand for credit, since they become more insured against bad states of nature. The decrease in bank financing in high exemption states that we documented in Table 4 is consistent with the supply effect dominating the demand effect.

Moreover, exemptions should not affect all firms similarly. We explore whether the supply and demand effects are different for proprietorships (i.e., unlimited liability firms) firms as opposed to corporations (i.e., limited liability firms). As noted in Gropp et al. (1997), demand effects should be greatest for firm owners who have the most to gain from generous bankruptcy exemptions. All else equal, the owner of a proprietorship should benefit from high exemption levels more than a corporate owner, because while she is liable with her personal assets in low exemption states, these assets can be sheltered from creditors in bankruptcy in high exemption states. The insurance provided by the exemptions makes these risk-averse owners better off, and should increase their demand for loans. As a result, we should expect a larger demand effect for proprietorships than for the corporations.

On the supply side, although the personal bankruptcy law should only affect proprietorships, previous research (Berkowitz and White, 2004 and Berger, Cerqueiro and Penas 2010) documents that in high exemption states banks are more likely to deny loans to both types of firms. These papers argue that the corporations could be indirectly affected by the personal bankruptcy law for two reasons. First, high exemptions decrease the value of personal guarantees of firm owners. Second, banks may anticipate that owners of small corporations have greater incentives to transfer assets from the firm to themselves in high exemption states. We contend that the latter point may be of particular relevance in the context of nascent firms, where weak governance mechanisms are still likely to predominate.

To study demand and supply effects for these two groups of start-ups, we use the loan-level data, which is available only for the years 2007 and 2008.[8] We argue that the legal form at inception (i.e., 2004) is more likely to be exogenous in these regressions that use data from 2007 and 2008. In these survey years, respondents were asked whether they applied for a loan, and if yes, whether the application was accepted or rejected by the lender. Respondents were also asked whether they were discouraged from applying for loans because they feared the application would be turned down. We use these questions to build two variables that capture demand for credit (*Applied* and *Need loan*). *Applied* refers to the probability that a firm applied for a loan, while *Need loan* refers to the probability that either the firm applied for a loan or it was discouraged from doing so.[9] To capture credit supply, we use an indicator variable that equals one if the firm applied for credit but was rejected (*Denied*), and zero otherwise. [10]

In Table 5, we report estimates from logit regressions of the above proxies for demand and supply of credit. We report two specifications for each dependent variable. The first specification (in columns I, III, and V) assesses the average effect of the exemptions across all firms. In the second specification (in columns II, IV, and VI), we test whether demand and supply effects are different for proprietorships and corporations. To this end, this specification includes an interaction term of exemptions with a dummy equal to one if the firm was established as a proprietorship in 2004, and 0 otherwise.

The results in Table 5 corroborate our conjectures on both the demand and supply of credit. We find no significant effect of the exemptions on the credit demand of corporations. In contrast, proprietorships increase significantly their demand for credit in high exemption

[8] We acknowledge that 2008 was an atypical year due to the financial crisis. We reran our regressions using only the 2007 survey and obtained qualitatively similar results.

[9] Cole (2010) proposes this measure using the Surveys of Small Business Finances (SSBF). The questions that we use to build the variable *Need loan* are framed in a similar way to those asked in the SSBF.

[10] The number of observations is lower than in the loan demand regressions, because only information for firms that actually applied for a loan can be used here.

states. Specifically, high exemptions increase the likelihood that a proprietorship either applies for or needs a loan by about 6 percentage points more than a corporation.

Consistent with the previous literature (Berkowitz and White 2004 and Berger, Cerqueiro, and Penas 2010), we also find a strong negative effect of exemptions on the probability of being denied a loan, which is statistically similar for both types of firms. Moving from a low-exemption state to a high-exemption state increases the probability of being denied credit by about 11 percentage points.

d. Panel analysis

Our cross-sectional results in Table 4 suggest that there is a reduction in credit availability in high exemption states. As argued before, we cannot rule out that this result may be driven by unobservable state or firm characteristics systematically correlated to the exemptions. One intuitive source of misspecification we pointed out was that perhaps high exemptions states attract low-skilled entrepreneurs who seek to take advantage of the generous bankruptcy laws.

To address these concerns, we exploit the time-series variation of exemptions during our sample period.[11] Four states (Massachusetts, Minnesota, Nevada, and Rhode Island) experienced increases larger than $100,000 in their exemption levels, while six states (New York, New Mexico, South Carolina, Idaho, Washington, and Delaware) experienced

[11] Since these changes occurred shortly after the 2005 reform to the Personal Bankruptcy code was passed, we presume that these states sought to offset the negative consequences of the new Law on debtors. The reform to the personal Bankruptcy Code passed in 2005 made it more difficult for high-income people to file for Chapter 7 (borrowers are required to pass a means test). The objective was to prevent borrowers from abusing the bankruptcy regime and use it to clear debts they could afford to pay. Importantly for us, these changes to the personal bankruptcy law specifically exclude small business owners, as long as their debts are mainly business debts (Bankruptcy Abuse Prevention and Consumer Protection Act 2005). Therefore, while the 2005 changes in the Bankruptcy code should not affect our sample of firms, the subsequent changes in the exemption levels that some states introduced should have an effect.

increases above $50,000 and below $100,000. Other states experienced smaller increases in their exemptions levels during the sample period.[12]

We exploit these changes in a panel data model that includes both firm and time fixed effects. The dependent variable is the log of one plus the level of bank financing obtained in that year. We report two specifications in Table 6. In the first specification, we control only for (time-varying) state level variables. In the second specification, we also control for firm characteristics that change over time.[13]

Our attention lies mainly on two variables: the exemption level (measured in thousands of dollars) and the exemption level interacted with a dummy that is equal to one if the firm established as a proprietorship in 2004, 0 otherwise. As in the previous section, we argue that the legal form at inception is reasonably exogenous in this dynamic setting, and that exemptions should affect proprietorships differently than corporations. In line with our previous findings, we expect demand effects to be stronger for the proprietorships, while both types of firms should face a reduction in credit supply. If this is the case, then an increase in the exemption level should unequivocally decrease bank financing for the corporations. For the proprietorships the effect should be less negative, or even positive if the demand reaction is sufficiently strong to offset the reduction in credit supply.

The findings corroborate that high exemptions reduce credit availability for the corporations. Our estimates show that a $100,000 increase in the exemptions level is associated with a 20% decrease in the inflow of bank financing for corporations. For the proprietorships, we find a positive and significant effect, confirming our conjecture that the

[12] The states with increases above $10,000 (and below $50,000) are: Ohio, Illinois, North Carolina, Indiana, Colorado, Maine, and Nebraska. The states with increases below $10,000 are: New Jersey, Pennsylvania, Hawaii, Michigan, Connecticut, Arkansas, Kentucky, Oregon, and District of Columbia

[13] Each year there is some loss in sample size because some firm owners either cannot be located, refuse to respond to the follow-up survey wave, or stop operations. The KFS dataset contains response-adjusted weights that were designed to minimize potential non-response bias in the estimates (see DesRoches et al. 2010 for methodological details in the KFS).

positive demand effect of exemptions is larger for the proprietorships. The estimates indicate that a $100,000 increase in the exemption level is associated with an increase in the level of bank financing of 17%.[14] In terms of the control variables, we find that increases in size measured by revenues increase bank financing, and that the deterioration of credit ratings decrease bank financing. Both results are consistent with the cross-sectional findings of Table 4.

We note that our empirical strategy resembles a difference-in-differences model that provides a tighter test of the effect of the exemptions. In particular, the finding of a differential effect between the two types of firms, that is consistent with our findings from the loan-level analysis, eliminates the possibility that what might be driving the panel results is some omitted state level factor that drives both the increase in exemptions as well as the change in bank financing.

Overall, these results confirm that the exemptions have a strong effect on the demand for credit from proprietorships. Moreover, these results corroborate that one of the channels through which the exemptions affect bank financing is credit availability.

e. Initial size and survival

There is strong evidence that the starting conditions of start-ups, in particular initial size, are key determinants of entrepreneurial success (Farinha and Santos, 2006, and Geroski, Mata and Portugal, 2010). Provided that high exemptions reduce credit availability, we should expect start-ups in high exemption states to start smaller. We would also expect these smaller start-ups to be more likely to fail, as they may not achieve the minimum efficient

[14] We note that in the cross-sectional analysis for the year 2004 (Table 3) we obtain qualitatively similar results when we interact the exemption level with the unlimited liability dummy. Strong endogeneity concerns – i.e., the fact that firms choose their legal form in 2004 – led us not to report these results. However, in unreported regressions we found a strong negative effect of exemptions on bank financing for the corporations (i.e., supply effect dominates demand effect) and no significant effect for proprietorships (i.e., demand effect offsets the supply effect).

scale (Audretsch and Mahmood, 1994), or as they may be in a weaker position to face temporary difficulties vis-à-vis competitors with better access to funds (Zingales, 1998). We therefore test whether exemptions affect initial firm size and firm survival.

As in Cabral and Mata (2003) and Kerr and Nanda (2009), we measure firm size with the number of employees (excluding the firm owner). In our sample, almost 60% of the startups have zero employees and almost 90% have less than five employees. For this reason, we analyze the effect of exemptions on both the likelihood of hiring and on the number of employees. The decision to hire employees involves the permanent commitment of funds to pay salaries. Consequently, we expect entrepreneurs who find it difficult to obtain credit to be more reluctant to hire employees and therefore to operate on a smaller scale. Consistent with this view, in Column I of Table 7 we show that in high exemptions states, the likelihood that companies will hire employees falls almost six percentage points.[15] This effect is both statistically and economically significant. Column II reports the regression results of the effect of exemptions on the number of employees. We find that in high exemption states the number of employees decreases by 8 percent.

We note that in these regressions we control for firm entry at the state level. Consequently, it is unlikely that our results are due to the increased entry of smaller firms in high exemption states (Fan and White 2003).

In Table 8 we analyze the effect of debtor protection on the survival of start-ups.[16] We estimate Cox proportional regression models using data from all survey waves (2004-2008). The dependent variable is the hazard rate, which measures the probability that the

[15] Strong endogeneity concerns led us to drop in these regressions the other firm-level variables (i.e., revenues, credit score, credit score, credit score missing, and proprietorship). However, our results are not altered significantly by the inclusion of these explanatory variables.

[16] We define a failing firm as one that reports to be no longer in business. Some firms drop out of the sample because firm owners either cannot be located or refuse to respond to the survey. These firms are not used in estimation, but the sample weights are adjusted to account for the non-response bias (DesRoches et al. 2010).

firm exits at time *t*, given that it survived until *t-1*. The average firm failure rate in our sample is about 10.9% per year. However, simple univariate comparisons show that this figure hides an interesting disparity across different exemption levels. While the average firm failure rate is 10.4% in states with low exemptions (i.e., lower than $160,000), it ascends to 12.3% in states with high exemption (i.e., higher than $160,000).

We employ three specifications to analyze firm survival. The first specification includes only the state variables.[17] The second specification adds the lagged firm characteristics, and the third specification further includes all owner characteristics, measured at the time of the firm's inception. The main independent variables are the level of exemptions in 2004, and the change in the exemptions lagged one year.

In all models, the exemption level at the firm's birth (i.e., in 2004) decreases the probability of survival. The estimated effects are statistically significant and economically relevant. Remarkably, not only the cross-sectional differences between states matter for survival, but also the increase in the exemption level within a state is significant. Specifically, states that increased exemptions accelerated considerably the failure rate of the pool of start-ups that began operations in 2004 in those states, and that were still active when the increase in exemptions occurred. Moreover, the economic magnitude of the effect is substantial: a $100,000 increase in the exemption level increases the failure rate by 31% (specification III). This means that a $100,000 increase in the exemption level raises the probability of firm failure from approximately 10% to 13%.

[17] We allow the exemption level at the firm's inception and subsequent increases in exemptions to have independent effects on firm survival (see, e.g., Geroski et al. 2010). To properly identify the effects of the exemptions, we also decompose the variables *House prices* and *Entry* into initial levels and subsequent changes. We need to control for house prices in order to obtain the real effects of the exemptions, while controlling for firm entry addresses the potential negative impact of higher establishment entry rates on these start-ups' survival chances. We note that our conclusions do not change when we decompose all time-varying variables into initial levels and subsequent changes.

Our survival analysis uncovers at least two other interesting findings among our state control variables. First, states with sharper declines in real estate markets experienced subsequently a larger increase in start-up failure rates. Second, higher establishment entry rates also decreases these start-ups' survival chances, which probably reflects an increase in competition in both product and resource markets.

With respect to the remaining control variables, our findings generally corroborate the evidence of previous studies. Firms experiencing either high growth (in terms of revenues) or an improvement in their credit scores experience lower failure rates. We also confirm that human capital is an important determinant of firm survival. Specifically, we find that start-ups founded by more educated owners, and owners who put more effort in terms of working hours are more likely to survive.

Overall, our findings suggest that the smaller start-up size and higher failure rates in high exemption states reflect credit constraints preventing entrepreneurs from acquiring the capital necessary to operate the business.

IV. Conclusions

We exploit both cross-sectional and times series changes in U.S. state exemption levels to analyze the effect of debtor protection on a start-up's initial financing sources. We find that the equilibrium level of formal debt falls in high exemption states, and that this decrease in the share of debt financing is compensated by an increase in informal sources, such as funds from the firm owners, family, and friends. We also find that higher exemptions are associated with smaller initial size and higher probabilities of failure. We analyze two possible driving forces of our results. The first one is a reduction in the supply of credit that more than compensates an increase in the demand for credit, as exemptions could reduce lenders' willingness to lend to small firms, but also may increase the demand for credit from risk-averse borrowers. The second mechanism at work could be a pool effect, as adverse

selection could attract low-skilled entrepreneurs to high exemption states. Our evidence strongly points to a reduction in credit availability as the main driver of our results. Finally, we find that while exemptions negatively affect the supply of credit for both unlimited liability and limited liability start-ups, exemptions positively affect the demand of credit only from unlimited liability start-ups.

References

Armour, John and Douglas Cumming (2008). "Bankruptcy Law and Entrepreneurship," *American Law and Economics Review*, 10, 303-350.

Audretsch, David and Talat Mahmood (1994). "The Rate of Hazard Confronting New Firms and Plants in U.S. Manufacturing," *Review of Industrial Organization*, 9, 41–56.

Audretsch, David (2007). "Entrepreneurship Capital and Economic Growth," *Oxford Review of Economic Policy*, 23(1), pp.63–78.

Berger, Allen and Greg Udell (2002), "Small Business Credit Availability and Relationship Lending: The Importance of Bank Organizational Structure", *Economic Journal*, 112(477), F32-F53.

Berger, Allen, Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, Jeremy C. Stein (2002), "Does Function Follow Organizational Form? Evidence From the Lending Practices of Large and Small Banks," *Journal of Financial Economics* 76(2), 237-269

Berger, Allen, Geraldo Cerqueiro, and Fabiana Penas (2010). "Does Debtor Protection really Protect Debtors? Evidence from the Small Business Credit Market," Working paper.

Berkowitz, Jeremy and Michelle White (2004). "Bankruptcy and Small Firms' Access to Credit," *Rand Journal of Economics*, 35, 69-84.

Blau, David (1987). "A Time Series Analysis of Self Employment in the United States," *Journal of Political Economy*, 95, 445–467.

Cabral, Luís and José Mata (2003). "On the Evolution of the Firm Size Distribution," *American Economic Review*, 93, 1075-1090.

Cameron, Colin and Pravin Trivedi (2005). "Microeconometrics: Methods and Applications," Cambridge University Press.

Cole, Rebel (2010). "Who Needs Credit and Who Gets Credit? Evidence from the Surveys of Small Business Finances," working paper.

Coleman, Susan and Alicia Robb (2009) "A Comparison of New Firm Financing by Gender: Evidence from the Kauffman Firm Survey Data," *Small Business Economics*, 33, 397-411.

Cooper, Arnold, F. Javier Gimeno-Gascon, and Carlyn Woo (1994). "Initial Human and Financial Capital as Predictors of New Venture Performance," Journal of Business Venturing 9, 371-395.

Cox, David (1972). "Regression Models and Life Tables". *Journal of the Royal Statistical Society Series B*, 34, 187–220.

Da Rin, Marco, Giovanna Nicodano, and Alessandro Sembenelli (2006). "Public Policy and the Creation of Active Venture Capital Markets," *Journal of Public Economics*, 80, 1699-723.

DesRoches, David, Frank Potter, Betsy Santos, and Zhanyun Zhao (2010). "Kauffman Firm Survey (KFS) Fourth Follow Up Methodology Report."

European Commission (2008). "Small Business Act," COM(2008) 394 final.

Evans, David and Boyan Jovanovic (1989). "Estimates of a Model of Entrepreneurial Choice under Liquidity Constraints," *Journal of Political Economy*, 97, 657–674.

Farinha, Luísa, and João Santos (2006) "The Survival of Start-Ups: Do Their Funding Choices and Bank Relationships at Birth Matter?," working paper.

Fan, Wei, and Michelle White (2003). "Personal Bankruptcy and the Level of Entrepreneurial Activity," *Journal of Law and Economics*, 46, 543-68.

Fay, Scott, Erik Hurst, and Michelle White (2002). "The Household Bankruptcy Decision," *American Economic Review*, 92, 706-718.

Geroski, Paul, José Mata, and Pedro Portugal (2010). "Founding Conditions and the Survival of New Firms," *Strategic Management Journal*, 31, 510-529.

Gropp, Reint, John Scholz, and Michelle White (1997). "Personal Bankruptcy and Credit Supply and Demand," *Quarterly Journal of Economics*, 112, 217-251.

Kerr, William, and Ramana Nanda (2009). "Democratizing Entry: Banking Deregulations, Financing Constraints, and Entrepreneurship," *Journal of Financial Economics* 94, 124-149.

Lin, Emily, and Michelle White (2001). "Bankruptcy and the Market for Mortgage and Home Improvement Loans," *Journal of Urban Economics*, 50, 138-162.

Nanda, Ramana (2009). "Entrepreneurship and the Discipline of External Finance," working paper.

Robb, Alicia, Robert Fairlie and David Robinson (2009). "Race and Financial Capital in Business Startups: Evidence from the Kauffman Firm Survey," Working paper.

Robb, Alicia and David Robinson (2010). "The Capital Structure Decisions of New Firms," working paper.

Shane, Scott (2008). "The Illusions of Entrepreneurship, the Costly Myths That Entrepreneurs, Investors, and Policy Makers Live by," Yale University Press.

Sorensen, Jesper and Patricia Chang (2006). "The Determinants of Successful Entrepreneurship: A Review of the Recent Literature", working paper.

Wooldridge, Jeffrey (2002) "Econometric Analysis of Cross Section and Panel Data," MIT Press.

Zingales, Luigi (1998). “Survival of the Fittest or the Fattest? Exit and Financing in the Trucking Industry,” *Journal of Finance*, 53, 905-938.

Table 1 – Bankruptcy exemptions by state in 2004 and 2008

The table displays the dollar amounts of homestead and personal property exemptions for each state in 2004 and 2008. We obtain the exemptions from individual state legal codes. [F] indicates that the Federal exemption was selected and [D] indicates that the exemption was doubled. In some states married couples are allowed to double the amount of the exemptions when filing for bankruptcy together (called "doubling"). We have doubled all amounts except in those cases where bankruptcy law explicitly prohibits "doubling."

State	Exemptions in 2004 ($)		Exemptions in 2008 ($)	
	Homestead	Personal property	Homestead	Personal property
Alabama [D]	10,000	6,000	10,000	6,000
Alaska	67,500	13,500	70,200	14,040
Arizona	150,000	10,300	150,000	10,300
Arkansas	unlimited	2,900	unlimited	2,900
California [D]	75,000	16,450	75,000	16,450
Colorado [D]	90,000	8,000	120,000	14,000
Connecticut [D]	150,000	5,000	150,000	9,000
D.C. [F, D]	36,900	12,000	40,400	11,300
Delaware	0	5,000	50,000	40,000
Florida	unlimited	4,000	unlimited	4,000
Georgia [D]	20,000	9,200	20,000	9,200
Hawaii [F, D]	36,900	12,000	40,400	11,300
Idaho	50,000	9,600	100,000	13,600
Illinois [D]	15,000	6,400	30,000	12,800
Indiana [D]	10,000	0	30,000	16,600
Iowa	unlimited	10,200	unlimited	20,000
Kansas	unlimited	42,000	unlimited	42,000
Kentucky [D]	36,900	12,000	40,400	11,300
Louisiana	25,000	15,000	25,000	15,000
Maine [D]	70,000	12,300	95,000	12,300
Maryland	0	22,000	0	22,000
Massachusetts	500,000	2,650	500,000	2,650
Michigan [F, D]	36,900	12,000	40,400	11,300
Minnesota	200,000	4,000	300,000	8,400
Mississippi [D]	150,000	20,000	150,000	20,000
Missouri	15,000	9,500	15,000	9,500
Montana [D]	200,000	14,000	500,000	14,000
Nebraska	12,500	4,800	60,000	4,800
Nevada	200,000	40,000	550,000	42,000
New Hampshire [D]	200,000	16,000	200,000	16,000
New Jersey [F, D]	36,900	12,000	40,400	11,300
New Mexico [D]	60,000	14,000	120,000	14,000
New York [D]	20,000	4,800	100,000	4,800
North Carolina [D]	20,000	4,000	37,000	8,000
North Dakota	80,000	7,400	80,000	7,400
Ohio [D]	10,000	4,400	40,400	12,100
Oklahoma	unlimited	6,000	unlimited	15,000
Oregon [D]	33,000	22,800	36,900	23,700
Pennsylvania [F, D]	36,900	12,000	40,400	11,300
Rhode Island	200,000	22,000	300,000	38,000
South Carolina [F, D]	36,900	12,000	100,000	12,000
South Dakota	unlimited	10,000	unlimited	10,000
Tennessee [D]	7,500	8,000	7,500	8,000
Texas	unlimited	60,000	unlimited	60,000
Utah [D]	40,000	5,000	40,000	5,000
Vermont [D]	150,000	14,800	150,000	14,800
Virginia [D]	10,000	10,000	10,000	10,000
Washington	40,000	11,000	125,000	11,000
West Virginia [D]	50,000	8,400	50,000	8,400
Wisconsin	40,000	14,400	40,000	14,400
Wyoming [D]	20,000	4,800	20,000	4,800

Table 2 – Variable definitions and summary statistics

The table defines all variables and displays summary statistics – means and standard deviations (S.d.). The dataset is the 2004 Kauffman Firm Survey (KFS). The number of observations is 4,914. All statistics take into account the 2004 KFS sample weights.

Variable	Description	Mean	S.d.
Financing sources(levels)			
Financial institutions	Total financing from financial institutions ($000)	61.43	535.55
Firm owners	Total financing from the firm's owners ($000)	58.09	1110.22
Other informal sources	Total financing from family, friends, and employees ($000)	36.98	1565.57
Other formal sources	Total financing from external, non-financial sources ($000)	53.49	1238.35
Financing sources(shares)			
Financial institutions	Share of total financing from financial institutions (in %)	29.48	35.94
Firm owners	Share of total financing from the firm's owners (in %)	59.63	38.99
Other informal sources	Share of total financing from family, friends, and employees (in %)	7.79	20.64
Other formal sources	Share of total financing from external, non-financial sources (in %)	3.11	13.89
State variables			
High exemptions	= 1 if state exemptions ≥$160,000; = 0, otherwise	0.27	0.44
House prices	Average house prices ($000)	243.35	119.62
Unemployment rate	Rate of unemployment (in %)	5.32	0.85
GDP	Per capita GDP ($000)	36.24	6.09
% Small banks	Fraction of banks in state with asset size below $100 million	0.38	0.16
Entry rate	% change in the number of establishments due to births (lagged)	11.66	1.47
Firm characteristics			
Revenues	Total revenues ($000)	148.97	2169.62
Credit risk	Credit score rank: ranges from 1 (minimum risk) to 5 (maximum risk)	3.33	0.68
Credit risk missing	= 1 if credit score is missing; = 0, otherwise	0.25	0.43
Proprietorship	= 1 if firm has unlimited liability form; = 0, otherwise	0.40	0.49
Employees	Number of employees	1.87	5.84
Owner characteristics			
Hours worked	Number of hours worked weekly by the owner	42.28	24.08
Age	Age of the owner (in years)	44.75	10.77
Previous experience	= 1 if owner started other businesses in the same industry; = 0, otherwise	0.19	0.39
High school degree	= 1 if highest level of education is a high school degree; = 0, otherwise	0.35	0.48
College degree	= 1 if highest level of education is a college degree; = 0, otherwise	0.44	0.50
Graduate degree	= 1 if highest level of education is a graduate degree; = 0, otherwise	0.18	0.38
Female	= 1 if owner is female; = 0, otherwise	0.30	0.46
Minority	= 1 if owner is non-white; = 0, otherwise	0.17	0.38

Table 3 – Univariate tests: Low versus high exemption states

High exemptions refer to exemptions above $160,000 (the 75th percentile in 2004) and low exemptions refer to exemptions below this threshold. All variables are defined in Table 1. The dataset is the 2004 Kauffman Firm Survey (KFS). All statistics take into account the 2004 KFS sample weights. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Low exemptions		**High exemptions**		**High - Low**	
	Mean	**S.d.**	**Mean**	**S.d.**	**Difference**	**t-stat**
Financing sources (levels)						
Financial institutions ($000)	55.49	528.31	77.38	554.39	21.89	1.12
Firm owners ($000)	62.95	1297.46	45.03	152.31	-17.92	-1.00
Other informal sources ($000)	65.84	1444.06	20.37	227.98	-45.47	-1.62
Other formal sources ($000)	46.06	1833.77	12.61	68.84	-33.45	-0.89
Financing sources (shares)						
Financial institutions (%)	30.14	36.11	27.74	35.45	-2.40*	-1.72
Firm owners (%)	59.17	39.03	60.81	38.88	1.64	1.07
Other informal sources (%)	3.06	13.85	3.23	14.00	0.17	0.31
Other formal sources (%)	7.62	20.38	8.21	21.31	0.59	0.70
State variables						
House prices	259.15	128.66	200.96	76.29	-58.19***	-16.43
Unemployment rate	5.45	0.84	4.97	0.75	-0.47***	-16.62
GDP	36.92	6.44	34.42	4.55	-2.50***	-13.00
% Small banks	0.34	0.13	0.48	0.18	0.45***	22.92
Entry rate (%)	11.32	1.47	12.60	1.97	1.28***	18.88
Firm characteristics						
Revenues	151.14	2461.48	143.13	1040.52	-8.01	-0.19
Credit risk	3.32	0.67	3.36	0.71	0.04	1.50
Credit risk missing	0.26	0.44	0.22	0.41	-0.04**	-2.44
Proprietorship	0.40	0.49	0.38	0.48	-0.03	-1.59
Employees	1.87	5.87	1.86	5.77	-0.01	-0.06
Owner characteristics						
Hours worked	41.81	23.95	43.52	24.36	1.70*	1.90
Age	44.60	10.73	45.15	10.85	0.55	1.37
Previous experience	0.17	0.38	0.22	0.41	0.05***	3.08
High school degree	0.35	0.48	0.36	0.48	0.00	0.18
College degree	0.44	0.50	0.47	0.50	0.03*	1.85
Graduate degree	0.19	0.39	0.15	0.36	-0.03***	-2.60
Female	0.31	0.46	0.29	0.45	-0.02	-1.06
Minority	0.19	0.39	0.14	0.35	-0.04***	-3.28
Number of observations	3,614		1,300			

Table 4 –Debtor protection and start-up financing sources

The table lists the coefficients from SUR regressions of total financing obtained from: Financial intermediaries (Banks), firm owners (Owners), and other informal sources (Informal). In Panel A the dependent variables are expressed in levels (log of one plus the financing amount in $000s). In Panel B the dependent variables are expressed as percentages of total financing obtained. The omitted category is the share of total financing obtained from other external, non-financial sources. The model also includes (estimates not shown) industry dummies. All variables are defined in Table 2. The dataset is the 2004 Kauffman Firm Survey (KFS). The number of observations is 4,914 in Panel A and 4,380 in Panel B. All statistics take into account the 2004 KFS sample weights. Robust t-statistics are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	(A) Levels			(B) Ratios		
	Banks	**Owners**	**Informal**	**Banks**	**Owners**	**Informal**
State variables						
High exemptions	-0.11*	0.11*	0.12***	-4.55***	2.68*	1.62**
	(-1.68)	(1.82)	(2.74)	(-3.28)	(1.80)	(2.05)
House prices	0.000037	0.00093***	0.00035*	-0.014**	0.0019	0.0073**
	(0.13)	(3.66)	(1.82)	(-2.37)	(0.30)	(2.14)
Unemployment rate	0.023	0.027	0.038*	0.076	-0.81	0.52
	(0.71)	(0.94)	(1.73)	(0.11)	(-1.11)	(1.34)
GDP	-0.011**	-0.0036	0.0021	-0.19*	0.21*	-0.030
	(-2.23)	(-0.83)	(0.62)	(-1.88)	(1.96)	(-0.52)
% Small banks	0.39*	0.033	-0.16	4.55	-4.64	-0.77
	(1.90)	(0.18)	(-1.20)	(1.09)	(-1.03)	(-0.32)
Firm characteristics						
Revenues (log of 1 +)	0.14***	0.086***	0.026***	1.42***	-1.84***	0.058
	(11.2)	(7.83)	(3.03)	(5.46)	(-6.57)	(0.39)
Credit risk	-0.20***	-0.14***	-0.087***	-0.42	2.20**	-1.13**
	(-4.98)	(-3.78)	(-3.16)	(-0.50)	(2.41)	(-2.33)
Credit risk missing	-0.15**	-0.16***	-0.047	1.29	0.16	-0.37
	(-2.36)	(-2.97)	(-1.10)	(0.97)	(0.11)	(-0.49)
Proprietorship	-0.47***	-0.69***	-0.15***	0.093	2.62**	0.27
	(-8.39)	(-14.2)	(-3.93)	(0.080)	(2.09)	(0.41)
Owner characteristics						
Hours worked	0.0094***	0.013***	0.0078***	0.046*	-0.13***	0.092***
	(8.17)	(13.2)	(10.2)	(1.94)	(-5.24)	(6.77)
Age (log of)	0.35***	0.66***	-0.31***	-0.28	6.65***	-8.93***
	(3.25)	(7.06)	(-4.30)	(-0.13)	(2.78)	(-7.03)
Previous experience	0.031	0.048	-0.066	0.70	-1.50	-1.00
	(0.45)	(0.81)	(-1.45)	(0.50)	(-1.00)	(-1.25)
High school degree	-0.12	0.13	-0.18	-7.45**	13.6***	-7.82***
	(-0.70)	(0.88)	(-1.55)	(-2.12)	(3.58)	(-3.88)
College degree	-0.097	0.24	-0.21*	-7.33**	15.9***	-9.21***
	(-0.57)	(1.64)	(-1.89)	(-2.09)	(4.20)	(-4.59)
Graduate degree	0.096	0.31**	-0.055	-5.25	11.8***	-8.35***
	(0.54)	(1.99)	(-0.46)	(-1.42)	(2.97)	(-3.96)
Female	0.0064	-0.051	0.032	1.22	-0.75	0.37
	(0.11)	(-1.02)	(0.83)	(1.02)	(-0.58)	(0.55)
Minority	-0.17**	-0.038	0.094**	-6.35***	3.57**	2.89***
	(-2.36)	(-0.61)	(1.99)	(-4.33)	(2.26)	(3.45)
Constant	0.86	-0.83*	1.43***	51.3***	10.0	45.9***
	(1.56)	(-1.74)	(3.90)	(4.52)	(0.82)	(7.07)
Number of observations	4,914	4,914	4,914	4,380	4,380	4,380
R-squared	0.118	0.161	0.059	0.035	0.051	0.044

Table 5 –Loan-level analysis: Demand versus supply

The table lists the coefficients from logit regressions of *Applied* (whether or not the firm applied for bank loans), *Needed loan* (whether or not the firm applied for a bank loan or reported that it did not apply for fear of being turned down), and *Denied* (whether or not the applicant was always denied credit). The model also includes (estimates not shown) industry dummies. The variables reported are defined in Table 2. The dataset comprises the 2007 and 2008 Kauffman Firm Survey (KFS). All statistics take into account the 2007 KFS sample weights. Robust t-statistics (clustered at the state level) are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	Demand				Supply	
	Applied		Needed loan		Denied	
	(I)	(II)	(III)	(IV)	(V)	(VI)
State variables						
High exemptions	-0.17	-0.32	0.11*	-0.022	1.05***	0.81
	(-0.97)	(-1.45)	(1.67)	(-0.27)	(2.59)	(1.63)
High exemptions × Proprietorship		0.58*		0.36**		0.75
		(1.90)		(2.42)		(0.86)
House prices	0.0017***	0.0019***	0.00095**	0.0011**	0.0030	0.0033
	(3.23)	(3.53)	(2.12)	(2.23)	(1.56)	(1.62)
Unemployment rate	0.018	0.023	0.039	0.042	-0.044	-0.041
	(0.46)	(0.59)	(1.13)	(1.20)	(-0.32)	(-0.31)
GDP	-0.0038	-0.0048	0.00089	0.00021	0.039	0.039
	(-0.48)	(-0.62)	(0.20)	(0.047)	(0.97)	(0.95)
% Small banks	0.73*	0.73*	0.016	0.0072	-0.71	-0.54
	(1.76)	(1.78)	(0.051)	(0.022)	(-0.64)	(-0.49)
Firm characteristics						
Revenues (log of 1 +)	0.21***	0.21***	0.074***	0.073***	0.081	0.082
	(7.38)	(7.31)	(3.14)	(3.02)	(0.68)	(0.73)
Credit risk	-0.18***	-0.18***	0.13**	0.13**	0.24	0.25
	(-2.85)	(-2.84)	(2.50)	(2.48)	(1.26)	(1.31)
Credit risk missing	0.16	0.15	0.31***	0.30***	0.34	0.26
	(0.88)	(0.83)	(2.75)	(2.72)	(0.86)	(0.68)
Proprietorship	-0.72***	-0.88***	-0.32***	-0.42***	-0.053	-0.32
	(-5.11)	(-5.92)	(-3.54)	(-3.76)	(-0.12)	(-0.46)
Owner characteristics						
Hours worked	0.0069***	0.0070***	0.013***	0.013***	0.011*	0.011*
	(2.89)	(2.96)	(7.35)	(7.40)	(1.76)	(1.82)
Age (log of)	-0.49*	-0.51**	-0.57***	-0.58***	0.069	0.092
	(-1.92)	(-1.99)	(-2.88)	(-2.97)	(0.12)	(0.17)
Previous experience	0.31***	0.32***	0.23	0.23	-0.46	-0.45
	(2.71)	(2.75)	(1.56)	(1.57)	(-0.89)	(-0.84)
High school degree	1.10	1.06	-0.15	-0.17	-1.91**	-1.79**
	(1.54)	(1.51)	(-0.43)	(-0.50)	(-2.29)	(-2.12)
College degree	1.06	1.01	-0.30	-0.32	-1.63**	-1.52**
	(1.49)	(1.47)	(-0.85)	(-0.92)	(-2.12)	(-1.97)
Graduate degree	1.08	1.02	-0.39	-0.41	-1.04	-0.92
	(1.45)	(1.42)	(-0.99)	(-1.06)	(-1.27)	(-1.12)
Female	0.036	0.048	0.19**	0.20**	0.87**	0.85**
	(0.26)	(0.36)	(1.96)	(2.06)	(2.34)	(2.32)
Minority	-0.37*	-0.38*	0.27***	0.26***	0.68	0.69
	(-1.84)	(-1.90)	(2.73)	(2.69)	(1.58)	(1.57)
Constant	-2.11**	-1.96*	-0.38	-0.27	-22.0	-22.2
	(-1.98)	(-1.88)	(-0.40)	(-0.29)	(N/A)	(N/A)
Number of observations	5,018	5,018	5,018	5,018	640	640
Pseudo R-squared	0.087	0.089	0.052	0.053	0.17	0.17

Table 6 –Debtor protection and bank financing: Panel analysis

The dependent variable is the yearly inflow of bank financing (measured as the log of one plus the amount in $000s). The dataset comprises the 2004, 2005, 2006, 2007, and 2008 Kauffman Firm Survey (KFS). All statistics take into account the KFS longitudinal sample weights. Robust t-statistics are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	(I)	(II)
State variables		
Exemptions ($000)	-0.00079	-0.0020**
	(-1.18)	(-2.32)
Exemptions × Proprietorship ($000)		0.0037***
		(3.31)
House prices	0.00081	0.00061
	(1.33)	(1.00)
Unemployment rate	0.045	0.043
	(1.43)	(1.39)
GDP	0.040*	0.037*
	(1.95)	(1.78)
Firm characteristics		
Revenues (log of 1 +)	0.12***	0.12***
	(10.6)	(10.5)
Credit risk	-0.055**	-0.055**
	(-2.37)	(-2.40)
Credit risk missing	-0.061	-0.064
	(-1.47)	(-1.53)
Constant	-0.28	-4.25
	(-0.32)	(-0.99)
Number of firms	3,419	3,419
Observations	17,095	17,095
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
R-squared	0.253	0.254

Table 7 – Debtor protection and start-up size

Column I lists the coefficients from a logit regression of the probability that the start-up hires employees and Column II lists the coefficients of a regression with the log of one plus the number of employees at start as the dependent variable. The model also includes (estimates not shown) industry dummies. All variables are defined in Table 2. The dataset is the 2004 Kauffman Firm Survey (KFS). The number of observations is 4,810. All statistics take into account the 2004 KFS sample weights. Robust t-statistics (clustered at the state level) are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	**(I) Prob(hire)**	**(II) Nr. Employees**
State variables		
High exemptions	-0.26***	-0.080**
	(-3.22)	(-2.47)
House prices	-0.00071**	-0.00031***
	(-2.41)	(-2.80)
Unemployment rate	-0.012	-0.012
	(-0.30)	(-0.95)
GDP	-0.0036	-0.0017
	(-0.74)	(-0.93)
% Small banks	0.26	0.032
	(1.16)	(0.32)
Entry rate	0.036*	0.015*
	(1.71)	(1.97)
Owner characteristics		
Hours worked	0.019***	0.0075***
	(12.5)	(12.3)
Age (log of)	0.14	0.12**
	(0.86)	(2.15)
Previous experience	0.16**	0.18***
	(1.99)	(5.33)
High school degree	-0.014	-0.035
	(-0.057)	(-0.36)
College degree	0.16	0.060
	(0.67)	(0.59)
Graduate degree	0.43*	0.12
	(1.69)	(1.22)
Female	-0.25**	-0.11***
	(-2.34)	(-3.36)
Minority	0.017	0.015
	(0.17)	(0.36)
Constant	-1.81**	-0.22
	(-2.01)	(-0.77)
Pseudo R-squared	0.048	0.082

Table 8 –Debtor protection and firm survival

The table lists the coefficients from a Cox proportional-hazard regression model. The dependent variable measures the hazard rate (the probability that the firm exits at time *t*, given that it survived until *t-1*). The symbol Δ refers to the yearly change in the respective explanatory variable. The model also includes (estimates not shown) industry dummies. The dataset comprises the 2004, 2005, 2006, 2007, and 2008 Kauffman Firm Survey (KFS). The number of observations is 11,689. All statistics take into account the KFS longitudinal sample weights. Robust t-statistics (clustered at the state level) are provided in parentheses. The symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Variable	(I)	(II)	(III)
State variables			
Exemptions in 2004 (in $000)	0.00026**	0.00029**	0.00032***
	(2.47)	(2.50)	(3.82)
Δ Exemptions (lagged)	0.0026***	0.0026***	0.0027***
	(3.45)	(2.58)	(2.63)
House prices in 2004	0.00056*	0.00079**	0.00082**
	(1.87)	(2.47)	(2.53)
Δ House prices (lagged)	-0.0032*	-0.0032*	-0.0032*
	(-1.89)	(-1.82)	(-1.81)
Unemployment rate (lagged)	0.030	0.011	0.015
	(0.95)	(0.34)	(0.45)
GDP (lagged)	0.0023	-0.0010	-0.000063
	(0.41)	(-0.19)	(-0.011)
% Small banks in 2004	0.031	0.084	0.12
	(0.12)	(0.31)	(0.44)
Entry rate in 2004	0.00067	-0.0014	-0.0082
	(0.026)	(-0.052)	(-0.30)
Δ Entry rate (lagged)	0.16*	0.18**	0.19**
	(1.81)	(2.03)	(2.08)
Firm characteristics			
Revenues (log of 1 +) (lagged)		-0.089***	-0.075***
		(-6.58)	(-5.50)
Credit risk (lagged)		0.23***	0.22***
		(5.36)	(4.92)
Credit risk missing (lagged)		0.0090	0.0073
		(0.069)	(0.054)
Proprietorship (2004)		-0.12**	-0.19***
		(-2.23)	(-3.58)
Owner characteristics(2004)			
Hours worked			-0.0031**
			(-2.11)
Age (log of)			-0.15
			(-1.07)
Previous experience			-0.17*
			(-1.66)
High school degree			-0.45*
			(-1.80)
College degree			-0.63**
			(-2.37)
Graduate degree			-0.74***
			(-2.88)
Female			0.16**
			(2.07)
Minority			0.076
			(1.00)

Appendix

The appendix briefly describes the econometric methodologies used in this paper. We refer to textbooks in micro-econometrics (e.g., Cameron and Trivedi 2005, and Wooldridge 2002), and the references therein for a more complete exposition.

Seemingly unrelated regression (SUR)

We model the four sources of firm financing described in Table 2 in a system of equations:

$$y_{1i} = \alpha_1 + x_i'\beta_1 + \varepsilon_{1i,} \quad (1)$$

$$y_{2i} = \alpha_2 + x_i'\beta_2 + \varepsilon_{2i}, \quad (2)$$

$$y_{3i} = \alpha_3 + x_i'\beta_3 + \varepsilon_{3i}, \quad (3)$$

$$y_{4i} = \alpha_4 + x_i'\beta_4 + \varepsilon_{4i}. \quad (4)$$

The subscript *i* refers to the unit of observation (firm), ε is an error term, and *x* is the vector of explanatory variables that we implicitly assumed to be common to all equations. The left-hand side variables correspond to the four financing sources considered (banks, owners, other informal sources, and other formal sources). We consider two alternative specifications. In the first, we model the levels of the financing variables (Panel A of Table 4). In the second, we scale each financing source by the total financing amount. This imposes the restriction that the four ratios on the left-hand side add to one, and therefore we have to omit one of the equations above. We choose to omit the category "other formal sources of financing". The parameters in the omitted equation say (4), can be calculated by difference, i.e.: $\beta_4 = 1 - \beta_1 - \beta_2 - \beta_3$

Although the OLS estimator applied separately to each equation is consistent, it is not efficient, because it disregards the correlation across different equations for the same individual. The SUR model permits nonzero covariance between the error terms. In particular, for equations k and l, with $k \neq l$: $cov(\varepsilon_{ki}, \varepsilon_{li,}) = \sigma_{ij}$. We estimate the SUR model via feasible GLS.

Duration model

We use duration analysis to study the process of firm failure. This methodology is preferred to binary choice models, because it properly accommodates right censoring, i.e., the fact that at the end of the sample some firms are still active. We employ the following discrete semi parametric proportional hazard model:

$$\log h(t|x_0, \Delta x) = h_0(t) + \beta_1 E_0 + \beta_2 \Delta E_{t-1} + x_0' \theta_1 + z_{t-1}' \theta_2 \qquad (5)$$

The dependent variable is the logarithm of the hazard rate, i.e., the log of the probability that a firm exits at time *t* given that it survived until *t-1*. The term $h_0(t)$ is the baseline hazard and it captures aggregate variations in failure rates. The regression coefficients $(\beta_1,\ \beta_2,\ \theta_1,\ \theta_2)$ measure the semi-elasticity of the hazard rate with respect to the respective variable. There are three groups of explanatory variables. *E* is state exemption variable (our variable of interest). We separate the effect on firm survival of the exemption level at the firm's inception (measured at time zero) from the effect of subsequent changes in the exemptions (which we lag one period). We separate the remaining variables into two groups: *x* refers to a vector of time-invariant control variables (e.g., owner characteristics) that are set to their initial values; z refers to vector control variables that vary over time (e.g., credit scores). We lag all dynamic variables one year to avoid reverse causality problems.

We estimate the relationship between the hazard rate and the explanatory variables using the partial likelihood method proposed by Cox (1972).