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# When Do Firms Risk Shift? Evidence from Venture Capital\*

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## **Abstract**

This dissertation studies the agency costs of debt and the role of risk shifting as firms face financial distress. I use the Small Business Investment Company (SBIC) program, which provides participating venture capital funds with debt financing from the U.S. government, as a novel setting to evaluate the importance of these costs. I find that managers of distressed funds invest in firms with lower credit scores, sales, employment and patenting activity. Distressed funds reallocate capital to riskier firms in their portfolio, rather than searching for new investments. Equityholders respond positively to riskier investments for distressed funds and debtholder losses increase.

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# Executive Summary

A substantial body of literature studies the agency costs of debt. Theory suggests that managers shift to riskier investments as distress increases, transferring wealth from bondholders to equityholders (Jensen and Meckling (1976)). However, certain economic mechanisms limit the extent of these agency costs in debt markets. Covenants in debt contracts often explicitly or indirectly control managerial actions when a firm becomes distressed (Smith and Warner (1979)). Further, bankruptcy costs and changes in the cost of capital prevent firms from excessive risk-taking (Andrade and Kaplan (1998)). Lastly, reputation — both from repeated interactions with debt markets (Diamond (1989)) and career concerns of managers (Fama (1980)) — discourages risk shifting by managers.

Yet it remains an empirical challenge to identify the impact of incentive conflicts between bondholders and equityholders on managerial risk-taking. First, debt contracts may develop endogenously to curb these agency costs. Second, previous studies on risk shifting focus on settings where covenants, market-determined cost of capital and reputation concerns are present, and find that distressed firms invest in less risky projects (Rauh (2009) and Gilje (2016)). Third, it is often difficult to observe individual investment decisions by managers. Common risk proxies are frequently either at the firm level or based on a model. Fourth, adjustment and transaction costs reduce the ability of managers to alter investment policies in large, industrial firms.

In this paper, I focus on a unique setting that mitigates these identification concerns. The venture capital (VC) industry was born in 1946 with the creation of the American Research and Development Corporation and the first VC partnership was founded in 1958 (Lerner (2009)). In this same year, the U.S. Congress passed the Small Business Investment Act of 1958. This law established the Small Business Investment Company (SBIC) program, which is operated by the Small Business Administration (SBA). With the goal of stimulating entrepreneurship through the venture capital market, this program provides debt financing to licensed venture capital funds. The government offers VC funds about two dollars in capital for every dollar invested by the fund (Dilger (2013)). The SBIC program continues to be active with more than 300 current licensed venture capital funds and over \$13.7 billion

in committed government capital.

Based on several of the program’s features, it presents a novel setting to evaluate the agency costs of debt. First, participating venture capital funds are largely unrestricted in their investment decisions, reflecting a lack of covenants in government debt. Second, the program offers debt financing at a slight premium to the 10-year Treasury Note, which is a relatively low cost of capital. This rate does not change if a fund becomes financially distressed. Third, reputation concerns are largely muted since the government is the bondholder. Lastly, leverage is received before the investment decisions of managers. This alleviates the potential for renegotiation if a fund becomes distressed.

Through a Freedom of Information Act (FOIA) request, I identify every venture capital fund active in the program since January 1, 1976. There are three main types of SBIC funds: leveraged, non-leveraged and specialized. Leveraged funds receive government capital as debt financing. Non-leveraged funds, which are often owned by banks, do not receive capital from the government. These types of SBICs are used by certain institutions to satisfy regulatory requirements (e.g., Community Reinvestment Act) or to increase their equity investments (e.g., exemptions in the Dodd-Frank Act). Specialized SBICs are restricted to invest only in companies with “social or economic disadvantages.”

I manually link venture capital investments to funds participating in the SBIC program. The FOIA request provides the exact dates of entry and exit from the program. I match 500 SBIC funds and 22,789 rounds of financing. The average fund size is \$62.0 million and 27.6% of investments are in the first round. To measure the riskiness of fund investments, I incorporate data on the portfolio company’s credit score, sales and employment growth, patenting activity prior to investment and the type of investment, such as equity. Since the cost of capital offered by the government is below the risk-adjusted rate of return for the venture capital market (Kaplan and Schoar (2005)), this suggests that funds will request the maximum amount of debt available, which leads to a debt-to-asset ratio of about two-thirds.<sup>1</sup> Therefore, I focus on funds participating in the program and receiving leverage.

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<sup>1</sup>The vast majority of capital is provided to leveraged funds. The maximum leverage is currently \$150 million and only higher for special exceptions. Historically, the amount of leverage has changed based on revisions to the Small Business Investment Act of 1958. Conversations with program employees and a former administrator of the program confirm that SBIC funds tend to receive the maximum amount of debt.

Table 1: Small Business Investment Company (SBIC) Program

Number of Licenses Issued by Type				
Years	Leveraged	Bank-Owned or		Total
		Non-Leveraged	Specialized	
1976 – 1980	140	33	98	271
1981 – 1985	122	63	70	255
1986 – 1990	43	32	35	110
1991 – 1995	61	13	6	80
1996 – 2000	171	43	2	216
2001 – 2005	152	12	0	164
2006 – 2010	56	9	0	65
2011 – 2015	105	20	0	125
Total	850	225	211	1,286

Table 1 details the licensing activity of the SBIC program since 1976. Over the past 40 years, more than 1,200 venture capital funds have participated in the program and 850 participants received government leverage. SBIC funds represent a non-trivial portion of the venture capital market. Since its inception to the end of 2015, there have been 5,210 venture capital funds in the U.S. (National Venture Capital Association (2016)). Program participants represent 24.7% of these funds, of which 66.1% receive government debt.

I identify the effect of financial distress on managerial risk-taking by using a difference-in-differences framework. Since funds participating in the program tend to withdraw the maximum amount of debt financing, I focus on variation in the financial distress of funds by exploiting the design of the program. In particular, SBIC funds are transferred to the Office of Liquidation when their capital is below a specific threshold or for regulatory violations. This transfer appears to be unanticipated by funds and, on average, a fund continues to operate and invest for the following seven years. I include fund and industry fixed effects in the specification to absorb time-invariant unobserved heterogeneity across funds and industries, in addition to year fixed effects to account for time-varying differences in risk-taking. This setting compares the average change in risk-taking by managers at funds in financial distress relative to the average change in risk-taking at funds that remain solvent.

I find that managers of distressed funds take on riskier investments. The first two measures of risk are credit scores and the credit risk class of the portfolio company. Investments

by distressed funds are related to a 10.2% decrease in credit scores relative to one standard deviation and are 26.4% more likely to be a high credit risk, relative to the sample mean. Next, I examine sales and employee growth in the previous year, which focus on a firm's performance in the prior year. Investments at distressed funds are associated with lower sales growth of 26.4% and employee growth of 22.6%. This is a decrease of 16.4% and 18.9% of one standard deviation in sales and employee growth, respectively. These effects are economically meaningful and statistically significant. I additionally measure risk using the patenting activity of a portfolio company prior to receiving an investment from a venture capital fund. Venture capital funds often invest in innovative firms with high potential patenting activity and there is arguably greater uncertainty for those firms with fewer patents (Lerner, Sorensen and Strömberg (2011)). I find that funds in distress invest in portfolio companies with lower prior patenting activity. The decrease of 0.17 patents is a 24.6% decline relative to the sample mean. Lastly, funds may alter the types of investments that they use when in distress. In particular, managers may adjust their portfolio by shifting towards relatively riskier investments, which could provide higher returns in certain states of the world. I find that distressed firms are 6.6% more likely to use equity investments in distress, which is a 22.0% increase relative to the sample mean. Absent mechanisms that prevent modifications to investment policy when in distress, these results provide evidence that managers at distressed funds invest in riskier firms.

The identifying assumption for the difference-in-differences approach is the parallel trends assumption. This assumption presumes that, if distress did not occur, the change in risk-taking by managers of distressed funds would not be different than the change in risk-taking by solvent funds. A concern in this setting could be that managers might anticipate distress and adjust their investment behavior prior to being transferred to the Office of Liquidation. As a falsification test, I study the risk-taking behavior of distressed funds just prior to becoming distressed. In the two years prior to being transferred, I find that managers do not invest in riskier companies. The estimates are negligible and statistically insignificant for each measure of risk-taking for the two years directly before distress, while the magnitudes and significance during periods of distress remain quite similar. This supports

the validity of the identification assumption for this specification.

An additional concern might be that managers of distressed funds diversify their portfolio by investing in different industries relative to their current holdings. If the investments in these industries are riskier, then an alternative interpretation of the findings is that managers are attempting to increase the diversification of investments in their portfolio, rather than risk shifting. To address this concern, I construct a measure of diversification based on the Herfindahl-Hirschman Index of a fund's investment by industry. I find that the results are largely unchanged when accounting for the diversification of a fund's investments.

One further issue might be that, if funds participating in the SBIC program and private venture capital funds respond similarly in distress, then riskier investments by SBIC funds are not necessarily driven by their relatively high leverage. To address this concern, I construct a sample of venture capital firms with both SBIC and private funds. This test holds constant unobserved differences between venture capital firms and compares how distressed funds in the SBIC program respond relative to private funds in distress at the same firm. I find that increased risk-taking is driven by distressed funds participating in the SBIC program. Across each measure of risk, I report similar estimates in terms of statistical significance and economic magnitude.

Next, I study how managers adjust their portfolios when the incentive to risk shift increases. Venture capital funds often provide financing to firms in their portfolio through multiple rounds. For several reasons, it might be less costly for distressed funds to allocate capital to firms currently in their portfolio, instead of searching for new investments. First, search costs might be relatively high for new portfolio companies, particularly during financial distress. Second, capital adjustment costs could be lower for existing investments, since contracts are in place at these firms. Third, it could be costly for funds to liquidate positions in firms currently in their portfolio (Nadauld et al. (2017)) and redeploy the capital to new investments. I find that managers tend to reallocate their portfolios to riskier companies already in their holdings, rather than seeking out new investments. Using a panel of annual fund observations, I find that distressed funds are 11.8% to 13.0% more likely to invest in post-first round financings. Similarly, funds in distress are 2.4% to 4.2% more likely to al-

locate capital to companies already in their portfolio on a quarterly basis. The results for risk shifting remain quite similar to the baseline estimates when the initial round financing for funds in distress are excluded from the sample. This suggests that managers reallocate their portfolio to riskier investments through post-first round financings.

Lastly, I study the value effects of risk shifting for equityholders and debtholders. Theories of risk shifting predict that it increases the value of equity, while decreasing the value of debt. Since equity for venture capital funds is commonly raised privately, it is often difficult to observe return data, especially over short, well-defined intervals. However, publicly-traded venture capital funds raise capital through public, rather than private, equity. This type of firm is referred to as a business development company (BDC). I estimate the change in returns in a narrow window around investment dates, which helps to disentangle the effect of distress from risk shifting. I find that equityholders respond positively to decisions by managers of distressed funds to risk shift, with an average increase of 2.4% to 4.3%. This result implies that riskier investments for distressed funds increase the value of equity. Further, I study the loss to the government for the funds participating in the program. I find that funds in distress lose an average of \$2.5 to \$8.0 million. Taken together, this provides evidence that risk shifting is beneficial to equityholders at the expense of debtholders, consistent with theories of risk shifting.

This paper contributes to the literature on risk shifting and the agency costs of debt. A longstanding stream of theoretical articles predicts that managers invest in riskier projects as a firm becomes distressed (Modigliani and Miller (1958), Fama and Miller (1972), Jensen and Meckling (1976), Stiglitz and Weiss (1981) and Acharya and Viswanathan (2011)). The extant empirical literature on risk-shifting incentives has primarily documented that firms near bankruptcy undertake more conservative investments. Firms in financial distress during the 1980s did not take on particularly risky investments or acquisitions (Andrade and Kaplan (1998)), while studies of pension plans (Rauh (2009)) and oil and gas producers (Gilje (2016)) provide evidence that managers of distressed firms select less risky investments. Model-based simulations of equityholder-debtholder conflicts suggest that these agency costs do not have a first-order effect on capital structure decisions for firms with low leverage, though these

costs grow as leverage and the size of the project increase (Parrino and Weisbach (1999)).

The literature documenting evidence of risk shifting is comparatively smaller. This paper suggests that economic mechanisms, such as covenants, market-based interest rates and reputation, place limits on the incentive and ability of managers to invest in riskier projects. Two case-based studies report evidence of risk shifting at thrift banks (Esty (1997)) and a large subprime mortgage lender (Landier, Sraer and Thesmar (2015)). Using a real-options framework, equity volatility is positively related to investment for distressed firms and investments by these firms are less valuable as uncertainty increases (Eisdorfer (2008)). Additionally, managers are less likely to invest in riskier projects when their fiduciary duty requires them to consider the interests of debtholders (Becker and Strömberg (2012)).

This paper offers insight into the design of government programs that aim to stimulate entrepreneurial activity. Many countries have programs tasked with these goals and provide capital directly to startups or invest through venture capital funds (Lerner (2009)). Yet it remains a relatively open question about the role of government intervention in the venture capital market (Gompers and Lerner (2001), Gompers (2007) and Da Rin, Hellmann and Puri (2013) survey the growing literature on venture capital). An early article on the SBIC program offers summary statistics and argues against it (Widicus (1966)). Existing cross-country evidence documents a positive association between venture capital funds using both government and private capital and successfully exiting their investments (Brander, Du and Hellmann (2015)). Direct investment by governments in startups increases the chance of future funding for awardees and boosts their innovative activity (Howell (2017)). This study aims to provide important policy implications regarding the design of the SBIC program, about which relatively little is known.

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