Capital Structure and Moral Hazard within Entrepreneurial Firms

Yan Wu*

April 3, 2008

Abstract

This paper tests agency theory using unique entrepreneurial effort and financing choices data. Focusing on entrepreneurs as a special type of agent, the paper develops a modified principal-agent model within a private firm setting. In line with the typical agency theory prediction, this model suggests that the severity of entrepreneur moral hazard relates to the firm's capital structure. Specially, the model predicts that the entrepreneurial effort is negatively related to equity and debt financing, and higher firm risk leads to greater entrepreneurial effort reductions. Accounting for both observable and unobservable firm and entrepreneur heterogeneities, empirical tests find supportive evidence for all these predictions.

*Assistant Professor, School of Business & Economics, Wilfrid Laurier University, Waterloo, Ontario, N2L 3C5. Phone: 519-884-0710 ext. 2925. Fax: 519-888-1015. E-mail:wwu@wlu.ca. The author gratefully acknowledges that financial support for this research was received from a grant partly funded by WLU operating funds and partly by the SSHRC institutional Grant awarded to WLU.

Capital Structure and Moral Hazard within Entrepreneurial Firms

Abstract

This paper tests agency theory using unique entrepreneurial effort and financing choices data. Focusing on entrepreneurs as a special type of agent, the paper develops a modified principal-agent model within a private firm setting. In line with the typical agency theory prediction, this model suggests that the severity of entrepreneur moral hazard relates to the firm's capital structure. Specially, the model predicts that the entrepreneurial effort is negatively related to equity and debt financing, and higher firm risk leads to greater entrepreneurial effort reductions. Accounting for both observable and unobservable firm and entrepreneur heterogeneities, empirical tests find supportive evidence for all these predictions.

1 Introduction

Moral hazard arises when actions taken by a manager remain largely unobservable by shareholders, producing different results for the manager as compared to shareholders of a company. The moral hazard conflict exists insofar as the manager does not own the company entirely. One solution that might mitigate the moral hazard problem and motivate managers to conduct more responsible action is to grant these company leaders equity-based compensation contracts. A substantial body of theoretical work shows that such solutions can be effective mechanisms in aligning managerial incentives with those of shareholders (e.g., Jensen and Meckling (1976), and Haugen and Senbet (1981)).

Despite the theoretical assertion that equity-based compensation contracts reduce moral hazard, there exists little direct empirical evidence. The reason for this is clear: the lack of easy external observation of the public firm's managerial behavior presents a barrier to empirical verification of this prediction. Instead, existing empirical studies focus on testing how managerial compensation influences firm performance, which is a joint test of two separate hypothesis. First, the compensation contract increases managerial effort. Second, managerial actions improve firm performance. The empirical evidence is mixed for this joint hypothesis. Demsetz and Lehn (1985) find no significant relationship between ownership concentration and accounting profit rates. McConnell and Servaes (1990), however, find a significant positive relation between firm performance and the fraction of managerial equity ownership. Himmelberg et al. (1999) conclude that managerial ownership does not affect firm performance after controlling for both observed firm characteristics and firm fixed effects.

This paper is one of the very few that performs alternative direct tests of the agency theory using private firm data. The only other research I am aware of in the same vein is Bitler et al.'s seminal paper of 2005. As suggested by their work, studying the agency problem in a private firm setting not only overcomes the data availability problem, but the data also appears more relevant. In this case, an entrepreneur is likely to exert a stronger influence on the performance of the firm, and the agency problem might be worse in those firms because of weaker corporate control systems.

I develop a principal-agent model in an entrepreneurial setting where a risk-averse entrepreneur manages the company under consideration. Because an entrepreneur acts as a special manager,

whose compensation equals his share of the company's net income, the size of the entrepreneur's compensation depends directly on the company's financing choices. Much like the typical agency theory results, the entrepreneurial moral hazard problem relates to entrepreneurial compensation through the firm's financing decisions. Bitler et al. (2005) model and test the moral hazard problem assuming the entrepreneurs under consideration only use equity financing. My model extends their study by allowing the entrepreneur to use both debt and equity financing. As suggested by empirical data, debt is the primary source of outside financing for small businesses and it provides the benefit of reducing exposure to idiosyncratic risk.

My model yields three empirical predictions regarding the interaction between capital structure and moral hazard. First, higher equity financing exacerbates moral hazard. This is consistent with Jensen and Meckling (1976) and Bitler et al. (2005). For an entrepreneur, higher equity financing means lower retained ownership and, consistent to the agency theory prediction, this leads to more severe agency problems. Second, debt financing exacerbates moral hazard. This implication can be explained by the economic principle that a rational person behaves to equal the marginal cost and benefit of his action. In this model, debt reduces the entrepreneur's share of the marginal benefit of effort because debt holders reap part of the benefit as effort reduces default risk of debt. Corresponding with the lower marginal benefit, the entrepreneur selects the effort level with lower marginal cost. Assuming that marginal cost of effort increases with effort, the entrepreneur exerts less effort. Third, higher firm risk leads to greater entrepreneurial effort reductions with respect to debt. The reasoning here follows from the last prediction. Because debt in firms with higher risk has higher default possibilities, debt holders of these companies receive more benefit from entrepreneurial effort. Hence, the entrepreneur's share of the marginal benefit of effort is even lower, further reducing the entrepreneur's effort to reduce marginal cost.

I test these model predictions using entrepreneurial effort, firm financing choice and performance data from the U.S. Survey of Consumer Finances (1989-2004). The empirical results confirm the model predictions. The empirical analysis reveals that effort is positively related to the proportion of company shares retained by the entrepreneur, and negatively related to the size of business debt. Moreover, effort improves firm performance, measured by the profit-to-equity ratio. These findings provide direct empirical evidence for the vast theoretical literature that proposes the use of compensation contract in order to curtail the moral hazard problem.

The remainder of the paper is organized as follows: Section 2 describes the model and derives its

equilibrium, Section 3 develops the hypotheses, Section 4 describes the data and its characteristics, Section 5 presents the empirical results, and Section 6 concludes.

2 The Model

The basic set-up of the model is as follows. Assume a risk-averse entrepreneur undertakes an investment project with initial investment X_0. For simplicity, normalize X_0 to unity. The entrepreneur has outside wealth, denoted W_0, which he can use to finance an investment project or put toward personal consumption. The entrepreneur can also finance the investment project by choosing capital structure (D, s), where D is the face value of debt and s is the fraction of equity retained by the entrepreneur. The rest of the company's equity, $1 - s$, is sold to outside investors who receive $1 - s$ fraction of the company's profit after the investment outcome is realized.

Assume that the financial market is composed of a large number of risk-neutral individuals acting to maximize value and pricing the debt and equity fairly. The lender earns the risk-free interest rate r_b. The debt interest rate r_d satisfies the fair pricing condition

$$\int_0^{r_d D} y f(y) dy + \int_{r_d D}^{\infty} r_d D f(y) dy = r_b D$$

where y is the investment outcome; y is assumed to follow normal distribution $y \sim N(E(A)+\rho, \sigma^2)$, while ρ is the effort chosen by the entrepreneur, and σ is the project's risk. Outside investors expect the effort level to be ρ^e and pay an amount $(1 - s)(E(A) + \rho^e)$ for their shares.

The entrepreneur will make effort choices in order to maximize his expected utilities, given by the negative exponential utility function

$$\max_{\rho} E(U) = -\frac{1}{a} e^{-a(W - k\rho^2)} \tag{1}$$

where

$$W = s \max[0, y - r_d D] + D + W_0 + (1 - s)(E(A) + \rho^e) - X_0$$

is the expected wealth of the entrepreneur. Here a is the degree of risk-averseness, and a higher value indicates the manager is more risk-averse; $k\rho^2$ is the cost of effort to the entrepreneur.

The expected utility can be written as

$$\begin{aligned} E(U) &= -\frac{1}{a}e^{(ak\rho^2-aW_1)}e^{-as\max[0,y-r_dD]} \\ &= -\frac{1}{a}e^{(ak\rho^2-aW_1)}\{\int_{y\geq r_dD} e^{-as(y-r_dD)}f(y)dy + \int_{y<r_dD} f(y)dy\} \end{aligned} \tag{2}$$

where f represents the density function, and define $W_1 = D + W_0 + (1-s)(E(A)+\rho^e) - X_0$ to simplify the equation.

Applying the technique of variable substitutions, equation (2) can be evaluated as

$$E(U) = -\frac{1}{a}e^{(ak\rho^2-aW_1)}\{e^B\phi(\Delta - as\sigma) + \phi(-\Delta)\} \tag{3}$$

where $\phi(.)$ represents the cumulative distribution function of the standard normal distribution.

$$\Delta = \frac{E(A)+\rho-r_dD}{\sigma}$$

is the default margin of debt divided by variance, and

$$B = -as\sigma\Delta + \frac{1}{2}a^2\sigma^2s^2$$

is defined to simplify the equation.

The optimal level of effort conditional on the debt and equity financing decision satisfies the following first-order condition:

$$\frac{\partial EU}{\partial \rho} = 0 \tag{4}$$

Differentiate (3) partially with respect to ρ and set the equation equal to zero. This determines the optimal effort satisfing the following implicit relation,

$$\rho^* = \frac{se^B\phi(\Delta - as\sigma)}{2k[e^B\phi(\Delta - as\sigma) + \phi(-\Delta)]} \tag{5}$$

From equation (5), testable empirical predictions on the relationship between effort and financing choices can be derived.

3 Hypotheses

Due to the complexity of equation (5), the properties of optimal effort must be analyzed numerically. I first choose a set of baseline parameter values and solve ρ. In turn, ρ is solved across parameter variations in the level of debt ratio D, the ownership share s, and risk σ. In setting these parameters, I examine the implication of the model for the representative entrepreneur. For this reason, I choose a reasonable range of parameters according to findings in the existing empirical research. The standard deviation of the annual stock return for a publicly-traded U.S. firm is around 50%, according to Campbell et al. (2001), so I choose $\sigma = 50\%$ as the baseline value and allow it to vary between 40% and 60%. Data from the Survey of Small Business Finance (SSBF) shows that the median ratio of debt-to-book assets for an entrepreneur is 0.335 (Heaton and Lucas (2004)), so I choose 35% as the baseline debt ratio and assume it to vary between 10% and 60%. The majority of entrepreneurs in my empirical sample own on average 85% of shares in the firm, so I set baseline share ownership at 85%, permitting it to vary between 50 and 100%. There is very little guidance on how to decide the relative sizes of a, k and $E(A)$: a is positive for a risk-averse person, so this baseline can be set at $a = 3$. I set the baseline $k = 1$ and $E(A) = 2$. Table 1 reports the optimum effort when s and D vary between the selected range.[1]

Based on the numerical solutions, the model generates the following predictions.

Prediction 1: Entrepreneurial effort, ρ, is negatively related to equity financing.

The premise for this prediction is straightforward, consistent with that of agency theory. With higher retained ownership shares, s, the entrepreneur reaps a greater share in the benefit of effort, so reducing the agency problem and increasing the unobservable effort. Effort increases with retained ownership share s and decreases with equity financing $1 - s$.

Prediction 2: Entrepreneurial effort, ρ, is negatively related to debt financing.

The grounds for this prediction stand as follows: the entrepreneur chooses optimum effort according to the economic principle that the marginal benefit of effort equals to its marginal cost. Without debt, the entrepreneur gets all the marginal benefit of effort. With debt, however, the entrepreneur only enjoys part of the marginal benefit of effort. Debt holders get the rest because

[1] I report only part of the numerical results due to limitations of space. I have done various numerical exercises with different sets of parameters and the results with all remain robust.

Table 1: Optimum Effort Under Different Financing Choices

s	ρ	$\frac{\Delta\rho}{\Delta s}$	D	ρ	$\frac{\Delta\rho}{\Delta D}$
55%	0.2746	0.498	15%	0.3748	-0.002
60%	0.2995	0.498	20%	0.3747	-0.002
65%	0.3244	0.498	25%	0.3746	-0.002
70%	0.3493	0.498	30%	0.3744	-0.004
75%	0.3742	0.498	35%	0.3742	-0.004
80%	0.3991	0.498	40%	0.3739	-0.006
85%	0.4239	0.496	45%	0.3735	-0.008
90%	0.4487	0.496	50%	0.3729	-0.012
95%	0.4735	0.496	55%	0.3722	-0.014
100%	0.4983	0.496	60%	0.3713	-0.018

Note: This table reports the numerical solution of optimum effort and the rates of change in effort under different s and D. The baseline parameter values are $a = 3,\ E(A) = 2,\ D = 35\%,\ s = 85\%,\ \sigma = 50\%$, and $k = 1$. Columns 2 and 5 are solutions of optimum effort. Columns 3 and 6 are the rates of change calculated using Columns 2 and 5. The sign of $\frac{\Delta\rho}{\Delta s}$ is positive, which indicates that effort is positively related to s. The sign of $\frac{\Delta\rho}{\Delta D}$ is negative, which implies that effort is negatively related to D. I have done various numerical exercises with different sets of parameters, for which the results are all robust.

effort reduces the default probability of firm debt. Evidently, higher debt financing implies lower marginal benefit of effort for the entrepreneur. At the equilibrium, the entrepreneur appears only willing to spend lower marginal cost for his effort. In this case, assuming that the marginal cost of effort is increasing, lower effort will be selected by the entrepreneur. This prediction stays consistent with the agency theory. Under higher debt financing, the entrepreneur reaps only some of the fruits of his labour, reducing his motivation to exert further effort: ρ thus decreases with D.

Furthermore, we know that the default possibility of debt is higher if the firm operation is at greater risk. When firm risk increases, debt holders receive more marginal benefit from entrepreneurial effort. Hence the equilibrium effort may decrease even further with respect to debt financing under higher firm risk. Hence, another testable prediction is,

Prediction 3: Higher risk may exacerbate the negative effect of debt financing on effort.

To investigate this hypothesis, I solve the equilibrium effort under different levels of debt financing and risk. The partial derivative of effort with respect to debt, $\frac{\Delta\rho}{\Delta D}$, is then calculated under different σ. The numerical results are reported in Table 2 and plotted in Figure 1. Figure 1 shows that $\frac{\Delta\rho}{\Delta D}$ indeed becomes more negative under greater risk.

Prediction 4: Entrepreneurial effort improves firm performance.

This prediction addresses the relationship between entrepreneurial effort and firm performance. This is an important underlying assumption for agency theory models. However, due to the lack of open observation of firm managerial effort data, this hypothesis can only be tested indirectly in the literature. Most existing empirical studies (Demsetz and Lehn (1985), McConnell and Servaes (1990) and Himmelberg et al. (1999)) test the influence of compensation on firm performance. As of yet, the evidence supporting this prediction has been varied. The Survey of Consumer Finances provides valuable and yet unconsidered data on the weekly working hours of entrepreneurs in the United States. Applying this data as an approximation of entrepreneurial effort, the above prediction can be tested directly.

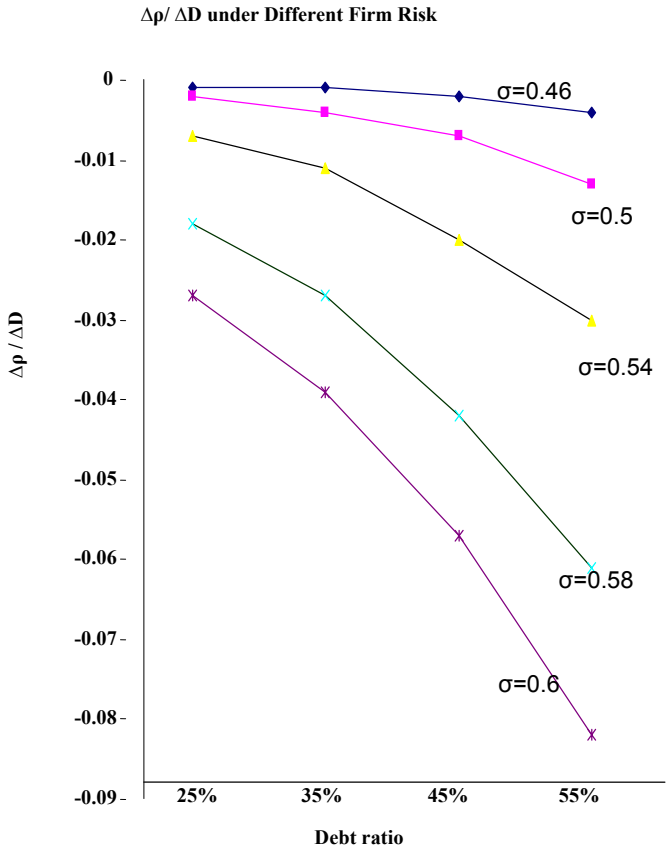

Figure 1: The partial derivative of effort with respect to debt, $\frac{\Delta \rho}{\Delta D}$, becomes steadily more negative under higher risk.

Table 2: The Partial Derivative of Effort to Debt

σ	ρ ($D=25\%$)	$\frac{\Delta\rho}{\Delta D}$	ρ ($D=35\%$)	$\frac{\Delta\rho}{\Delta D}$	ρ ($D=45\%$)	$\frac{\Delta\rho}{\Delta D}$	ρ ($D=55\%$)	$\frac{\Delta\rho}{\Delta D}$
0.46	0.3749	-0.001	0.3748	-0.001	0.3746	-0.002	0.3742	-0.004
0.5	0.3746	-0.002	0.3742	-0.004	0.3735	-0.007	0.3722	-0.013
0.54	0.3734	-0.007	0.3723	-0.011	0.3703	-0.02	0.3673	-0.03
0.58	0.3704	-0.018	0.3677	-0.027	0.3635	-0.042	0.3574	-0.061
0.6	0.3677	-0.027	0.3638	-0.039	0.3581	-0.057	0.3499	-0.082

Note: This table reports the equilibrium effort under different debt financing, D, and risk, σ. The rates of change of effort with respect to debt, $\frac{\Delta\rho}{\Delta D}$, are calculated under different σ. The numbers in Columns 3, 5, 7 and 9 show that $\frac{\Delta\rho}{\Delta D}$ becomes more negative under higher σ. This leads to Prediction 3, that higher risk may exacerbate the negative effect of debt financing on effort.

4 Data and Summary Statistics

The private firm data used in this study draws on the Survey of Consumer Finances (SCF) from the years 1989, 1992, 1995, 1998, 2001, and 2004. A triennial survey of American households conducted by the Federal Reserve Board and the U.S. Department of Treasury, the SCF provides detailed information on household assets, liabilities, income, use of financial instruments, employment, and demographic characteristics. Considered reliable, the survey data has been used by many researchers to analyze household savings, portfolios, borrowing and liquidity constraints and wealth inequalities in the United States (For e.g., Canner et al. (1995), Starr-McCluer (1996), and Kennickell et al. (2000)). Each survey samples about 4000 families; the total number of the families surveyed from 1989 to 2004 rests at 24,624. For the purpose of my study, I have selected households that report owning private equity in a firm in which they have an active management interest. Excluded, however, are those households which acquired equity ownership by joining a firm or becoming a partner. The entrepreneur sample contains 5,364 observations, which is about 21.8% of the total SCF respondents. A notable feature of the SCF is that the surveys tend to oversample relatively wealthy households. In order to achieve a more accurate representation of the broader population, I use the sampling weights provided by the Federal Reserve Board to

correct this bias.

To focus the empirical analysis on the most relevant survey group, I further restrict my sample using the following criteria. First, the entrepreneurs in my study identify as no older than 75 years with both positive net worth and work hours. Second, the business shows positive sales and equity values. Third, I exclude a small number of firms with equity worth $100 million or more as the industry information for these companies remains unavailable. Lastly, to reduce the influence of outliers, the data is Windsorized by dropping the top and bottom 2 percent of real annual sales. The final sample used in the empirical analysis contains 4338 observations. Table 3 presents summary statistics of these observations.

The mean of ownership shares reads 85.5%; the median is 100% because ownership in entrepreneurial business is typically highly concentrated, with entrepreneurs holding on average more than 80% of the firm's equity. For the business debt and debt-to-equity ratio variables, two sets of values are reported. Since only 1169 observations show positive business debt, the median, and the 25^{th} and 75^{th} percentiles of the two variables remain entirely zero. For business debt, the means stands at 57.1 thousand, while that for debt-to-equity ratio is 16.7%. To better reflect the distribution of these two variables, the summary statistics for the observations with positive business debt are included. The mean business debt and debt-to-equity ratio for the subsample are 260.5 thousand and 75.8% respectively. As in Bitler et al. (2005), weekly working hours are defined as those spent at the person's main job if this job is considered as self-employment, or hours worked at the person's second job, if first job is not self-employment but the second is. The working hour data lends credible measurement of work time as it is self-reported and unobservable to outside investors. On average, entrepreneurs work 45.3 hours per week at their own business, with the 25^{th} percentiles working 30 hours and the 75^{th} percentiles working up to 60 hours.

I include a wide variety of variables to control for heterogeneity in the characteristics of the entrepreneurs. Namely, these variables include entrepreneur age, years of education and experience, gender, ethnicity and household net worth. Entrepreneur age and education are provided directly by the survey: the average entrepreneur in my sample is 46.9 years old with 14 years of education. The experience variable is defined as the number of years a person has worked full-time, including self-employment, since 18 years of age. The average experience in the sample is 22.5 years. For the gender variable, I have selected the gender of the household member working the greatest number of hours for the business. Most often, these are men, at 84.9% of the sample. In terms of ethnicity,

Table 3: Summary Statistics

Survey of Consumer Finances Selected Entrepreneur Sample (1989-2004)							
Variable	Mean	Median	25%	75%	Min	Max	Std. Dev.
Ownership share(%)	85.5	100	85	100	0.5	100	26.1
Business debt($,000)	57.1	0	0	0	0	200,000	624.7
Debt-to-equity(%)	16.7	0	0	0	0	14431.9	257
Business debt($,000)(debt>0)	260.5	40	13	102	1	200,000	1315
Debt-to-equity(%)(debt>0)	75.8	23.3	8.3	58.3	0	14431.9	545.2
Effort(weekly hours)	45.3	48	30	60	1	148	20.7
Equity($,000)	703.4	98	26.5	308.4	0.3	100,000	3106
Profits($,000)	161	22	5.9	78.4	-1,000	100,000	1045.9
Sales($,000)	1003	90	27	321	1.5	150,000	5295.7
No. of employees	10.5	3	1	6	1	5000	48.3
Firm age	11.5	8	4	17	0	63	10.1
Age of entrepreneur	46.9	46	38	55	20	75	11.6
Experience(years)	22.5	22	14	32	0	61	13.1
Net Worth($,000)	774.3	297.5	111.1	717.8	0.2	325,000	2,391.8
Education(years)	14	14	12	16	1	17	2.7

Note: This table reports the summary statistics for the Survey of Consumer Finances sample used in this study. Selected households are those that report owning private equity in a firm in which they have an active management interest. Excluded, however, are those households which acquired equity ownership by joining a firm or becoming a partner. The following selection criteria are also used. First, the entrepreneurs are no older than 75 years with both positive net worth and work hours. Second, the business has positive sales and equity values, with equity worth less than $100 million. Lastly, this sample excludes firms in the top and bottom 2 percent of real annual sales. Statistics reported are the mean, median, 25^{th} and 75^{th} percentiles, minimum and maximum, and the standard deviation. All statistics are calculated using sample weights to correct the sampling bias.

the sample contains 1.96% African American, 2.12% Hispanic, and 4.17% Asian; the remainder identify as White. Net worth is calculated by collecting all household asset and liabilities variables and taking the difference between the two variable groups. The average entrepreneur possesses a net worth of $774,300. The control variables for the firm characteristics are market equity, sales, profit, industry, age, and total number of employees of the business. The equity is obtained by using the value of shares owned by the entrepreneur, divided by the percentage of self-ownership. The average business holds a market equity of $703,400. The sales and profit variables contain the total gross business sales and total net income during the year before that of the survey. Average sales and profit are $1,003,000 and $161,000 respectively. The industry variable contains seven broad categories. Roughly, they include farming, construction, manufacturing, retail, financial service, service, and other.[2] The firm age variable is constructed using the difference between the survey year and the year in which the business was founded. On average, business age was reported as 11.5 years. Finally, the typical business in this sample employs about 10 individuals, including the entrepreneur.

5 Empirical Results

This section presents the empirical results, wherein all regressions are estimated with robust standard errors to solve the heterroskedasticity and correlation errors.

The first hypothesis – that entrepreneurial effort is negatively related to equity financing – is equivalent to the prediction of a positive relationship between effort and retained ownership share s. As defined in the last section, the effort variable is constructed using weekly working hours. Although the working hour is only a partial measurement of entrepreneurial effort, it gives some insight into the day-to-day operations of the entrepreneurs. This unique information, not available for public firm managers in most existing research, makes it possible to test the agency theory directly.

To begin, I have run a cross-section OLS regression of effort on retained ownership shares. The control variables used here are log of number of employees and log of firm market equity to

[2]The 1989 public-use survey records 26 categories while the 1992 survey records 22. Since 1992, only seven broad categories have been used.

control for the size of business; firm age, firm age squared and industry dummies to control for firm specific characteristics. Entrepreneur age, education, gender, ethnicity, experience and log of net worth are used to control for personal differences among entrepreneurs; and finally, year dummies are used to capture different economic environments throughout the survey period. The regression result and t-statistics are presented in Column 1 of Table 4. The coefficient of ownership share is 12.24, with t-value of 5.85, which is highly significant. Consistent with the model prediction, there is a positive and significant relation between effort and ownership share.

Other than the control variables used in the regression, there may be other unobservable entrepreneur or firm attributes correlated to ownership share choice. In that case, the ownership share variable is endogenous, and the OLS regressor could be biased and inconsistent. To solve this potential problem, I apply instrument variables for ownership share, and estimate the equation with the two-stage least squares technique. In the first-stage, ownership share is predicted using instrument variables, two firm acquisition dummies indicating whether the entrepreneur has founded or inherited the business. These dummy variables provide exogenous variation of ownership share unlikely related to the omitted firm or entrepreneur characteristics. The predicted ownership share is then used as a regressor in the second-stage regression. The regression results are reported in Column 2 of Table 4. The coefficient on ownership share reads 13.01, slightly greater than that of the OLS. However, the coefficient becomes less significant, with t-value dropping from 5.85 to 1.94. For robustness, I also run the regressions using different combinations of control variables and data subsamples. In all these regressions, coefficients of ownership share are positive and significant. For the sake of brevity, only two robust test results are presented in Columns 3 and 4.

To recall the second hypothesis, entrepreneurial effort is negatively related to debt financing. In response to this hypothesis, I run a cross-section regression of effort on business debt, controlling for firm and entrepreneur characteristics. Similar to the last regression, the control variables used are log of number of employees, log of firm market equity, firm age, firm age squared, industry and year dummies, entrepreneur age, education, gender, ethnicity, experience, and log of entrepreneur net worth. Table 5 presents these regression results. Model 1 does not control for the differences of retained ownership share. The coefficient of debt is negative. However, the t-value of this coefficient is -1.8, which is significant at 10%, but not at 5%. As indicated in Table 4 regression results, effort is significantly related to ownership share. Model 2 adds control for the ownership

Table 4: Effort and Ownership Share

Dependent Variable = Entrepreneurial Effort (Hours Worked)				
Independent Variables	OLS	IV	Subsample (1989-1995)	Subsample (1998-2004)
Ownership share	12.24	13.01	14.76	9.52
	(5.85)	(1.94)	(4.5)	(3.72)
Log(Networth)	-1.26	-1.20	-1.09	-1.33
	(-3.06)	(-2.68)	(-1.66)	(-2.66)
Log(Equity)	3.44	3.56	3.24	3.51
	(9.03)	(5.66)	(5.37)	(7.55)
Log(Total employees)	1.62	1.56	2.16	1.19
	(3.33)	(1.46)	(2.82)	(1.94)
Owner age	-0.43	-0.44	-0.51	-0.37
	(-8.35)	(-8.42)	(-7.35)	(-4.94)
Experience	0.42	0.43	0.42	0.42
	(11.62)	(10.37)	(7.64)	(8.72)
Education	-0.48	-0.48	-0.61	-0.34
	(-2.44)	(-2.25)	(-2.08)	(-1.31)
R square	0.192	0.201	0.203	0.206
No. of observations	4338	4338	2030	2308

Note: This table reports the regression results of effort on retained ownership shares, controlling for entrepreneur age, education, gender, ethnicity, experience, log of entrepreneurial net worth, log of number of employees, log of firm market equity, firm age, firm age squared, industry and year dummies. Column 1 presents OLS coefficient estimates. Column 2 supplements the OLS regression with the instrumental variable (IV) method to reduce the potential endogeneity problem. Instrumental variables, two firm acquisition dummies indicating whether the owner has founded or inherited the firm, are used for ownership share. Columns 3 and 4 repeat the OLS regression using two subsamples. The numbers in parentheses indicate t-values. The coefficients of ownership share are positive and significant in all regressions. Only selected coefficient estimates are reported for brevity. All regressions are estimated with robust standard errors to solve the heterroskedasticity and correlation errors.

share. The coefficient on debt increases at this point, now statistically significant at both the 5% and 10% levels. Similar to the last group of regressions, the coefficient of ownership share is positive and highly significant with t-value of 5.85. For robustness, various combinations of the control variables have been used. The coefficient of debt stays negative and significant, supporting the second hypothesis.

The third hypothesis states that the relationship between effort and debt financing depends on the magnitude of risk: higher risk may increase the negative effect of debt financing on effort. To test this hypothesis, I have included an interaction term defined as the product of firm risk and debt. To construct a measurement of firm risk, I follow Bitler et al. (2005) and run a regression of firm profit-to-equity ratio regressed on log of firm market equity, log of number of employees, firm age, firm age squared, year and industry dummies, entrepreneur experience, gender, education, and firm acquisition method dummies. The residual from this regression is used as a proxy for firm risk. The results for this regression, effort on debt, ownership share, and interaction term of debt and risk, and controlled for firm and entrepreneur characteristics, are reported in Column 3 of Table 5. Consistent with Prediction 3, the coefficient of this interaction term is negative and significant at a level of 8.1%. The negative sign of the coefficient confirms that higher firm risk increases the negative effect of debt on effort. Note that the coefficient of debt variable becomes smaller and less significant in this regression. This is because the addition of the interaction term changes this coefficient's meaning, now capturing the effect of debt on effort at zero risk, which appears of little interest.

The final hypothesis revisits the typical underlying assumption of agency theory that effort improves firm performance. I use the profit-to-equity ratio as the measurement of firm performance and regress it on effort, controlling for entrepreneur gender, education, ethnicity, experience, log of number of employees, log of firm market equity, firm age, firm age squared, industry and year dummies, and entrepreneur firm acquisition method dummy variables. The coefficients and t-statistics are reported in Table 6 Column 1. The coefficient of effort is positive and highly significant with t-value 3.31.

Because the effort variable is likely correlated to the missing explanatory variables influencing firm performance, the OLS regression might be biased and inconsistent. Again, instrument variable method deals with this problem. I use entrepreneur age and age squared as the instruments for effort and apply a two-stage least squares regression. As the coefficients in Tables 4 and 5

Table 5: Effort and Debt

Dependent Variable = Entrepreneurial Effort			
Independent Variables	Model 1	Model 2	Model 3
Debt	-0.00042	-0.00057	-0.00053
	(-1.8)	(-2.24)	(-1.74)
Debt x Risk			-0.000019
			(-1.73)
Ownership share		12.175	12.176
		(5.85)	(5.85)
Log(Networth)	-0.926	-1.175	-1.175
	(-2.25)	(-2.89)	(-2.89)
Log(Equity)	3.030	3.547	3.547
	(8.18)	(9.48)	(9.48)
Log(Total employees)	0.656	1.529	1.529
	(1.4)	(3.13)	(3.13)
Owner age	-0.438	-0.443	-0.443
	(-8.32)	(-8.54)	(-8.54)
Experience	0.447	0.429	0.429
	(12.28)	(11.9)	(11.89)
Education	-0.55	-0.485	-0.484
	(-2.53)	(-2.29)	(-2.29)
R square	0.184	0.2014	0.2014

Note: This table reports the regressions of effort on business debt and control variables of entrepreneur age, education, gender, ethnicity, experience, log of entrepreneurial net worth, log of number of employees, log of firm market equity, firm age, firm age squared, industry and year dummies. Model 1 and 2 are tests of hypothesis 2. Model 3 is a test for hypothesis 3 and includes an interaction variable defined as the product of debt and firm risk. The risk variable is measured as the residual of the profit-to-equity ratio regressed on log of firm market equity, log of number of employees, firm age, firm age squared, year and industry dummies, entrepreneur experience, gender, education, and firm acquisition method dummies. Numbers in parentheses are the t-values. Again, only selected coefficient estimates are reported for brevity.

Table 6: Performance and Effort

Dependent Variable= Profit/Equity						
Dependant Variable	OLS	IV	OLS	IV	OLS	IV
			(1989-1995)		(1998-2004)	
Effort	0.011	0.021	0.01	0.0179	0.012	0.044
	(3.31)	(1.85)	(2.4)	(1.87)	(2.28)	(2.3)
Log(total employees)	0.727	0.718	0.641	0.630	0.799	0.779
	(5.15)	(5.07)	(3.05)	(3.1)	(4.36)	(4.24)
Log(equity)	-0.983	-1.015	-0.759	-0.783	-1.184	-1.296
	(-7.21)	(-6.64)	(-4.7)	(-4.27)	(-5.66)	(-5.12)
R square	0.0788	0.0775	0.0407	0.0399	0.1335	0.1202
No. of observations	4338	4338	2030	2030	2308	2308

Note: This table reports the regression of profit-to-equity ratio on effort, and control variables of entrepreneur gender, education, ethnicity, experience, log of number of employees, log of firm market equity, firm age, firm age squared, industry and year dummies and dummy variables for firm acquisition method. Column 2 reports instrumental variable regression results using entrepreneur age and age squared as the instruments for effort. Columns 3 through 6 repeat the same OLS and IV regression using 1989-1992 and 1998-2004 data. The numbers in parentheses are the t-values. Only selected estimates are reported for brevity.

show, entrepreneur age is significantly related to effort, but not necessarily correlated to firm performance if the experience of the entrepreneur is controlled. In the first-stage, I predict effort using the instruments, and the predicted effort is then used as a regressor in the second-stage regression. The result is presented in Table 6 Column 2. Here, the coefficient on effort of the IV regression has increased dramatically in magnitude, while the t-value has decreased. Still, the effect is significant at 10%. Repeating the OLS and IV regressions with two subsamples in order to test the robustness of the result, the regression results appear in Columns 3 through 6. The coefficients of effort in all these regressions prove to be positive and significant. To again assure for robustness, I have run all the regressions with different combinations of control variables. All the empirical results hold.

6 Conclusion

Agency theory suggests that granting managers more equity-based compensation may reduce managerial moral hazard. However, finding direct empirical evidence for this proposition is very difficult due to the lack of managerial behavior data. To fill this gap, this paper develops a modified principal-agent model within private firms and initiates an alternative direct test drawing on private firm survey data.

In line with the agency theory, this modified principal-agent model suggests that the severity of entrepreneur moral hazard closely relates to the private firm's capital structure. Three empirical predictions about the interaction of capital structure and moral hazard are derived. First, equity financing exacerbates moral hazard. Second, debt financing likewise worsens moral hazard. Third, higher firm risk may increase the negative effect of debt financing on effort.

Applying entrepreneurial effort, firm financing choice and performance data extracted from the Survey of Consumer Finances, I find fairly strong evidence supporting the model predictions. These results offer direct evidence in support of using compensation contracts to motivate effort, evidence not previously available due to limitations in data. The specific moral hazard considered in this model is the managerial working effort. Other moral hazards, such as manipulating the accounting statements, is excluded from the study as it is less important in the content of private firms.

References

[1] Bitler, M. P., Moskowitz, T. J., Vissing-Jorgensen, A., 2005. Testing Agency Theory with Entrepreneur Effort and Wealth. *Journal of Finance*, 539-576.

[2] Canner, G., Kennickell, A. B., and Luckett, C. A., 1995. Household Sector Borrowing and Burden of Debt. *Federal Reserve Bulletin* 81, 323-338.

[3] Campbell, J., Lettau, M,. Burton G. Malkiel, B. G., and Xu, Y., 2001. Have Individual Stocks Become More Volatile? An Empirical Explanation of Idiosyncratic Risk. *Journal of Finance* 56, 1-43.

[4] Demsetz, H., Lean, K., 1985. The Structure of Corporate Ownership: Causes and Consequences. *Journal of Political Economy* 93 (6), 1155-1177.

[5] Haugen, R., Senbet, L., 1981. Resolving the Agency Problems of External Capital through Options. *Journal of Finance* 36, 629-648.

[6] Heaton, J., Lucas, D., 2004. Capital Structure, Hurdle Rates, and Portfolio Choice-Interactions in an Entrepreneurial Firm. Working Paper, University of Chicago

[7] Himmelberg, C. P., Hubbard, R. G. and Palia, D., 1999. Understanding the Determinants of Managerial Ownership and the Link between Ownership and Performance. *Journal of Financial Economics* 53, 353-384.

[8] Jensen, M. C., and W. Meckling, 1976. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Econimics* 3, 305-360.

[9] Kennickell, A. B., Starr-McCluer, M., and Surette, B. J., 2000. Recent Changes in U.S. Family Finances: Results from the 1998 Survey of Consumer Finances. *Federal Reserve Bulletin* 86 (1), 1-29.

[10] McConnell, J. J., Servaes, H., 1990. Additional Evidence on Equity Ownersip and Corporate Value. *Journal of Financial Economics* 27, 595-612.

[11] Starr-McCluer, M., 1996. Health Insurance and Precautionary Savings. *American Economic Review* 86 (1), 285-295.