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The Opportunity Cost of Entrepreneurial Labor And Dominant Financial Contracts

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This paper introduces a reduced-form model where agency costs are considered using differing costs of capital and the value of entrepreneurial labor. The entrepreneur faces a choice among three financial contracts: common stock, straight preferred stock and convertible preferred stock. The model first identifies the situation in which convertible preferred stock is dominant. With the cost of capital faced by the entrepreneur lower than the cost of funds to a venture capitalist (Gentry and Hubbard, 2000; Heaton and Lucas, 2009), a numerical solution of our model shows that as an entrepreneur's labor value decreases (increases), straight preferred stock (common stock) becomes more dominant, with convertible preferred stock being dominant in the interior. In other words, as an entrepreneur's bargaining power increases (when his or her human capital becomes more valuable), the venture capitalist should have more vested interest (i.e., common stock). Our model thus predicts that a medical doctor entrepreneur would more likely be financed with convertible securities or equity, while a high-school drop-out entrepreneur would more likely be financed by high-yield fixed income securities like junk bonds or usury loans.

Field of Research: Venture Finance, Entrepreneurship

1. Introduction

Issues in entrepreneurial finance abound (Barry, 1994; Wright and Robbie, 1997; Harrison and Mason, 1996). One empirical stylized fact that emerges is that the dominant financial instruments in venture financing are convertible securities (Norton and Tenenbaum, 1992, 1993; Kaplan and Stromberg, 2001, 2004). The traditional explanation has been that the use of a convertible security serves to motivate the entrepreneur E to exert the proper effort and avoid improper risk taking. That is, the use of convertible securities reduces agency costs (Gompers, 1997).

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In this paper, we contribute to the extant literature by introducing a theoretical model where agency and other risks are incorporated solely into differing costs of capital for the VC and E. This reduced-form model requires no abstract assumptions nor stochastic calculus (which other models of agency theory require) and yet it yields findings that are consistent with the abovementioned empirical evidence. We examine the first stage (the angel investing stage) of the venture and, using our model, derive the dominant financial contract when the bargaining power of E changes. In the extant literature, the explicit value of E's time and skill in financial deal making has been neglected. Instead, an "individual rationality" constraint is simply added to the model analysis. We incorporate an explicit value for the opportunity cost of entrepreneurial labor, and translate this value into "minimum required cash flows" for E and a "maximum allowed rate of return" for the venture capitalist VC. Obviously the higher the labor value, the stronger is E's bargaining power. We then show that the dominant security depends on the extent of E's bargaining power. When E's bargaining power is within certain bounds, we are able to demonstrate that the use of convertible securities dominates the use of common or straight preferred stock. The value of entrepreneurial labor provides an upper bound for the return a VC could demand as E would walk away if E's share is less than this labor value.

The paper is organized as follows: Section 2 provides a literature review. Section 3 presents the model and research questions. Section 4 provides a numerical illustration and the findings. Section 5 concludes with the model's limitations. Because of the minimal tax advantages of debt in venture financing, the convertible security used is convertible preferred stock (Copeland and Weston, 1992; Kaplan and Stromberg, 2001).

2. Literature Review

The agency theory explanation goes as follows: E may place significant weight on increasing private benefits at the expense of VC, a moral hazard problem. There is also adverse selection with respect to E's ability. This adverse selection problem is mitigated by a fixed income instrument, which separates the low-ability E from the high-ability E. But the fixed income instrument entails a moral hazard problem of 'bondholder-stockholder conflict of interest' due to limited liability. That is, there is an incentive for E to increase risk to increase E's residual payoff at the expense of VC (Green, 1984). Convertible provisions reduce this incentive (Green, 1984; Jensen and Meckling, 1976; Smith and Warner, 1979). Our model is *novel* in that, unlike the extant literature (Robe, 1999), we do not use the traditional principal-agent framework. Instead, we include an agency risk premium for VC (Reid and Smith, 2002). This results in a higher cost of capital for VC (contrary to Kerins, Smith and Smith, 2004; but consistent with Gentry and Hubbard, 2000; Heaton and Lucas, 2009). This higher cost of capital for VC could also account for the default risk premium, Knightian risk premium (Walden, 2004) and different degrees of risk aversion of VC and E, amongst other factors (Sahlman, 1990).

Our model also shows how cash flow rights are allocated between E and VC as a function of the state of the world (Schmidt, 2003), E and VC's differing costs of capital, and E's labor value. More recently, an important question was raised in the financial contracting literature (Bolton and Rosenthal, 2002; Robe, Steiger and Michel, 2006; Athreya, Tam and Young, 2009). Basically, they ask if financial contracts should change as the returns to human capital or entrepreneurship increase. In this paper, we attempt to relate the type of financial contract with the returns to human capital (E's labor value). The cash flows and required costs of capital are expected to embody all other factors (Norton and Tenenbaum, 1992, 1993), and we focus on the bottom line, which is valuation.

3. The Model and Research Questions

Let L^* be the expected present value of entrepreneurial labor which can be obtained by assuming a salary structure of E over the duration of the venture, discounted at the cost of capital of E, k_E. Since the expertise and skill of E will be more (less) in demand in the labor market in the states of nature in which the venture will be a success (failure), E's salary structure is expected to be affected by the probability distribution of future cash flows of the venture. L^* then gives the benchmark of acceptance of a deal by E. The venture is assumed to consist of one entrepreneurial project. The initial cost of the project is I_0, and the project's stochastic future cash flows, denoted by $\boldsymbol{CF}$, is assumed to be homogeneously known to both VC and E. VC evaluates this venture using its acceptable minimum required discount rate k^*_V (which should incorporate premiums for various types of risks faced by VC). This evaluation provides the expected present value, *PV*, and the expected net present value, *NPV*, of the project. Due to a lower cost of capital k_E, the evaluation of the project by E is higher. A lower k_E is assumed as entrepreneurs are more risk tolerant (Gentry and Hubbard, 2000; Heaton and Lucas, 2009). Given any financial deal, there is a specific rate of return to VC, denoted by k_V, which provides a split of $\boldsymbol{CF}$ between VC and E so that VC can recover its financial investment of I_0 and earn exactly k_V per period. Denote this portion of $\boldsymbol{CF}$ to VC by $\boldsymbol{CF_V}$ and the remainder that goes to E by $\boldsymbol{CF_E}$. The minimum required rate of return to VC, denoted by k^*_V, provides a particular split of $\boldsymbol{CF}$ into $\boldsymbol{CF^*_V}$ and $\boldsymbol{CF^*_E}$, and by design VC will not accept cash flows inferior to $\boldsymbol{CF^*_V}$. Given any $\boldsymbol{CF_E}$ (equal to $\boldsymbol{CF}$- $\boldsymbol{CF_V}$ by construction), E will calculate the expected present value, PV_E. S/he compares the resulting PV_E with L^* and makes the decision about accepting or rejecting the deal. Suppose E's minimum acceptable share of $\boldsymbol{CF}$, given L^*, is $\boldsymbol{CF^0_E}$. In other words, given L^*, $\boldsymbol{CF^0_E}$ is the minimum share of the venture's future cash flows which must accrue to E. Let the remainder that accrues to VC be $\boldsymbol{CF^0_V}$. The internal rate of return to recover I_0 with $\boldsymbol{CF^0_V}$ is k^0_V. Obviously, $\boldsymbol{CF^0_V}$

and $\boldsymbol{CF^0_E}$ must sum to $\boldsymbol{CF}$. In each deal, both k^*_V and L^* provide cut-off points for decision making: L^* to E and k^*_V to VC. If a deal leads to an allocation of venture cash flows in such a way that VC earns a rate of return less than k^*_V, VC will reject the deal. On the other hand, if a deal results in the expected present value of E's share of cash flows, PV_E, being less than L^*, E will reject the deal. This implies that if $k_V > k^0_V$, the deal is not acceptable to E as a higher share of $\boldsymbol{CF}$ goes to VC (that is, $\boldsymbol{CF_V > CF^0_V}$ so $\boldsymbol{CF_E < CF^0_E}$). Therefore, a feasible range requires that $k_V < k^0_V$. On the other hand, if $k_V < k^*_V$, VC will reject the deal. Thus, it must be the case that $k^*_V < k_V$, and the acceptable range of k_V lies from k^*_V to k^0_V. In order to find the relationship between the dominant financial security and the opportunity cost of E, L^*, we shall restrict the analysis to the upper bound of the acceptable range for VC which is k^0_V. It is directly related to L^* as follows: Suppose expected future earnings for E increase and thus L^* rises. This means that the share of the cash flows going to E, $\boldsymbol{CF^0_E}$, must be increased or E will reject the deal. As the venture's cash flows $\boldsymbol{CF}$ are fixed, this means that $\boldsymbol{CF^0_V}$ must decrease. In order to make the present value of the lower $\boldsymbol{CF^0_V}$ equal to I_0, the internal rate of return k^0_V must decrease. The dominant financial security is then determined by comparing the present value of the cash flows $\boldsymbol{CF^0_V}$ of VC (discounted at k^*_V) as L^* changes. We then use this model to answer the following research questions:

(1) Is it possible for a convertible security to still be the dominant financial security for contracting between VC and E in the absence of explicit agency costs?

(2) Would the dominant financial security change when E's bargaining power (which is increasing in the value of E's opportunity cost) changes?

4. A Numerical Illustration and Findings

4A. A Simple Numerical Project

Assume that the entrepreneurship will consist of a single venture that needs the initial outlay of $1,000,000. The probability distribution of operating cash flows and terminal values, along with the duration of the venture, are given in Table 1. The project, though simple, characterizes some common features of entrepreneurial ventures. For example, in a venture, there are usually no cash flows at the "seed" and "start-up" stages and we have permitted this period to be one year. Secondly, in poor states of nature, new ventures produce very little operating cash flows and terminal value, while if the venture is a success, the operating cash flows and terminal value are expected to be significantly higher. Thirdly, the life of the project is assumed to be five years, consistent with the average holding period of most venture capitalists (Barry, 1994).

Table 1
Venture's Future Cash Flows
(Dollar figures are in thousands)

State of Nature	Probability	Annual Operating Cash Flow in Year 1	2	3	4	5	Terminal Value In Year 5
Bad	0.5	0	100	100	100	100	200
Good	0.5	0	900	900	900	900	1800

One more thing about the venture's future cash flows in Table 1 is that the uncertainty about cash flows persists only until year two, and once the operating cash flows occur, the "bad" or "good" state has been realized and there is no uncertainty thereafter. We assume that both VC and E accept the characterization of the venture's future cash flows as given in Table 1, that is, both have homogeneous projections as the risks of asymmetric information or different perceptions are captured in higher risk premiums of VC. While we shall assume various levels of the required discount rate of VC, k_V, the required discount rate of E is:

$$k_E = R_f + a_E * CV_E \qquad (1)$$

where R_f = the risk free rate of interest,

a_E = value per dollar per period of a unit of the coefficient of variation placed by E (i.e., E's risk aversion parameter), and

CV_E = the coefficient of variation of cash flows belonging to E.

For the higher cost of capital of VC, let k^0_V=40%, and let R_f=10% (Sahlman, 1999). The discounted values of the project as of date two under "bad" and "good" states are then $498,950 and $4,490,550 respectively. The expected discounted value as of date two is $2,494,741 with standard deviation of $1,995,793. As of date zero, the expected present value, *PV*, using k_V = 40%, is $1,272,827. Given the initial cost of the project of $1,000,000, the expected net present value, *NPV*, is $272,827. While the discounted values of the project as of date two under "bad" and "good" scenarios are the same as above, due to E's lower degree of risk aversion, the current value of the project is higher. Suppose k_E is 20%, then *PV* to E is $1,732,459. Given the coefficient of variation of the project of 0.8 and the initial value of k_E of 20%, equation (1) implies a_E = 0.125. This is the value we shall use subsequently.

4B. The Value of Entrepreneurial Labor

Es usually have a lot of work experience in their areas of expertise. The levels of their salaries are expected to be contingent on the "bad" or "good" state of nature because demand for their services will be weaker if the "bad" state occurs and will be stronger if the "good" scenario materializes. Reflecting these considerations, we assume the following:

Table 2
Entrepreneur's Salary Structure
(Dollar figures are in thousands)

State of Nature	Probability	Annual Salary in Year 1	2	3	4	5
Bad	0.5	100	80	80	80	80
Good	0.5	100	105.3	113.7	122.8	132.6

In the "bad" scenario, E's salary declines to $80,000 and stays at that level for the next four years while in the "good" scenario, his/her salary rises by 5.3% for one year and rises by 8% thereafter. The coefficient of variation of E's salary structure is 0.16. With a_E = 0.125 and R_f = 10%, the annual personal discount rate, using equation (1) above, is approximately 12%. The expected present value of E's labor, L^*, is then $363,809.

4C. Choice of Financial Contract

In this section, we consider various instruments by which VC can provide funds to E. We assume that in each case, the total amount of the initial cost of $1,000,000 is provided by VC.

(4Ci) Common Stock Financing

With k^0_V = 40%, the expected present value, *PV*, of the venture is $1,272,827, and the expected net present value, *NPV*, given the initial cost of $1,000,000, is $272,827. Given these figures, VC will demand 78.57 percent ownership of the venture, leaving 21.43 percent for E. The cash flows (***CF***) of the venture are also split by these percentages. These split cash flows are rounded to the nearest integer and given in Table 3. At k^0_V = 40%, PV_E = $363,809 = L^* by design. In calculating PV_E, k_E = 20% is used and this discount rate is obtained by using equation (1). The minimum required rate of return to VC may not be higher than 40%. Otherwise E will be out of the deal because PV_E will then be lower than $363,809 or L^*. Suppose k^*_V is 35%. Then, the allocation of the project's cash flows to VC and E is given in case B of Table 3. In this situation, the expected present value of $\boldsymbol{CF_E}$ rises to $467,734, but the expected present value of $\boldsymbol{CF_V}$ is still $1,000,000. Obviously, if a higher k_V is set while k^*_V is 35%, the PV_E, using k^*_V as the discount rate, will be lower than $467,734 but greater than $363,809. We allocated cash flow rights and calculated DV_2, PV_E and $\boldsymbol{PV_V}$ for several k_V for 35% < k_V < 40%. For example, if k_V = 37.5%, E's ownership ratio is 24.22 percent and its PV_E becomes $415,790 (using k_E = 20%). VC's share becomes 75.78 percent and VC's PV_V becomes $1,041,102 (using k^*_V = 35%).

Table 3
Benchmarked Cash Flows of VC and E Under Common Stock Financing
(Dollar figures are in thousands)

		Annual Operating Cash Flows						
Type of Cash Flow	**State of Nature**	**1**	**2**	**3**	**4**	**5**	**Share of Terminal Value**	**Discounted Values & Std. Dev.**
Case A: k^0_V = 40% **CF**$_V$	Bad	0	79	79	79	79	158	DV_2 = 1971 σ_2 = 1577
	Good	0	711	711	711	711	1422	PV_V =1082.2[a]
Case A: k^0_V = 40% **CF**$_E$	Bad	0	21	21	21	21	42	DV_2 = 524 σ_2 = 419
	Good	0	189	189	189	189	378	PV_E = 363.8
Case B: k^*_V = 35% **CF**$_V$	Bad	0	73	73	73	73	146	DV_2 = 1821 σ_2 = 1457
	Good	0	657	657	657	657	1314	PV_V =1000[b]
Case B: k^*_V = 35% **CF**$_E$	Bad	0	27	27	27	27	54	DV_2 = 674 σ_2 = 539
	Good	0	243	243	243	243	486	PV_E = 467.8

[a, b] For the calculation of this PV_V, a discount rate of 35% is used

(4Cii) Straight Preferred Stock Financing

With a finite venture, only a term preferred stock can be negotiated. After determining preferred dividends, the sharing of the terminal value has to be decided upon. Given any k_V, it is clear that if a higher share of the terminal value goes to VC, the annual preferred dividends to earn the given k_V will be lower. That is, there is a trade-off between annual preferred dividends and share of terminal value belonging to VC. We have to fix one of the two and we do that by assuming that in each state of nature, 75.78 percent of the terminal value is allocated to VC. This sharing is consistent with k_V = 37.5% under common stock financing. The annual preferred dividend X cannot be recovered from operating cash flows in the "bad" scenario; therefore, all cash flows will belong to VC. It means that VC will receive $100,000 in each year starting at year two in the "bad" scenario. In addition, the VC receives 75.78 percent of the terminal value in each state of nature. E's share of the cash flow is the remainder of the ***CF***. The annual preferred dividend X*,* k^0_V and k_E are obtained from equation (1), the following equation (2) and the present value of X in the good state and the terminal shares for E (with a_E = 0.125, R_f = 10%):

$$1000 = [1/(1+k_V)^2] * [0.5\{100*3.4869 + 0.7513*0.7578*200\} + 0.5\{X*3.4869 + 0.7513*0.7578*1800\}] \quad (2)$$

Solving these simultaneous equations finds that k^0_V, the k_V at which PV_E = $363,809, is 39.8%. E's discount rate in this case rises to 21.8% due to a higher level of risk borne. Assume that k^*_V, the minimum required rate of return to VC, is 34.8%. Then, from ***CF***$_E$, PV_E is $455,300, while PV_V of

$\boldsymbol{CF}_V$ is \$1,000,000. The calculations of cash flows to VC and E for k^*_V = 34.8% and k^0_V = 39.8% are provided in Table 4.

Table 4
Benchmarked Cash Flows of VC and E Under Straight Preferred Stock Financing
(Dollar figures are in thousands)

		Annual Operating Cash Flows						
Type of Cash Flow	**State of Nature**	**1**	**2**	**3**	**4**	**5**	**Share of Terminal Value**	**Discounted Values & Std. Dev.**
Case A: k^0_V =39.8% $\boldsymbol{CF}_V$	Bad	0	100	100	100	100	152	DV_2 = 1957
								σ_2 = 1494
	Good	0	695	695	695	695	1364	PV_V = 1077 [a]
Case A: k^0_V =39.8% $\boldsymbol{CF}_E$	Bad	0	0	0	0	0	48	DV_2 = 538
								σ_2 = 502
	Good	0	205	205	205	205	436	PV_E = 363.8 (k_E = 21.8%)
Case B: k^*_V =34.8% $\boldsymbol{CF}_V$	Bad	0	100	100	100	100	152	DV_2 = 1819
								σ_2 = 1356
	Good	0	616	616	616	616	1364	PV_V = 1000 [b]
Case B: k^*_V =34.8% $\boldsymbol{CF}_E$	Bad	0	0	0	0	0	48	DV_2 = 675
								σ_2 = 639
	Good	0	284	284	284	284	436	PV_E = 456 (k_E = 21.8%)

[a, b] For the calculation of this PV_V, a discount rate of 34.8% is used.

The choice of k^*_V takes into account the fact that the risk of VC with preferred stock is slightly lower than the risk with common stock. We allocated cash flow rights and calculated DV_2, PV_E and PV_V for several k_V for 34.8% < k_V < 39.8%. For example, at k_V=37.5%, the annual preferred dividends, X, is \$658,000 and resulting PV_V at k_V=34.8%, is \$1,041,501 (NPV = \$41,501) and PV_E = \$406,266 (at k_E = 20%).

(4Ciii) Convertible Preferred Stock Financing

For this instrument, there are three components of the deal which need to be decided upon. One is the periodic preferred dividends, X, the second is the conversion ratio, to be denoted by δ, and the third is the sharing of the terminal value if conversion does not take place. With respect to the sharing of the terminal value in the non-conversion state, we continue to assume the 75.78 percentage. The conversion ratio, δ, is the fractional claim on the operating cash flows and terminal value of the venture in the "good" state of nature (the conversion state). Given a k_V, if X is set at a high level, the required δ will be lower, and vice versa. Now one of these components must be fixed and we let X = \$75,000. Then, as before, δ, k^0_V and k_E are obtained from equation (1), the following equation (3) and the present value of X and the terminal share in the "bad" state plus (1-δ) of the cash flows in the "good" state for E (a_E = 0.125 and R_f = 10%):

$$1000(1+k_V)^2=(75*3.4869+0.7513*0.7578*200)*0.5+\delta*(900*3.4869+0.7513*1800)*0.5$$

which implies that: $\delta = [1000(1+k_V)^2 - 188.09]/2245.275$ (3)

Table 5
Benchmarked Cash Flows of VC and E Under Convertible Preferred Stock Financing
(Dollar figures are in thousands)

		Annual Operating Cash Flows						
Type of Cash Flow	**State of Nature**	**1**	**2**	**3**	**4**	**5**	**Share of Terminal Value**	**Discounted Values & Std. Dev.**
Case A: k^0_V =40% CF_V	Bad Good	0 0	75 716	75 716	75 716	75 716	152 1432	DV_2 = 1974 σ_2 = 1598 PV_V =1083.7[a]
Case A: k^0_V =40% CF_E	Bad Good	0 0	25 184	25 184	25 184	25 184	48 368	DV_2 = 521 σ_2 = 397 PV_E = 363.8 (k_E=19.6%)
Case B: k^*_V =35% CF_V	Bad Good	0 0	75 656	75 656	75 656	75 656	152 1312	DV_2 = 1824 σ_2 = 1448 PV_V = 1000 [b]
Case B: k^*_V =35% CF_E	Bad Good	0 0	25 244	25 244	25 244	25 244	48 488	DV_2 = 670 σ_2 = 547 PV_E = 466.5 (k_E=20%)

[a, b] For the calculation of this PV_V, a discount rate of 35% is used.

Solving the simultaneous equations yields δ=79.56% implying k^0_V=40% (approximately). For comparison, we choose k^*_V =35%. Table 5 above provides a split of the cash flows and the resulting valuations. Compared to Table 4, we see that k_E declines slightly because VC share of cash flows rises only when the venture has upside potential and this reduces risk to E. We allocated cash flow rights and calculated DV_2, PV_E and PV_V for several k_V for 35% < k_V < 40%. For example, at k_V = 37.5%, δ = 75.84 percent, PV_V (k^*_V = 35%) is $1,037,458, and PV_E = $419,780 ($k_E$ = 20%).

4D. Findings

We now have the following two results to our research questions:

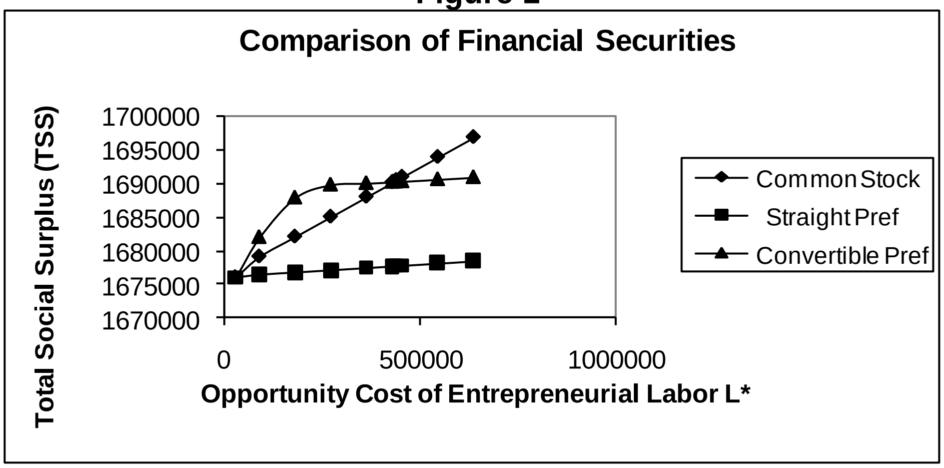
Result (1): There exists a k_V lying in the acceptable range from k^*_V to k^0_V where the convertible preferred stock is the dominant financial security for the VC and E. To obtain this result, we examine Total Social Surplus or TSS (Schmidt, 2003) to determine the dominant financial security. We define TSS = PV_E + PV_V. Table 6 below shows the existence of a k_V where the convertible preferred stock has the highest TSS.

Table 6
Choice of a Financial Instrument at Interior Values of k_V

Instrument	TSS ($ '000)	PV_V ($ '000)	PV_E ($ '000)
Common Stock at k_V=37.5 %	1456.892	1041.102 (k^*_V =35 %)	415.79 (k^0_V =20 %)
Straight Pref. at k_V=37.5 %	1447.77	1041.5 (k^*_V =34.8 %)	406.27 (k^0_V =21.8 %)
Convert. Pref. at k_V=37.5 %	1457.238	1037.458 (k^*_V =35 %)	419.78 (k^0_V =20 %)

Having shown the possibility of convertible securities being dominant, we now approach the issue of when such securities are dominant.

Figure 1



In order to find the relationship between the dominant financial security and the opportunity cost of E, L^*, we shall restrict the analysis to the upper bound of the acceptable range for VC that is k^0_V as previously discussed. When L^* increases, k^0_V and the cash flows $\boldsymbol{CF^0_V}$ of VC fall, and vice versa. The dominant financial security is then determined by comparing the present value of cash flows $\boldsymbol{CF^0_V}$ of VC (discounted at k^*_V) for each of the three securities, denoted PV_V. For the sake of continuity in using TSS as the basis of comparison, we shall add PV_E or L^* to PV_V (= TSS).

Result (2): Figure 1 shows that as E's opportunity cost L^* increases (decreases), common stock (straight preferred stock) becomes more dominant as it has the steepest (flattest) slope, with the concave convertible preferred stock dominant in the interior region (L^* from 29,000 to 433,000 approximately). That is, as E's bargaining power increases (due to human capital increasing), VC should take more vested interest (that is, common stock).

5. Conclusion

In this paper, we introduced a new reduced-form model of venture financing by considering the opportunity cost of labor income faced by an entrepreneur E. In a financial deal, E's labor value must represent a cut-off point for E in negotiation with a venture capitalist VC. Using a higher cost of capital for the VC, we then suggested a range of acceptable deals to both the VC and E. We considered three financial contracts: common stock, straight preferred stock and convertible preferred stock, and derived the benchmarked cash flows to the VC and E for each security. When examining the conditions for dominance, we found that convertible preferred stock could have an edge over common stock and straight preferred stock in providing greater total social surplus. This result is consistent with the empirical evidence. We then calibrated our model and found that as E's opportunity cost L^* increases (decreases), common stock (straight preferred stock) becomes more dominant, with the convertible preferred stock dominant in the interior region. That is, as E's bargaining power increases (due to E's human capital becoming more valuable), VC should take more vested interest (i.e., common stock). This result is not inconsistent with the extant literature (Hart and Moore, 1994) if, as they suggest, common stock is thought to be a bond with a very long maturity. If E has little bargaining power (L^*<29,000), the dominant financial security is straight preferred stock (Admati and Pfleiderer, 1994).

Our results are also consistent with the finding that bankruptcy laws become tougher as the returns to human capital decrease (Robe, Steiger and Michel, 2006). We find that financial contracts should change as the returns to human capital change. The optimal contract changes from debt to equity as the returns to E's human capital increase as the higher opportunity costs induce E to expend the necessary effort. VC is then able to share more of the risk with an equity contract. Es with higher human capital would also need to upkeep their reputations. Reputational concerns provide a key disciplining device which mitigates moral hazard problems (Brandt and Hosios, 1996; Weidenmier, 2005).

The major limitation of this reduced-form model is that it lacks the generality of a principal-agent model that maximizes the expected utility of a principal subject to the incentive compatibility and individual rationality constraints of the agent. With the use of stochastic calculus and topology, such models allow one to derive optimal financial contracts for a very rich set of preferences and technologies. However, if one simply wanted to maximize net present value or NPV for both the principal and agent, then our reduced-form model suffices to generate results consistent with the empirical evidence. Future research could examine empirically whether expected future incomes of Es affect the use of convertible securities (Result (2)). Our model predicts that a medical doctor entrepreneur would more likely be financed with convertible securities or equity, while a high-school drop-out entrepreneur would more likely be financed by high-yield fixed income securities like junk bonds or usury loans.

Endnote

Preliminary results were presented at the FMA International Meeting, the Australasian Banking and Finance Conference, the Administrative Sciences Association of Canada Conference and the Asian Finance Conference. This version contains new results which were presented at the Annual American Business Research Conference in Las Vegas. Comments from Zia Haqq (founding editor), Ted Fee, Randy Hoffman, Michel Robe, Charles Schell, Bill Wilson and participants at the abovementioned conferences are acknowledged. We are also grateful for research assistance from Min Chet Luei, and acknowledge support from the Social Sciences and Humanities Research Council of Canada. The usual disclaimer applies.

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