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Exit routes in LBO projects

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Exit routes in LBO projects

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Abstract

The current paper studies the financial structure in buyout firms under moral hazard due to unobservable efforts and an excessive risk-taking.

The choice of the exit route may lead to agency conflicts between the entrepreneur and the LBO firm: the former may take very risky decisions to increase the probability of IPO exit. If the target is taking public, he gets a non transferable and private benefit. The opportunistic behavior of the entrepreneur decreases the probability of sale exit; the preferred exit route of the LBO firm.

Without moral hazard, there are many ways to finance the project and the two agents exert strictly positive efforts. With moral hazard, the entrepreneur, the LBO firm and the bank must finance jointly the buyout. Financing the project through standard debt-equity contracts does not implement the first-best solution.

Only a set of projects can be financed through both the LBO fund and the bank at the macroeconomic level. If the entrepreneur is not wealthy enough, her project is not undertaken.

Keywords: LBO, moral hazard, excessive taking risk, financial structure, Exits.

JEL Classifications: G15, G23, G32.

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1 Introduction

Despite the fact that buyout investments represent a considerable part of private equity investments, few papers has been done related to the financial structure and exit routes in LBO projects. The main topic often mentioned in the literature is the impact of LBO firm (hereafter he) on the performance of the acquired firm (called also Op Co or target). In the late 1980's, many papers focused on the investigation of other determinants of the target's performance (after the exit of the LBO firm)[1].

An important element of the buyout investment is the contractual agreement to end up the project and to repay the parties within a specified period of time. The exit is the most important and last way the LBO firm can realize a high positive return on the investment: he invests in buyouts with the aim of exiting after 3-5 years. He wants to get his money back quickly in order to invest it in a new deal. Consequently, there must be a clear route for him to exit the buyout.

In this paper, we shed light on the topic of exit choices in buyout investments and aim at investigating the following question: does the financial structure in LBO solve the agency conflicts between the entrepreneur (hereafter she) and the LBO firm?

We focus on the agency conflicts related to the choice of the exit route under moral hazard. The exit route and timing are crucial for financing. The entrepreneur must know that the LBO firm will eventually want to exit the buyout, and that very often this means that the project will be sold to another company (trade sale) or to another LBO firm (secondary LBO). If the target turns out to be non-performing, it is abandoned showing the ability of the LBO firm to filter out good from bad investments.

The choice of the exit date and route may lead to agency conflicts between the entrepreneur and the LBO firm. The three main possible exit channels are initial public offerings IPO, sales[2] and write-offs (typically called quick-flips).

An IPO results in the highest valuation of the target and is very often the preferred exit vehicle. The entrepreneur favors an IPO because it preserves the target's independence and ensures the liquidity of its securities. If the company is taking public, the entrepreneur keeps the control and gets private benefits[3] because she shares the control with

[1] See among others, Jensen and Smith (1985), Jensen (1986, 1989), Kaplan (1989), Lehn and Poulsen (1989), Kaplan and Stein (1993)...

[2] Sales encompass trade sales, secondary sales and buybacks.

[3] Examples of the private benefits might be the entrepreneur's consumption perks, her desire to be a business owner or to keep a family business going (In this case, we

a large number of investors who usually face information asymmetry. In order to get an IPO exit, the entrepreneur may take very risky decisions which can, for example be asking for additional funds from the bank (hereafter he) and other financiers, investing in new mergers and acquisitions which are not valuable for the buyout, hiding important information to the LBO firm, recruiting new staff to control the majority of voting rights and to get more private advantages. However, in contrast with a sale, such exit does not end the LBO firm's involvement with the target. He may be restricted for many reasons, from selling any or a portion of his shares in the offering.[4]

Sale has very different consequences; it is more attractive for the LBO firm since it offers many advantages: fast and full exit opportunities, less restrictions than in IPO, quick payment in cash or marketable securities and ends the partnership's involvement with the buyout. It is unwelcome for the entrepreneur because the target may be merged with or acquired by another company and cannot remain independent.

Less profitable or underperforming projects are abandoned: the LBO firm writes the buyout off if it cannot cover its investment costs. Keeping such projects in the fund's portfolio would signal his inability to differentiate between good and bad projects. This exit channel is considered as a constraint rather than an option.

The present model is related to the financial literature on exit in private-equity investments. To our knowledge, most of the papers study the exit in the venture capital but few papers, mostly empirical studies, focus on the topic of buyouts.

These papers argue that the exit route is a function of the firm's performance. Indeed, IPO is the exit route of highly profitable buyouts: these firms are called *high-flyers*. But only the firms which are in a mature development stage (high growth prospects and strong future cash-flows) are taken public which suggests that the probability of an IPO exit in LBO is smaller compared to the other private equity investments: the target has very often low growth prospects and generate important cash-flows.

The most common exit route in LBO is sales which are subdivided into trade sales, secondary sales and buybacks. Less profitable buyouts are sold to a strategic investor (trade sale) or a private equity fund (secondary sale) or the entrepreneur (buyback). The probability of exit through buyback is the highest in France since LBO projects are very often LMBO projects which are contracted to save a family business or

call the project a Leveraged Management Buy Out LMBO)...

[4]See among others Barry et al. (1989), Gompers and Lerner (1994), Fenn et al. (1995), and Muscarella and Vetsuypens (1990).

to sell the buyout to the heirs of the founding family. Then, the buyout organizes the financing of an ownership change (Fenn et al., 1995 and Chérif, 2004).

There are many papers dealing with the choice of the exit route in private equity investments; mostly in venture capital. However, few papers mostly empirical, explain the choice of the exit vehicle in buyout investments. They argue that the exit decision and route depend on the target's performance.

For instance, Giot and Schwienbacher (2007) argue that the exit decision depends on the type of exit strategy and on the timing. For instance, biotechnology and Internet projects are the fastest in exiting through IPO. Unprofitable Internet firms are written off quickly. The level of innovation in the venture may depend on the choice the exit route. In fact, going public is more profitable than trade sale when the project is very innovative. The IPO exit enables the entrepreneur to remain in the firm, keep its control and get private benefit. Consequently, she is tempted to distort the innovation strategy so that the IPO looks the preferred exit route (Schwienbacher, 2008). Empirical analyses show that IPOs are the most profitable, followed by secondary sales, buybacks and write-offs for less profitable projects (Cumming and MacIntosh, 2003). However, sales' probability is the highest in the buyout stage (Das et al., 2002). Groh and Gottschalg (2008) point out that the US buyout investments clearly outperform the market benchmark.

More recently, Cao and Lerner (2009) conduct a study about the performance of 496 reverse LBO (RLBO) in the USA. Their results indicate that the IPOs that had been bought by LBO investors outperform other IPOs and the stock market as a whole, and that quick flips[5] perform much worse than the firms kept longer than one year by the LBO firm.

Schmidt et al. (2009) analyze the determinants influencing the choice of the exit option. They consider a sample of 666 buyouts in Europe and in the United States between 1990 and 2005. Their results show strong support for signaling effect. If the return is very poor, the LBO firm writes the project off early instead of holding it in his portfolio as *living-dead* buyout: he is able to differentiate between good and bad investments quickly. Only most profitable projects are taking public. Nikoskelian and Wright (2007) consider a sample of 321 UK buyouts, exited between 1995 and 2004. They find a positive relationship between the value increase and the management ownership. Ick (2006) investigates the risk and return relationship of private equity relative to public market equity and finds that the private equity returns depend on the stage of the investment. Later stage investments achieve higher

[5]Private equity firms sell off their investments within a year after acquisition.

risk adjusted returns.

These papers do not consider agency conflicts between the entrepreneur and the LBO fund when they raise the question of exit. Both of them are supposed to have the same criterions to choose the exit route; the preferred exit route must be valuable for the target whatever the revenue-sharing rule and the gains of each party.

My model is also related to the financial literature on the financial structure when there is asymmetric information due to unobservable efforts; these efforts are supposed to increase the project's performance. For instance, Bergemann and Hege (1998), Cornelli and Yosha (2003), Repullo and Suarez (2004), Schmidt (2003)...These papers highlighted the importance of adequate incentive-rewarding schemes, the role of the *stage financing* and convertible securities to mitigate the moral hazard problem. Most of these papers consider a double sided moral hazard model with two agents: the entrepreneur and the VC fund. Only Casamatta (2003) adds a third partner (the pure financier) and shows that under specific conditions, the entrepreneur and the VC fund exert the first-best levels of efforts.

In another brand of the literature, it is showed that the managers' shareholding reduces the agency costs and increases therefore the buyout's performance (Bruton et al., 2002). Going private through a buyout acquisition is a mean to consolidate the firm and to solve agency conflicts before going public (Cornett and Travlos, 1993). Only the firms in a mature development stage can be financed through both the LBO firm and the bank. Andres et al. (2005) conducted a study in the European market. They claimed that the debt solves the agency conflicts in LBO projects, particularly when the managers are not sufficiently monitored and the buyout is very profitable. However, these papers do not consider the financial structure of the target under asymmetric information.

Yousfi (2009) considers a model with three agents: the entrepreneur, the LBO firm and the bank, and argues that the write-off threat leads the two first agents to exert high levels of efforts but does not implement the first best solution with standard debt-equity contracts.

In the current model, we consider that there are two sources of moral hazard. First, the entrepreneur and the LBO firm exert costly and unobservable efforts to increase the probabilities of exit through IPO and sale. Second, to take to target public, the entrepreneur may take very risky decisions in order to get a non transferable and private benefit. These decisions are costly and decrease the probability of the sale exit. The LBO firm prefers a sale exit rather than an IPO. For the stake of simplicity, we assume that this channel does not induce further costs (in contrast with an IPO). This may be explained by the fact that the LBO

firm is well connected with many industries and was deeply involved in many past investments. Consequently, he has the power through his extensive contacts to bring in other industrialists, financiers and other private equity firms. The entrepreneur has very often no past experience in LBO acquisitions. Consequently, the LBO firm is usually more engaged in the sale exit than the entrepreneur. The opportunistic behavior of the latter induces therefore agency conflicts.

Without moral hazard, the project can be implemented in a number of ways. The entrepreneur and the LBO firm must exert strictly positive levels of efforts. Consequently, the entrepreneur is indifferent between hiring an LBO firm who contributes financially and technically to the project and asking for advice from a consultant who does not put money into the target. If the entrepreneur is wealth constrained, the target is financed. This is no longer true under moral hazard: all agents must finance jointly the target. We show that standard debt-equity contracts do not implement the first best solution: the agents exert non optimal levels of efforts.

Moreover, relying on a consultant is too costly for the entrepreneur: when the LBO firm contributes financially, he reduces the cost of his advice. The main insight is that the outside equity raised by the private-equity investor compensates the entrepreneur for the rent that she would leave to induce him to exert high level of effort.

When the financial contracts are chosen to maximize the expected gain of the entrepreneur, we show that risk-taking does not worsens the moral hazard problem in the sense it increases the agents' incentives and induce them to exert high levels of efforts. This result is such a break with pervious literature.

The model and assumptions are presented in the next section. Section (3) derives the optimal financial contracts. Here I analyze the optimal provision of effort and level of outside financing when the entrepreneur may make risky decisions to take the target public. Section (4) discusses the implementation of these contracts with convertible securities. Concluding remarks are in the last section and proofs in the Appendix.

2 The model

Consider a market with a continuum of risk-neutral entrepreneurs. Each entrepreneur is endowed with the opportunity to acquire a firm which costs K, and an initial wealth $w \leq K$, which can, for example, be the heritage or the fortune generated by her past investments. If she needs outside financing, she asks first for financing from the LBO firm. If the latter accepts to undertake the investment with the entrepreneur, he

issues the amount of equity i in exchange of an outcome's share $1-\beta$ where $0 \leq \beta \leq 1$. If they still need further funds, they can turn to the bank to raise the residual capital $I = K - (w + i)$. The revenue-sharing rule β and the outside financing i and I are endogenous to be characterized in the financial contracts. The riskless interest rate r is normalized to zero.

The target's revenues are given by

$$\tilde{X} = \begin{cases} X + B - b & \text{with the probability } \phi + \varepsilon \\ X & \text{with the probability } \phi - \varepsilon \\ C & \text{with the probability } (1 - 2\phi) \end{cases}$$

where

- $X \geq C$, C is the liquidation value of the project.
- $0 \leq \varepsilon \leq 1$, $B \geq 0$ and $0 \leq b \leq X$.
- $\phi = \min\{e + a, 1\}$ and e and $a \in [0\ ,\ 1]$ are the efforts provided simultaneously and respectively by the entrepreneur and the LBO firm. These efforts are unobservable and costly. Let $u(.)$ denote the entrepreneur's disutility of effort and $v(.)$ the LBO's disutility of effort such that:

$$u(e) = \frac{e^2}{\lambda} \text{ and } v(a) = \frac{a^2}{\mu}$$

We assume that the entrepreneur's effort is less costly than the LBO's effort : $\mu < \lambda$ and λ is assumed to be significantly high. This captures the idea that the entrepreneur's effort is more efficient than the LBO's effort: the project relies more on the entrepreneur's expertise.

2.1 Timing

The time line of the game is presented in the following figure:

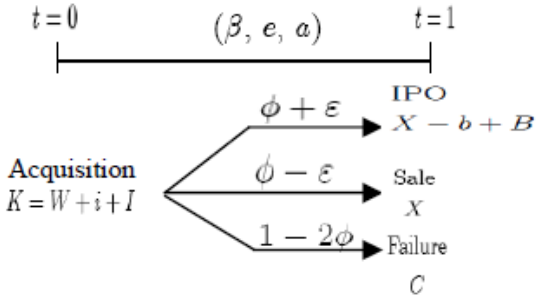

Fig 1- The sequence of events in the model.

- At date 0, the entrepreneur, the LBO firm and the bank sign the holding and debt contracts.
- At date 1, the project is completed. In case of failure, the bank gets the whole liquidation value C. Otherwise, the bank is paid $(1 + r_B) I$ where r_B is the interest rate of the bank ($0 \leq r_B \leq 1$).
  - If the entrepreneur takes very risky decisions, the probability of IPO exit increases by $\varepsilon > 0$ which first is supposed to be exogenous. Risk-taking costs $b > 0$ to the entrepreneur and the LBO firm. The entrepreneur gets a non transferable private benefit $B > 0$ in addition to her outcome's share $\beta [X - (1 + r_B) I - b]$. The residual amount $(1 - \beta) [X - (1 + r_B) I - b]$ is paid to the LBO firm. However, the probability of sale decreases by ε. The project is sold[6] with probability $\phi - \varepsilon$ to financiers[7] and/or industrialists. The entrepreneur will retain $\beta [X - (1 + r_B) I]$ for herself and the LBO firm gets the remainder $(1 - \beta) [X - (1 + r_B) I]$.
  - If there is no risk-taking, the project is sold or taking public with the same probability ϕ ($\varepsilon = 0$). If the exit route is an IPO, exit cost is null ($b = 0$) and the entrepreneur cannot get private benefit ($B = 0$).

2.2 Contracting with the LBO and the bank

1. The holding contract $(\beta\ ,\ i)$

   The LBO firm issues the equity i only if:

   $$\pi_A = (1 - \beta) \{2\phi [X - (1 + r_B) I] - (\phi + \varepsilon) b\} - v(a) - i \geq 0 \qquad (PC_A)$$

   There is a continuum of LBO firms, the competition induces the LBO firm to make the best offer possible to the entrepreneur. Consequently, his expected gain is null.

2. The debt contract $(r_B\ ,\ I)$

   The participation constraint of the bank is written:

   $$\pi_B = [2\phi (1 + r_B) - 1] I + (1 - 2\phi) C \geq 0 \qquad (PC_B)$$

[6] The entrepreneur may acquire the shares of the LBO fund. Here, the exit vehicle is buyback. For simplificity, we assume that sales include trade sales, secondary sales and buybacks.

[7] They may be private equity funds such as LBO funds: the project is then called secondary LBO.

Because of the competition among the banks, the constraint (PC_B) is binding.

The expected gain of the entrepreneur is written:

$$\pi_E = 2\phi\beta\left[X - (1 + r_B)\, I\right] + (\phi + \varepsilon)\left[B - \beta b\right] - u\,(e) - w \qquad (1)$$

Given the fact that participation constraints of the LBO firm and the bank are binding, we replace $w = K - i - I$ in (1). The expected revenue of the entrepreneur is therefore written:

$$\pi_E = \phi\,(A + B) + \varepsilon\,(B - b) + C - u\,(e) - v\,(a) - K \qquad (2)$$

where $A = [2\,(X - C) - b]$.

2.3 The first best

As a reference point, let us define the first best efficient investments when there is no moral hazard and when the entrepreneur abstains from taking excessive risks. Consequently, the project will be financed. This corresponds to the first best solution.

Let

$$V\,(e,\, a) = 2\phi\,(X - C) + C - u\,(e) - v\,(a) - K$$

be the social value of the project. The first best efforts are given by the first order conditions of $V\,(e,\, a)$. They are written:

$$e^{FB} = \lambda\,(X - C) \quad \text{and} \quad a^{FB} = \mu\,(X - C) \qquad (3)$$

It is straightforward to see that the entrepreneur provides the highest effort because it is less expensive than the LBO's one. But, as expected, the increase of the parameters λ and μ leads to a decrease of the efforts' costs which increases e^{FB} and a^{FB}. Moreover, they are increasing with the difference between the revenue X obtained if the target is taking public (IPO) or private (sale), and the failure revenue C.

The optimal social value of the project is therefore given by

$$V^{FB} = (\mu + \lambda)\,(X - C)^2 + C - K$$

There are many ways to implement the first best: the identity of the agent providing funds and efforts is irrelevant. The entrepreneur and the LBO firm may rely only on debt financing to fund the acquisition $(K = I)$. They can also finance the project through a standard equity contract: one of them or both can provide financing, in the sense $K = i + w$. Accordingly, the entrepreneur between asking for finance and advice from the LBO firm and hiring a consultant who provides only advice. This is no longer true under moral hazard.

2.4 The efforts in equilibrium

When the efforts are unobservable, each agent chooses the level of effort which maximizes his expected gain but he/she must take into account the level of effort exerted by the other agent.

These efforts are solutions of the following programs:

$$\hat{e} \in \arg\max_{e} \pi_E \quad \text{and} \quad \hat{a} \in \arg\max_{a} \pi_A$$

The first order conditions of π_E and π_A give the results summarized in the following lemma:

Lemma 1 *The equilibrium levels of efforts $\hat{e}$ and $\hat{a}$ are given respectively by:*

$$\hat{e} = \frac{\lambda}{2}\beta\left\{2\left[X - (1+r_B)\,I\right] - b\right\} + \frac{\lambda}{2}B \tag{4}$$

$$\hat{a} = \frac{\mu}{2}(1-\beta)\left\{2\left[X - (1+r_B)\,I\right] - b\right\} \tag{5}$$

We assume $[\lambda\beta + \mu(1-\beta)]\left\{2\left[X - (1+r_B)\,I\right] - b\right\} + \lambda B < 1$ $(A.1)$ to ensure that the probability ϕ is inferior to 1. If there is no risk taking, ϕ is the probability that the LBO firm will exit through IPO or sale. Notice that B and b affect the agents' incentives, in contrast with ε. The assumption that risk-taking increases the probability of IPO exit and decreases the probability of sale exit with the same probability ε is an important one. The two effects cancel each other from an incentive point of view.

The entrepreneur's effort increases (respectively decreases) with the amount of the private benefit B (respectively the cost exit b) and with her share of revenue β. In contrast, the LBO's effort is a decreasing (respectively increasing) function of b (respectively his share of revenue $(1-\beta)$). At a first sight, the effort $\hat{a}$ does not depend on the private benefit B since it is not transferable but the optimal sharing rule, as showed below, is a function of B.

The optimal financial contracts should induce simultaneously both parties to exert high levels of efforts: if we give high outcome's share to one of them, this will increase his or her incentives to exert high level of effort but it will decrease the incentives of the other one. Notice that these efforts are independent: the entrepreneur and the LBO firm have dominant strategies.

If there is no excessive risk taking problem, we replace $B = b = 0$ in (4) and (5) to get the agents' efforts: $\hat{e} = \lambda\beta\left[X - (1+r_B)\,I\right]$ and

$\hat{a} = \mu(1-\beta)[X-(1+r_B)I]$. To induce the entrepreneur and the LBO firm to exert the first-best levels of efforts, the debt's payments should be decreasing with the project's outcome and $C < X \leq 2C$ (in other words, the buyout should be not very risky)[8]. But this is not a feature of a standard debt contract since the bank is expecting the highest payment in the good state of the nature.

Adding excessive taking risks is supposed to worsen the moral hazard problem: in the sense, the entrepreneur will exert high level of effort in contrast with the LBO firm.

Now, the first best efforts are implemented only if the efforts $\hat{e}$ and $\hat{a}$ satisfy respectively (3) which gives:

$$\hat{\beta} = \frac{2(X-C)-B}{4(X-C)-B}$$

$$\hat{I} = (\mu+\lambda)(X-C)[B-b-2(X-C)]+C$$

$$\hat{r}_B = 1 - \frac{2C-X+\frac{1}{2}(B-b)}{\hat{I}}$$

$$\hat{\imath} = (\mu+2\lambda)(X-C)^2 - \frac{2(X-C)}{4(X-C)-B}\varepsilon b$$

$$\hat{w} = K - \hat{\imath} - \hat{I}$$

Notice that these contracts exist under the condition $C + \frac{1}{2}(B-b) < X \leq 2C + \frac{1}{2}(B-b)$ which means that the project is not very risky and the bank's payments should be decreasing with the project's outcome: $(1+r_B)I < C$. Consequently, we conclude that there are no debt-equity contracts that induce the entrepreneur and the LBO firm to provide optimal efforts.

3 Optimal financial contracts

The optimal financial contracts maximize the expected gain of the entrepreneur (1) subject to the participation constraints of the LBO firm and the bank (PC_A) and (PC_B), and the incentive constraints (4) and (5). Furthermore, we add the feasible condition $K = w + i + I$ and constrain the bank's payments to be nondecreasing with the project's outcome:

$$(1+r_B)I \geq C \tag{6}$$

[8]If the bank was a pure financier, in the spirit of Casamatta (2003), it would be possible to reach the first-best levels of efforts (only if the project is not very risky). The pure financier is regarded as a *budget breaker*. This is not enough when the project is very risky ($X > 2C$) because the levels of e^{FB} and a^{FB} become very high and we need high powered incentive scheme.

We replace i and I by their expressions given by (PC_A) and (PC_B) in π_E. The entrepreneur's program is to maximize the net present value of the project:

$$\arg\max_{\beta,\, I} \pi_E = \phi\,(A+B) + \varepsilon\,(B-b) + C - u\,(e) - v\,(a) - K$$

$$\text{s.t} \quad 0 \leq \beta \leq 1,\, C \leq (1+r_B)\, I \leq X,\ (4) \text{ and } (5)$$

In the first best, we showed that the entrepreneur may not invest money. This is no longer true when the levels of efforts are not observable.

Proposition 1 *Under moral hazard, the entrepreneur maximizes her expected gain by hiring both the LBO firm and the bank.*

The proof is presented in the appendix A.

Under moral hazard, all agents must contribute financially to the target. In contrast with the previous section, the entrepreneur now prefers hiring an LBO firm rather than a consultant; the latter is too costly for her. In fact, the rent that she would leave to the consultant is too high compared with the LBO firm. The amount of equity $\hat{\imath}$ issued by the LBO firm comes as a compensation for the "agency" rent left to the LBO firm for incentive motive. In other words, when he contributes financially to the buyout, he reduces the cost of the effort a.

The optimal debt contract does not depend neither on the efforts' problem nor on risk taking. The bank is paid the liquidation value C not only if the firm fails but even if it is taken public or sold. Lending money to the entrepreneur and the LBO firm is not a risky task since the bank will get his money back. The interest rate r_B must be null. In contrast, given λ high and the assumption $(A.1)$, the amount of outside equity is larger when the entrepreneur chooses an opportunistic behavior. Also, according to the condition $K = w + i + I$, the entrepreneur issues now smaller amount of equity.

If the entrepreneur is wealth constrained, in the sense $w < \hat{w}$ (where $\hat{w}$ is defined in the appendix A), only the projects where the entrepreneur is wealthy enough (has an initial wealth superior to the minimal level $\hat{w}$) are undertaken and financed through both the LBO firm and the bank: the other projects have to look for other ways of financing.

Let us see under what conditions the entrepreneur would take very

risky decisions:

$$\frac{\lambda^2(\lambda+2\mu)+\mu^2(\mu+2\lambda)}{4(\lambda+\mu)^2}(A+B)^2+\varepsilon(B-b)+C-K$$
$$>\frac{\lambda^2(\lambda+2\mu)+\mu^2(\mu+2\lambda)}{(\lambda+\mu)^2}(X-C)^2+C-K$$

where the left-hand side is the expected gain of the entrepreneur if there is risk-taking, and the right-hand side is her gain otherwise. This condition is satisfied only if the amount of the private benefit is larger than the risk-taking cost $B > b$ $(A.2)$. This is a surprising result since she would pay only βb if the project is taking public and the residual cost $(1-\beta)b$ is paid by her partner. But, for incentive motive, she must surrender to the LBO firm an additional outcome's share[9] $\frac{\mu}{\mu+\lambda}\frac{B}{A}$ which is increasing with both the private benefit and the risk-taking cost. In the remainder of the analysis, $(A.2)$ will be assumed to hold.

If there is risk-taking, the optimal financial contracts show that the amount of equity issued by the entrepreneur decreases with B and increases with b and ε. The explanation is that the financial contribution of the LBO firm increases with B and decreases with b and ε, in contrast with the amount of raised debt which depends only on the liquidation value and the interest rate of the bank.

The increase of the private benefit B and the cost of risk-taking b lead to a decrease (respectively an increase) in the outcome's share given to the entrepreneur (respectively the LBO firm). This result is very intuitive since an increase of the risk-taking cost b affects in a negative way the LBO's incentives. Consequently, in the optimal contracts, the entrepreneur must surrender to him a higher share's outcome. In contrast with the LBO firm, these contracts must assign to the entrepreneur a lower outcome share to make risk-taking not too attractive.

If the entrepreneur abstains from risk-taking, the optimal revenue-sharing rule assigns to her the highest outcome's share $\left(\beta=\frac{\lambda}{\lambda+\mu}\right)$. The effort e is less costly than a, so it is efficient to give her high incentives. This is no longer true when she takes very risky decisions : if the amount of the private benefit is too large in the sense $B > \frac{\lambda-\mu}{2\mu}A$, the optimal contracts give the highest share to the LBO firm to let him exert high level of effort. Despite the fact that the two efforts are perfect substitutes, whether there is excessive risk-taking or not, the entrepreneur exerts higher level of effort than the LBO firm.

[9] Without risk-taking, the LBO'share is $\frac{\mu}{\mu+\lambda}$ otherwise he gets $\frac{\mu}{\mu+\lambda}+\frac{\mu}{\mu+\lambda}\frac{B}{A}$ and the entrepreneur $\frac{\lambda}{\mu+\lambda}-\frac{\mu}{\mu+\lambda}\frac{B}{A}$.

With standard debt-equity contracts, the two agents provide non optimal efforts:

$$\hat{e} = \frac{\lambda^2}{2(\mu+\lambda)}(A+B) \qquad ((BB5))$$
$$= \frac{\lambda^2}{(\mu+\lambda)}(X-C) + \frac{\lambda^2}{2(\mu+\lambda)}(B-b)$$
$$\hat{a} = \frac{\mu^2}{2(\mu+\lambda)}(A+B) \qquad ((BB6))$$
$$= \frac{\mu^2}{(\mu+\lambda)}(X-C) + \frac{\mu^2}{2(\mu+\lambda)}(B-b)$$

It is easy to check that they increase with the entrepreneur private benefit B and decrease with the risk-taking cost b. Given the condition $(A.2)$, it is straightforward to see that these efforts are higher than those provided when there is no risk-taking $(B = b = 0)$.

The efforts' problem worsens moral hazard in contrast with risk-taking. This result is such a break with previous literature that argue that risk-taking worsens moral hazard. Our result is explained by the fact that we consider financial contracts that maximize the expected gain of the entrepreneur and a competitive LBO market. Accordingly, LBO expected gain is null.

4 Does leverage help to reduce risk-taking?

In order to answer the question, we consider hereafter that the target is financed only through equity. The LBO firm is the only outside financier. He issues the residual capital $i = K - w$.

In contrast with previous sections, the collateral C is shared between the entrepreneur and the LBO firm.[10] Consequently, the participation constraint (PC_A) is written:

$$\pi_A = (1-\beta)\{2\phi(X-C) - (\phi+\varepsilon)b + C\} - v(a) - i$$

The expected revenue of the entrepreneur is given by:

$$\pi_E = \beta\{2\phi(X-C) - (\phi+\varepsilon)b + C\} + (\phi+\varepsilon)B - u(e) - w$$

The incentive constraints of the LBO firm and the entrepreneur are given by the derivative of π_A and π_E with respect to a and e. Their efforts in equilibrium are therefore given by:

$$\hat{e} = \frac{\lambda}{2}(\beta A + B) \quad \text{and} \quad \hat{a} = \frac{\mu}{2}(1-\beta)A \qquad (7)$$

[10] Whether the collateral C is shared between the entrepreneur and the LBO firm or assigned to one of them, our results do not vary.

Consequently, the optimal financial contracts are supposed to maximize π_E under the participation constraint of the LBO firm, the incentive constraints (7) and the feasible condition $K = w + i$. The entrepreneur's program becomes:

$$\arg\max_{\beta} \pi_E = \phi(A+B) + \varepsilon(B-b) + C - u(e) - v(a) - K$$

$$\text{s.t} \quad 0 \leq \beta \leq 1 \text{ and } (7)$$

We replace the efforts in the objective function. Given the fact that $w = K - i$, the expected revenue of the entrepreneur is written

$$\arg\max_{\beta} \pi_E = \left\{\tfrac{1}{2}\left[\lambda\beta + \mu(1-\beta)\right]A + \tfrac{\lambda}{2}B\right\}(A+B) + \varepsilon(B-b) - \tfrac{\lambda}{4}(\beta A + B)^2 - \tfrac{\mu}{4}(1-\beta)^2 A^2 + C - K$$

The first order condition of π_E enables us to deduce that $\hat{\beta} = \frac{\lambda A - \mu B}{(\mu+\lambda)A}$. Then, it is easy to check that the entrepreneur and the LBO firm exert the levels of efforts $((BB5)$ and $((BB6)$. Whether there is risk-taking or not, equity contract does not implement the first best but leads them to exert the same levels of efforts as with debt-equity contracts. Financing the project through the LBO firm and the bank or solely through the LBO firm lead the two agents to exert the same levels of efforts. Debt financing is not used to lead the entrepreneur and the LBO firm to exert the first-best levels of efforts. This result does not join the financial literature which highlights the disciplinary value of debt (see among others Jensen and Meckling, 1976, Jensen, 1986, 1989, Kaplan and Strömberg, 2008...). One explanation is that debt and equity are substitutes, in the sense we ignore some features of the debt financing, like for example, the deductibility of the debt's interests (see appendix B). Another explanation is that the bank is paid the whole liquidation value in the bad state of nature, and simultaneously her payments are supposed to be nondecreasing with the project's outcome. The bank is therefore a passive financier. The presence of such financier along with the LBO firm and the entrepreneur is irrelevant from an incentive point of view since it does not increase the levels of efforts.[11]

5 Conclusion

This paper analyzed the financial structure when there is an excessive-risk taking. The entrepreneur and the LBO firm provide simultaneously non observable efforts which improve the project's performance. They

[11] See Appendix B to explain why buyouts are levered.

face a double moral hazard problem. We show that there are no debt-equity contracts that solve the moral hazard.

Adding the excessive taking risk worsens the moral hazard, in the sense, it leads the entrepreneur to provide higher level of effort, in contrast with the LBO firm. The opportunistic behavior of the entrepreneur decreases his incentives to exert effort and leads him to raise a small capital.

In the current paper, we studied the features of debt-equity contracts. However, the use of convertible securities becomes prevalent in buyout investments. These securities are rarely issued in the presence of passive financiers such as banks and other outside equity holders. In practice, the LBO firm can convert his debt/stocks into equity in order to get the majority of the voting rights. It would be interesting to study how the use of these securities influences the agents' incentives as well as the financial structure, namely the debt to equity ratio.

Despite the fact that the *strip financing* and the *debt syndication* are commonly used to mitigate agency conflicts between the entrepreneur and the LBO firm, there are no academic papers analyzing how they solve such problems under asymmetric information.

Appendix

A Proof of proposition 1

The straight application of the Kuhn-Tucker theorem enables to deduce the following financial contracts:

$$\hat{\beta} = \frac{\lambda A - \mu B}{(\mu + \lambda) A}$$
$$(1 + r_B) \hat{I} = C$$
$$\hat{\imath} = \frac{\mu}{(\mu + \lambda)} (A + B) \left[\frac{\mu^2 + 2\lambda^2}{4 (\mu + \lambda)} (A + B) - \frac{\varepsilon b}{A} \right]$$
$$w = K - C - \hat{\imath}$$

Assume $A \geq \frac{\mu}{\lambda} B$ to ensure that the optimal revenue-sharing rule $\hat{\beta} > 0$. The interest rate of the bank is therefore null $r_B = 0$. The buyout is not risky for the bank since he will get his money back.

It is easy to check that the entrepreneur and the LBO firm will not provide the first-best levels of efforts. Their efforts are given by

$$\hat{e} = \frac{\lambda^2}{2 (\mu + \lambda)} (A + B) < e^{FB}$$
$$\hat{a} = \frac{\mu^2}{2 (\mu + \lambda)} (A + B) < a^{FB}$$

Then, the expected gain of the entrepreneur is:

$$\hat{\pi}_E = \frac{1}{4} \left[\mu + \lambda - \frac{\mu \lambda}{\mu + \lambda} \right] (A + B)^2 + \varepsilon (B - b) + C - K < V^{FB}$$

More formal proof is available upon request.

B Why buyouts are heavily in debt?

One among the explanation for the involvement of bank in LBO acquisitions is a mean to save taxes. The tax deductibility of the debt's interests seems to be a convincing theoretical rationale for the involvement of banks in buyout acquisitions.

Let τ denotes the corporate income tax, $0 \leq \tau \leq 1$. If the exit route is an IPO, the revenue after taxation is

$$(1 - \tau) [X - (1 + r) I - b] + (1 + r) I = (1 - \tau) (X - b) + \tau (1 + r) I$$

where $(1-\tau)[X-(1+r)I-b]$ is shared between the entrepreneur and the LBO firm. If the exit route is a sale, the revenue after taxation is

$$(1-\tau)[X-(1+r)I]+(1+r)I=(1-\tau)X+\tau(1+r)I$$

where $(1-\tau)[X-(1+r)I]$ is shared between them. Otherwise, the project fails and they have no payments.

After some manipulations, the straight application of the Kuhn-Tucker theorem shows that debt financing is the only source of funds (the entrepreneur and the LBO firm does not contribute financially to the project). The use of debt does not improve the agents' incentives but it creates an incentive to be "*heavily*" in debt.

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