The Effects of Incentive Structures on the Performance of Publicly Funded Venture Capital Funds

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Abstract

A majority of developed countries have realized the importance of functioning venture capital markets for job creation, innovation, and economic growth. Accordingly, governments have taken measures to support the development and efficient functioning of national venture capital markets. As a policy response, particularly in the more problematic early-stage investment area, many countries have set up government financed support programs to channel risk capital to new ventures through private VC funds. The choice of the incentive structure for a publicly co-financed and privately managed venture capital fund is crucial for the success of a program. However, there is very little robust research determining the actual effects of different structures on fund performance. A comparison of government VC structures has been hindered by both the variety of utilized structures and the plurality of domestic environments. In this study, we examine the effects of different incentive structures on the performance of publicly co-financed venture capital programs under changing market conditions by comparing these structures in a simulation model.

Introduction

Over the two decades, governments have increasingly channeled public financing to new ventures through private sector venture capital investors. This has reflected a popular policy belief that using professional investors as program agents is more effective than the government itself attempting to act as a venture capitalist. These venture capital investment funds are typically structured as 'limited liability partnerships', which are set up with a contract between the investors (the limited partners or LP) and the managers of the fund (the general partners or GP). After the fund is established and there is capital committed, the investors are legally constrained from a direct involvement in the operation of the fund in order to keep preferential tax advantages. Thus, the *ex ante* structuring of the fund and detailed contractual commitments are essential for the limited partners in order to control the conduct of general partners during the lifetime of the fund.

When the public sector co-invests with private sector investors, the former's political goals may conflict with the interests of profit maximizing limited and general partners. Governments typically seek primarily welfare outcomes through generation of employment, fostering of innovation, and the support of economic growth. Conversely, the commercial participants in the fund seek the potential high returns of the asset class. The problems of conflicting public and private interests are especially evident in cases where a government attempts to channel funding to a sector or investment stage which does not generate attractive returns to private investors, and where a market failure may exist.

In order to encourage additional funding to areas that are unattractive to private sector investors, governments need to devise mechanisms to support the market and to incentivize private sector interest. Several alternatives have been deployed in numerous countries to facilitate the injection of public funding to these sectors. The results of these mechanisms are as diverse as the underlying structures. However, the assessment of the effectiveness of each individual structure is impeded by the heterogeneity of underlying political, economical and societal structures. Governments facing the decision how to structure their intervention have to rely on evidence from the performance of tested structures that is obscured by the idiosyncrasy of the national mechanisms. Coherent policy comparisons of cause and effect are very difficult to make.

Earlier research on the subject reflects this complexity. Although there are multiple studies on the performance of differing structures, these analyses mostly operate on country specific level (e.g. Lerner, 1999). Where international comparisons are attempted, the conclusions are necessarily highly qualified (e.g. Maula & Murray, 2003). Mainstream research on venture capital touches this subject in its focus on relationship between investors and managers of venture capital funds. Yet, substantive research from the investors' perspective itself is limited. Those few studies that address the subject mostly cover issues such as the structures of relationship (Sahlman, 1990; Wright & Robbie, 1998), the compensation and incentives of fund managers (Cooper & Carleton, 1979; Gompers & Lerner, 1999), and the structuring of fund agreements (Brophy & Haessler, 1994). However, these studies sensibly assume that all limited partners invest on equal terms.

This governance problem of conflicting investors' interests is also addressed in the larger theoretical literature. An underlying problem is how to structure the contract between the limited partner (the principal) and the venture capitalist (the agent) in such a way that the fund yields a socially optimal outcome. Incentive and reward structures have received extensive attention in the literatures of finance (e.g. Noe & Rebello, 1996), agency (e.g. Jensen & Meckling, 1976), and contracting. Specific to venture capital, the research has mostly concentrated on contracting between the venture capitalist and the entrepreneur (e.g. Admati & Pfleiderer, 1994; Bergemann & Hege, 1998; Gompers, 1995; Hellmann, 1998; Kaplan & Strömberg, 2000; Sahlman, 1993; Trester, 1998) and between venture capitalists (Admati & Pfleiderer, 1994; Cumming, 2001). While the contracts between limited and general partners share the same aspects of

agency, asymmetric information and contracting as the commitments between VCs and the ventures, there is only limited research on the former subject. A notable exception is Gompers and Lerner (1996) who study the use of covenants in venture partnership agreements.

Thus, the earlier research while valuable is problematic. On one hand, when assessing the performance of individual programs, the idiosyncrasy of systems loses the distinctive characteristics of fund structures. On the other hand, when considering the relationship between the limited and managing partners, it does not address a situation where one of the investors would have other goals than maximizing return on investment.

This study aims to address this gap by providing an initial examination on the characteristics and performance of various fund structures used in channeling public funding to support new, entrepreneurial firms. The research question of this paper is: What are the effects of different incentive structures on the behavior and performance of publicly funded venture capital programs? To answer this question, we first chart the range of incentive structures that are used in publicly funded VC funds and review their implications for the fund performance. Second, we compare these structures employing a simulation model to examine the differences in performance under changing market conditions.

This study seeks to make three contributions. Firstly, we survey the scope of fund structures used in public/private co-financed venture capital programs. Secondly, we examine the nature of these structures under a neutral setting, thus separating the effects of the structures from the effects of the surroundings and their interaction with the embedded programs. This enables undistorted comparison between the structures. Thirdly, we provide insight for public decision makers on how to structure future funds by examining the outcomes and risks of known structure types.

Government Venture Capital

The venture capital funds are predominantly structured as limited liability partnerships (LLPs), in which investors become limited partners and venture capital fund managers are general partners (Sahlman, 1990). While the venture capitalist firm acts as a vehicle to mitigate the inherent uncertainty, asymmetric information and agency costs of investing directly in new ventures (Amit, Brander, & Zott, 1998; Barry, Muscarella, Peavy, & Vetsuypens, 1990; Bergemann & Hege, 1998; Megginson & Weiss, 1991), the same conflicting interests are present between the general and limited partners. In a typical LLP, the general partner effectively holds complete control over the committed funds and the investment process of the partnership although it provides typically no more than 1% of the funds capital (Gilson, 2003; Sahlman, 1990). This structure is beset by various types of agency conflicts and the compensation structures are specifically designed to resolve these issues. The primary compensation of the general partner consists of typically 20% of the net capital gain ('carried interest') but only after returning the LP's capital with a minimum level of interest ('hurdle rate') (Gompers & Lerner, 1999). The carry incentive is designed to align directly LP and GP interests.

Because of the effectiveness of the US venture capital model in solving the problems associated with financing and nurturing of high risk, new ventures, governments have increasingly channeled public financing to new ventures through private sector venture capital investors. Venture capital is seen to have a positive impact on job creation, innovation, and economic growth (Kortum & Lerner, 2000; NVCA, 2002), thus giving governments an incentive to support and grow their domestic venture capital industries. The main role for governments is considered by practitioners to be in the creation of favorable fiscal and legal environment for venture capital financing (EVCA, 2003). Direct involvement in new venture investment by government agencies carries a material risk of market disruption through the misallocation of capital and the crowding out of private investors due to inexperienced personnel and differing return requirements (Leleux & Surlemont, 2003). However, supporters of the direct involvement of government as investor frequently employ the arguments of market failure. A market failure occurs when market price mechanisms fails to produce socially optimal outcome. In the case of venture capital, it has been argued that there exists a persistent market failure in the financing of new ventures (Hyytinen & Pajarinen, 2003). The risk-return characteristics are unfavorable for private investors to engage in early stage ventures. However, as new ventures may create technological spillovers and social outcomes in addition to financial outcome, it may be beneficial for a government to intervene in a venture capital market. The situation is however specific to national markets, and while Hyytinen and Pajarinen (2003) conclude that there exists a lack of financing in certain technological sectors of SMEs in Finland, Bank of England (2001) did not find any substantial evidence for a market failure in the financing of technology-based small firms. The difficulties of determining what a market failure is and what is more properly seen as ineffective demand (i.e. investors who are not market ready) is an endemic problem with early-stage investing.

Although there is a lack of unambiguous evidence in the literature both on the existence of market failures and the effect of venture capital on economic growth, the perceived benefits of direct involvement of governments in venture capital markets have resulted in multiple national vehicles (See e.g. a review in Maula & Murray, 2003). This investment activity is typically directed towards areas, where private markets are underdeveloped, e.g. early-stage investing in technology ventures. In order to correct these failures in domestic VC markets, most countries have set up governmental VC organizations to invest either directly in ventures or indirectly as a limited partner in third party established VC funds. The indirect investments are done in co-operation with private sector investors. The structures of these vehicles vary by country (Armour & Cumming, 2004; Gilson, 2003; Maula & Murray, 2003). While organizations such as the European Investment Fund and the Finnish Industry Investment Ltd. have favored investing on equal terms with private sector (pari passu), the original Israeli Yozma-fund was structured to provide a buy-out option for private sector management participants thereby rewarding high investment performance. The German approach has included in addition to investment incentives a 'down side' guarantee for losses provided by the state (Maula & Murray, 2003). In their analysis of these various structures, both Gilson (2003) and Maula and Murray (2003) pointed out the importance of the incentive structures in government sponsored venture capital programs. Both studies noted that compared to

of the incentive structures in government sponsored venture capital programs. Both studies found that compared to guarantees on downside risk, structures which create incentives to exceed performance expectations (such as capped return for the government investor or a buy-out option for private investors) are likely to be more effective. Murray and Marriott (1998) also support this conclusion. However, due to the idiosyncratic contexts in which different models have been tested, the strength of the case-based evidence on the effectiveness of various types of government venture capital programs and resultant incentive structures is hampered. Therefore, we attempt to contribute to the understanding of the performance effects of different types of incentive structures by building a simulation model of a venture capital fund that can be used to compare various structures in a homogeneous context.

Simulation Model

Organization of Simulation

To explore the effects of profit distribution structures on the performance of the funds and on the outcomes to both the LPs and GP, we model the operations and organization of a venture capital firm using a Monte Carlo simulation model executed with Microsoft Excel. We build the simulation starting from the investment behavior of the fund manager (GP). By making the venture capitalist's behavior and investment decisions endogenous components of the simulation, we are able to study the effects of the incentives on the outcomes of the fund.

The organization of the simulation is as follows. We assume an investment window of four years and fixed term fund of ten year's duration. Investments arrive at equally spaced intervals within the investment window after which each investment goes through two additional investment rounds and an exit. Each step is assumed to take two years, thus resulting in total six years for an investment in the portfolio. At each investment round, the GP assesses the investment according to its previous development and expected outcomes, and makes a decision whether or not to continue the investment. Should the venture reach the exit phase, the investment is liquidated and cash is distributed to the LPs of the fund. Once the hurdle rate is met, the GP also participates in any further distributions on the agreed ratio of the carry (20:80). After the all investments are concluded, either by a market exit or project abandonment, the cumulated net capital gains are calculated for all parties.

Portfolio and Scenarios

We simulate the portfolio of the venture capitalist GP as consisting of 15 identical investments. The behavior and development of the investments are modeled as a scenario tree, following the example and parameterization of Murray and Marriott (1998). The development of a venture is simplified to three stages corresponding to the initial and two follow-on investment rounds. At the end of each investment period, the venture has four development outcomes expressed as a multiple for the change in the value of the venture over the preceding two years. In total, the scenario structure results in 64 different outcomes (i.e. 4 x 4 x 4) after the third stage. The terminal value of the venture is determined by the success of each investment round as it from stage to stage. This development is randomized using probabilities for each of the four investment outcomes for each of the three stages.

Market Development

While the development of the venture is modeled using a scenario tree structure, the outcomes from an investment are determined both by the development of the venture while in the portfolio and by the attractiveness of the exit market once the venture capitalist seeks to liquidate its investment. To combine these both characteristics, we first calculate the value of the investment for each of the outcome alternatives using the value multiples provided by Murray and Marriott (1998). Second, as this multiple approach results in a range of potential values for the venture at the last stage, we convert these values to an index using the highest outcome as a benchmark. In this case, if the venture achieves the most desirable outcome at the end of each of the three sequential investment periods, the resulting relative value is one. The other 63 outcomes receive values between zero and one.

This conversion offers us a means to relate the prevailing market situation to the value of an investment. We use the exit value of the most successful venture as a market value indicator, and as we have benchmarked the other outcomes to the highest value, we can simulate the market development with this indicator. Thus, the scenario tree depicts the internal development of the venture, while the market situation captures the development of external factors. Should the portfolio venture develop internally to its full potential without problems in the organization, growth, and execution of the business plan, it is able to realize the highest market value possible at the time of the exit. However, as the exit market fluctuates independently of individual ventures, the outcome values cannot be fully modeled using the scenario tree exclusively.

Decision Making

When receiving a new investment proposal or considering an existing portfolio company with the need of an additional round of finance, the decision of the GP to invest is determined by two factors. First, the GP assesses the investment independently and without reference to the rest of the portfolio. Thus, if the focal investment is expected to reach an acceptable risk adjusted return, the investment is made. When assessed as an individual investment, previously committed capital and other resources (advice) are treated as sunk costs. However, the additional investment has also to be assessed by its impact on the terminal performance of the enlarged fund. The second component of the venture capitalist decision making is thus the expected return from the fund. Invariably, the cash flows to the GP are only partially dependent on any individual venture. Thus, when a venture capitalist manages a fund that is significantly out of

the money (i.e. it is not expected to reach the hurdle rate i.e. the threshold level for the carried interest compensation), it is financially rational for the VC to discard investments that would be financially sound as standalone ventures. Thus, for a favorable investment decision, first the investment opportunity has to be attractive, and second, the rational incentives for the GP to make the investment have to be in place.[1]

Incentive Structures

As the decision making of venture capitalist is based on expected cash flows, the profit distribution structure is of crucial importance. The distribution structure consists of two distinctive parts. First, for the GP compensation we use the standard structure consisting of a management fee of 2.5% of the fund size and 20% share of profits after a hurdle return of 5%. It is assumed that the fee only covers operational costs and does not constitute a source of profit. Further, general partners are required to provide an investment of 1% of the fund size (Gilson, 2003; Gompers & Lerner, 1999; Sahlman, 1990). We hold this general partner specific compensation structure constant across the simulations. Second, the variable part of the structure consists of the terms of investments of the LPs. We construct four alternative structures for the profit distribution and study their effects on the incentives and fund's net returns. First, as a benchmark, we use the standard venture capital fund structure, where LPs invest on equal terms (pari passu) with no distinction between private and public investors. Second, we study a model where public investor's committed capital is drawn down before calls on the private LPs. Third, we use a structure where the returns of public LP are limited to a predetermined level of 5%, and the remaining profits are distributed to the private LPs and the GP. Fourth, we implement a guarantee scheme, where the governmental investor provides a guarantee for private investors, which covers 75% of the project investment losses of private investors and GP.

Interrogating the Model

We compare the different profit distribution structures under two specific market scenarios. We first run the simulations for each structure with a market level corresponding to an expected return of 18% for investors. This is a figure comparable to long run VC returns in the US market. Then we use an alternative scenario where we introduce a downward step of 25% in the markets valuations after four years into the life of 10-year fund, i.e., after closing of the investment window. We execute 500 rounds of simulations for each of the four structure-market combinations to ensure convergence.

Effect of Venture Capitalist's Incentives on Fund Performance

To test the effect of venture capitalist incentives on the performance of the fund, we first compare the fund performance under two types of VC behavior. First, the model follows both of the decision-making components, the net present value of focal investment and the expected terminal value of the portfolio. After running the model under these pari passu conditions, which we define as the base model, we further run the simulation ignoring the portfolio component of decision making. This corresponds to a case where venture capitalist is ignorant to opportunity cost and invests always if the net present value of focal investment is positive. Figure 1 presents the results for our analysis.

Under constant market conditions, both decision methods yield the same results. However, under the scenario where the market falls 25%, the difference is clear. When the GP uses only a simple project NPV rule for decision-making, the distribution of outcomes moves almost uniformly to left, corresponding to a fall of 7.42% in the median return (IRR) of the portfolio. When introducing the portfolio effect to the investment decision, the fall in the median is 9.9%. In addition, the distribution of return shows a strong left hand skew with negative returns and a second peak representing a total loss of invested capital. This effect demonstrates the non-linear effect of GP's incentives on the performance of the fund.

In a fund, unlike a one-off investment choice, the existing portfolio investments are not sunk costs irrelevant to the investment decision. Rather, as the GP's returns are tied to the surplus delivered on the capital and imposed hurdle rate, the situation may occur that the expected future profits from the fund are not large enough to reward the GP. If the fund does not achieve at least the hurdle rate, the returns to the GP are limited to his 1% share as an LP of a poorly performing fund. As GPs face an opportunity cost, the incentives may fail if actual and expected portfolio valuations are too low. This is demonstrated in figure 1. Although the decreased market valuations would results in additional investments being profitable as one-offs, the portfolio effect distorts the GP's incentives.

Robustness of Venture Capitalist's Incentives under Different Distribution Structures

As the portfolio, effect may lead to failure of GP's incentives and lead to the dismissal of financially sound investments, the robustness of venture capitalists incentives under unexpected market conditions become essential. While above we illustrated the effect of the failure of the incentives to the returns, we next study the robustness of incentives under different compensation structures.

We repeated the simulations for the different structures and tested their behavior under the two market scenarios recording the number of occasions, where a financially sound investment was discarded due to failed incentives. While all the structures performed flawlessly under normal market conditions, there were differences in the robustness of incentives when tested under conditions of an adverse market change. Figure 2 present the results from these simulations.

The pari passu structure coincides with the structure used in the examination of the effect of failure on the performance

The pari passu structure coincides with the structure used in the examination of the effect of failure on the performance. We use it here as a benchmark for the other structures, as it represents the standard structure of venture capital funds. When we change the structure to the one in which the public LP leverages the returns to the private LPs by investing in the fund first, the failure rate of incentives increases. This effect is due to the staging of capital investments between public and private investors. The GP provides 1% of the capital to the fund. When public investor invests first, the drawdowns from the venture capitalist are delayed. Once the private LPs investments are required after the public investor has made its contribution, their net present value introduces a higher hurdle than in the pari passu case. Thus, the public investor effectively offers the GP an option to first invest with public money and then observe the development of fund before the decision to invest its own money. This timing, however, also introduces a hurdle that leads to weakened incentives.

When we use the structure, in which the profits for the public investor are limited to 5%, the failure rate is reduced. The limited distribution of profits to the public investor increases the distribution to the private LPs and the GP, thereby strengthening the incentives. The failure rate produced by the guarantee structure is identical to the pari passu structure. In this model, the public investor guarantees 75% of the losses. However, this guarantee does not have an effect on GP decision making as the venture capitalist incentives have failed much earlier in the investment cycle.

While the pari passu model and the guarantee model produce identical failure rates for the GP's incentives, differences emerge when we examine the frequency of those occasions in which public investors lose their capital. (An IRR of -99% indicates the near total loss of all monies invested.). In the guarantee model, the public investor's losses are increased due to the payments to the private LPs, while in pari passu model the losses are equally divided. The effects of the other models of capped public investor profits and of sequential entries of public and private investors are similar. The proportion of funds where public capital is lost is increased with respect to the benchmark when we use the model where the public investor invests first. It should be noted, that this proportion is lower for the sequential investments model than it is for the guarantee model. Although failures in incentives occur more often with sequential model the with the guarantee model, the amplified losses due to the 75% guarantee increase the number of occasions where capital is lost.

It is interesting to note that also the proportion of failed funds is lower for the model where the profits of the public investor are capped. Since the downside is shared equally with the private LP, it seems that the capped profits model is more likely to avoid large losses to government than the other models. On one hand, the profits for the public investor are naturally lower due to the profit cap. However, on the other hand, there is a commensurately lower risk of large losses. Compared to other models the capped return model has a higher probability than other models to produce positive (but capped) returns for the government investor.

These results indicate that although the profit distribution and investment structures are mainly directed to alter the profit distribution between the public and private LPs, they also affect the incentives and actions of GPs. Furthermore, the failure rates are connected to the returns of the public investor through the structures used to share the profits and losses. While the failure rates demonstrate differences among the structures, we emphasize that the context-dependence of the frequencies. Although the direction and relative size of changes in the models can be meaningfully interpreted, the actual frequencies reported are contingent upon the model and its parameters.

Conclusions

In this paper, we set out to analyze the impact of different incentive structures in publicly co-financed venture capital funds on the incentives of general partners and the subsequent performance of the venture capital funds. Prior research focusing on the same problem has relied on case analysis (Gilson, 2003) providing deep insight but making it difficult to differentiate the effects of the incentive structures from the idiosyncratic characteristics of the context in the case countries. In order to allow direct comparison and analysis of the effects of the structures, we resort to modeling and simulation. This allows us to compare directly the behavior of alternative structures under different market scenarios.

In our Monte Carlo simulation, we find that market conditions clearly influence the investment behavior of venture capitalists if they consider the performance impact of each investment on the returns from the total portfolio. As the general partner's compensation is based on the share of capital gain left over after invested capital is paid back with interest (the hurdle), the investment decisions of the GP are affected by the situation of the portfolio as a whole. Investments made earlier in other ventures cannot be treated separately or as sunk costs. This may lead to termination of financially sound additional investments. Optimizing the performance of the portfolio leads to suboptimal outcomes for individual ventures (Gifford, 1997). In our simulation, we find that in a scenario where market has declined rapidly investors considering the impact of investments on the total portfolio may end up giving up investment opportunities that would be attractive when appraised as one-off investments.

Supporting prior case based research, our Monte Carlo simulation also shows that different incentive structures created in the contracts between the public investor, institutional investors and the management firm, do influence the investment behavior of the fund managers (Gilson, 2003). In our study, we find that asymmetric profit sharing between the government investor and the private LPs can lead to improved robustness in conditions of adverse market developments if the incentives are properly structured. In our analysis, we find that the alternative structures in which the returns to government investors are capped to the hurdle rate and returns in excess of this rate are shared between the LPs and the GP yields an incentive structure that is less likely to fail under unexpected adverse market developments. Capped public returns compared favorably to pari passu profit sharing or structures in which government invests before LPs or in which part of the LPs'/GP's losses are guaranteed by the state.

Furthermore, our analyses show that the outcomes from the failure of incentives vary between the alternative structures. In the guarantee structure, where the public investor provides a downside protection for the private investors, the costs are notably increased in the cases where incentives fail. These results are clearly in line with the prior research examining the incentive structures built in government venture capital programs (Gilson, 2003). However, for the first time, using simulation, we are able to disconnect the programs from the underlying idiosyncratic elements and to provide evidence supporting these arguments. Based on our results we can say that the incentive structures implicitly or explicitly built into government venture capital programs influence economically rational investors. The influences may engender outcomes which would be seen as perverse by the public architects of the fund given their socially sub-optimal consequences.

While our results indicate difference among the structures with respect to their ability to create incentives for the GP and to distribute profits and losses among LPs, we emphasis three restrictions on the interpretation of our results. First, the investment behavior of the venture capitalist is modeled with a decision making model based on the opportunity costs of venture capitalist general partner. This model assumes that the GP has feasible and attractive alternatives. However, the legal agreements between general and limited partners as well as the implications on reputation effects usually tie the general partner to the fund. This severely constrains the freedom of venture capitalist to turn to alternative opportunities should the outlook of fund turn unfavorable. Thus, the consequences of the failure of the incentives are not likely to be as total as in the model. However, while a total abandonment of the fund is unlikely, the missing incentives are likely to affect the effort contributed by the management and the consequent outcomes on the fund's performance. Thus, we claim that the results illustrate an existing tendency resulting from the incentive structures of venture capitalist. The relative importance of short run monetary incentives against the contractual and reputational bounds is an interesting question for the further research.

The second assumption in the model that could be relaxed in future research is that GPs cannot change the risk profile of their investments so that in the case of 'out of the money' portfolio they could start to make speculative high risk investments which, if successful, could produce high returns and help the fund to exceed the hurdle rate. The third limitation and source for further research stems from the use of frequencies to describe the differences between the structures. Although our analysis of relative frequencies and changes highlights source of differences in the structures, a valuable contribution from the future research would be the quantification of the net capital gains under each structure. Future research could e.g. aim to quantify the net effect of higher probability of positive returns but capped maximum returns in the capped return structure compared to the standard pari passu model. The paper has important implications for the several governments considering various models of public support for venture capitalist activities in early-stage investments. The incentives that are created as a result of the program structure influence the outcomes and the performance of the program sometimes in unexpected ways. Understanding the effects of different structures is crucial for governments that wish to create successful government venture capital programs that extend beyond one fund raising.

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Note

1. This decision rule assumes a) that GPs have an opportunity cost that is not met without exceeding the hurdle rate and receiving carried interest compensation; and b) that GPs cannot change the risk profile of their investments so that in the case of 'out of the money' portfolio they could start to make speculative high risk investments which, if successful, could produce high returns and help the fund to exceed the hurdle rate (This type of moral hazard is known as 'the asset substitution problem' in corporate finance literature).

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Figure 1

The effect of VC decision-making rule on the fund performance

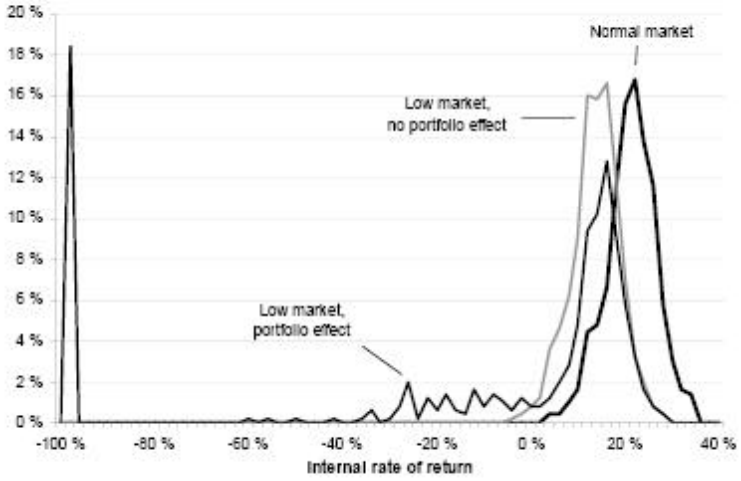

Figure 2

The proportion of simulation rounds, where a financially sound investment was discarded due to failure in the venture capitalist's incentives, and the proportion of funds where the investment from public investor was lost, when the markets face a 25% decline after the 4th year