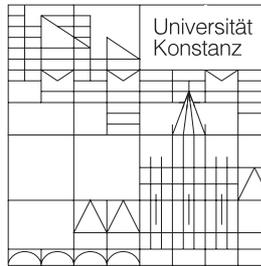


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Dominique Demougin,
Oliver Fabel

The Division of Ownership in New Ventures

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The Division of Ownership in New Ventures

Dominique Demougin

School of Business and Economics
Humboldt University of Berlin
Spandauer Str. 1
10178 Berlin

mail: :demougin@wiwi.hu-berlin.de
phone: +49-30-2093-1341
fax: +49-30-2093-1343

Oliver Fabel

Fach D 144
78457 Konstanz
Germany

mail : oliver.fabel@uni-konstanz.de
phone : +49-7531-88-2990 /-2992
fax : +49-7531-88-4456

Zusammenfassung:

The Division of Ownership in New Ventures

The current study investigates a tripartite incentive contract between an innovator supplying an intellectual asset, a professional assigned to productive tasks, and a consulting firm specialized in recruiting qualified personnel. The liquidity-constrained professional is compensated by receiving a share of one half in the new venture. With continuous search activities of the consultant the pure tripartite partnership implements the consultant's expected profit maximum. The consultant's and the innovator's shares reflect the relative value of search. However, the consultant's optimal search effort is inefficiently low. With binary search and only two innovator types, there may also exist bipartite partnerships of equals between the innovator and the professional, and bipartite partnerships of equals between the consultant and the professional. The latter emerge from complete buy-outs of innovators with low value business ideas.

JEL Klassifikation : M13 (Entrepreneurship), M21 (Business Economics)

Schlüsselwörter : new ventures, tripartite incentive contract, consulting contract, partnerships

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The Division of Ownership in New Ventures

Dominique Demougin
School of Business and Economics
Humboldt University of Berlin*

Oliver Fabel
Department of Economics
University of Konstanz[†]

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*Prof. Dominique Demougin, PhD, Walter Rathenau Chair in Organization Theory, School of Business and Economics, Humboldt University of Berlin, Spandauer Str. 1, 10178 Berlin, Germany; Fone: +49-(0)30-2093-1341; Fax: +49-(0)30-2093-1343; E-Mail: demougin@wiwi.hu-berlin.de.

[†]Prof. Dr. Oliver Fabel, Chair for Managerial Economics, in particular Business Policy, Department of Economics, Faculty of Law, Economics, and Public Administration, University of Konstanz, Box D144, 78457 Konstanz, Germany; Fone: +49-(0)7531-88-2990/-2992; Fax: +49-(0)7531-88-4456; E-Mail: oliver.fabel@uni-konstanz.de.

Abstract

The Division of Ownership in New Ventures

The current study investigates a tripartite incentive contract between an innovator supplying an intellectual asset, a professional assigned to productive tasks, and a consulting firm specialized in recruiting qualified personnel. The liquidity-constrained professional is compensated by receiving a share of one half in the new venture. With continuous search activities of the consultant the pure tripartite partnership implements the consultant's expected profit maximum. The consultant's and the innovator's shares reflect the relative value of search. However, the consultant's optimal search effort is inefficiently low. With binary search and only two innovator types, there may also exist bipartite partnerships of equals between the innovator and the professional, and bipartite partnerships of equals between the consultant and the professional. The latter emerge from complete buy-outs of innovators with low value business ideas.

Keywords: new ventures, tripartite incentive contract, consulting contract, partnerships.

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1 Introduction

The current study investigates optimal incentive contracts to set up a new innovative firm. Three parties are involved: the innovator supplying an intellectual asset, a professional assigned to productive tasks, and a consultant specialized in matching innovators and professionals. The innovator's asset and the professional's effort supply constitute productive complements. The objective of this paper is to analyze the resulting tripartite mechanism design problem under moral hazard and adverse selection.

To fix ideas, consider the following example. A biologist has identified relevant antigenic proteins of a bacterium allowing the development of a new diagnostic test. To produce a marketable test, the researcher would require the cooperation of a partner with the appropriate experience in developing, producing and marketing pharmaceuticals. A consultant offers his services to match the scientist with such a partner. After matching, production takes place. In this example, one would expect numerous incentive problems. Initially only the scientist will know the precision and the complexity of the new test compared to already existing diagnostic methods. In addition, neither the search effort of the consultant nor the productive effort of the business partner are likely to be contractible.

The subsequent formal analysis addresses the set of problems contained in the above example. A risk-neutral innovator possesses private information concerning the value of her business idea. To realize the project she requires a professional. However, she has no expertise in recruitment herself and may therefore turn to a risk-neutral consultant. Professionals are employees performing operative tasks. For parsimony, they are assumed to be risk-neutral and liquidity constrained. To align incentives between the three parties contracts can only be conditioned on the resulting output.

In contrast to the consultant, the professional can observe the type of the

innovator's project upon being hired. This assumption is natural, since the professional would have to be a specialist in production. Thus, the relationship between the new venture and the professional reflects a standard moral hazard problem. Due to risk-neutrality, the solution then implies that the professional should receive a fixed share in the new venture. Furthermore, the optimal scheme is found to be independent of the innovator's contract with the consultant.

Contracting between the innovator and the consultant is more cumbersome because their relationship is characterized by bilateral asymmetric information. To solve the problem we assume that the consultant acts as a principal. What we have in mind are situations where the consultant is looking for innovators to offer them a contract to start up a new venture. The innovator typically faces a brief "window of opportunity". If she fails to establish her new venture in due time a competitor will be able to produce a close substitute innovation. Thus, the innovator can only turn to a single consultant in order to seek his service. Else, she can decide to hire the professional on her own and commence production.

Consequently, beyond the adverse selection problem due to the innovator's (i.e. the agent's) private information, the optimal contract must convince the innovator that the consultant (i.e. the principal) will search. When the consultant's search activities are continuous, we find that a menu of pure tripartite partnership contracts without additional fixed payments implements the consultant's expected profit maximum. The sharing rule between the consultant and the innovator reflects the relative value of the project-specific search activity. However, since the professional earns a rent, the consultant's search activity level is inefficiently low.

With binary search decisions and only two innovator types, the optimal scheme implements a variety of possible ownership structures depending on the consultant's search costs and the value of the innovation. High-value

innovations will again be organized as pure tripartite partnerships. However, with high search costs the consultant may buy out the low-value innovator and organize a bipartite partnership of equals with the professional. Finally, with low search costs, there is a plethora of equivalent contracts for low-value innovators including the tripartite partnership and the buy-out solution. Thus, different innovator-types may receive an identical partnership offer.

Our analysis is closely related to the existing literature on venture-capital backed start-ups.¹ One strand of that literature builds upon Grossman and Hart's (1986) incomplete contracts approach. It analyzes bipartite incentive-problems between a credit-constrained innovator and a venture capitalist. Both the innovator's and the "inside" investor's efforts enhance the project's success.² Thus, the optimal contract must solve a double moral hazard problem. The basic venture-capital contract then provides an adequate incentive structure.³

Some authors specify the type of moral hazard problem allowing them to further investigate the institutional structure of venture-capital backed firms. For example, Aghion and Bolton (1992), Dewatripont and Tirole (1994), and Hart and Moore (1994, 1998) analyze models in which the entrepreneur can generate non-transferrable private benefits, "steal" part of the cash-flow, or threaten to leave the firm (which is worth less without her due to the inalienability of human capital). In this kind of environment, the optimal

¹Gompers and Lerner (2001), Kaplan and Stromberg (2001), and Botazzi and Da Rin (2002) provide extensive literature surveys.

²Such "inside" investors provide important consulting and management services, in particular, assisting in recruiting personnel (see e.g. Rind 1981 and Tyebjee and Bruno 1984, Sahlman 1990, Lerner 1995, and Hellmann and Puri 2002). In fact, Bhidé's (2000, p. 282-288) investigation of the Fortune 500 start-ups shows that attracting experienced managers from established firms constitutes a key success factor.

³See, for instance, Keuschnigg and Nielsen (2003a,b) who then proceed to analyze the effects of taxation on the incentives to establish new ventures.

contract assigns to the venture capitalist the right to take control in the “poor” states of nature or respectively to liquidate the firm.

Other authors examine the time structure of contracts. For example, Admati and Pfleiderer (1994) and Cornelli and Yosha (2003) show that “staging” the financing precludes mispricing securities, and/or “window dressing”. Building upon a similar framework, Bergemann and Hege (1997) find that increasing shareholdings of the venture capitalist reflects her learning about the project’s quality. Finally, according to Schmidt (2003), the sequential nature of the double moral hazard problem implies the predominant use of convertible securities in financing new ventures.⁴

A second strand of literature emphasizes the venture capitalist’s portfolio selection problem. For example, Ravid and Spiegel (1997) show that under “extreme” uncertainty concerning the value of the project the venture capitalist should opt for pure equity financing. According to Shepherd (1999), such project risk is, in particular, attributable to personal characteristics of the entrepreneur (e.g. she should have the ability to “educate” consumers concerning the new product and possess “industry related competencies”). Finally, Keuschnigg and Kannianen (2003a,b) analyze a model of optimal shareholdings, given that the venture capitalist screens projects and his post-contract consulting service is costly.

Combining the foregoing arguments from the literature, the current paper aims at understanding the moral hazard and adverse selection problems underlying new venture contracts. The remainder of the paper is organized as follows. Next section introduces the basic model. Section 3 derives the optimal contract of the consultant given continuous search decisions of the consultant. Assuming only two innovator-types and binary search decisions, section 4 serves to illustrate the self-selection mechanism induced by

⁴This finding is empirically confirmed by Kaplan and Soderstrom (2000). At the same time, the study strongly supports the earlier analyses of the allocation of control rights.

partnerships. It also allows to analyze the case where, due to fixed costs, active search is only efficient for some innovator types. The final section provides a summary and draws conclusions.

2 The model

Consider an inventor, or innovator who has generated a business idea of value θ . In order to exploit this idea economically she needs the assistance of a professional specialist. Professionals can be of different ability that do not equally match with the innovator's project. The quality of the match is denoted hereafter with x . Moreover, given x a professional would need to supply productive effort e . The professional's private costs of effort are given by the quadratic cost function $\frac{e^2}{2}$.

Jointly, the innovative idea, the professional's effort, and the quality of the match generate a revenue net of production costs

$$y = \theta x e . \tag{1}$$

The distribution of skills measured by the quality of the match is given by $x \sim F(x; s)$, where s denotes the search effort when recruiting.⁵ The respective density function exhibits $f(x; s) > 0$, for all $x \in [0, 1]$ and $s \geq 0$. Moreover, we assume that $F_s(x, s) < 0$ and $F_{ss}(x, s) > 0$. Hence, intensified search generates a dominant quality distribution where the search technology satisfies the usual Convexity of Distribution Function Condition (CDFC).⁶

The innovator is taken to incur prohibitively high costs of searching for quality professionals. However, there exists a consultant who offers to search for the appropriate professional. The consultant incurs search costs $c(s)$,

⁵Given the example in the introduction, we assume that the distribution F does not depend on the realization of θ .

⁶See Rogerson (1985).

with $c'(s) > 0$, $c''(s) > 0$, and $c(0) = 0$. Search effort constitutes private information of the consultant.

Assumption: *Third parties called in to enforce contracts can only observe y and verify whether explicit contractual terms are fulfilled.*

This assumption is crucial for our model. It guarantees that the consultant - acting as a principal - cannot write a contract with the innovator conditioning payments on future reporting made by the professional.⁷

The timing of the game is as follows. The consultant offers the innovator a menu of contracts conditioning payments on net revenue y . At this point in time, the consultant has no information regarding the realization of θ . However, he knows the distribution. The innovator can accept or reject the contract. Suppose the contract is accepted. At this decision node the consultant must determine whether or not to search. In the case of a separating contract, he can condition this decision on the innovator's type.

The professional possesses expertise in production. Upon being matched, he is therefore able to observe θ and x when deciding whether to participate. Given that he accepts the contract, the professional chooses his effort level. There are two possibilities for the contracting game with the professional. One case has the principal (i.e. the consultant) delegate the design of the contract with the professional to the innovator reserving himself the right to disagree. This may be advantageous since both parties - the professional and the innovator - have the same information.

Alternatively, the principal may choose to directly design the contract. The contract with the professional must then solve a standard moral hazard and an adverse selection problem. We analyze the latter case and verify that delegating the contract design to the innovator is in fact not advantageous

⁷Allowing contracts to depend on the professional's reporting would introduce the additional possibility of a coalition with the principal to exploit the innovator.

for the consultant.

All parties are assumed to be risk-neutral. Moreover, the professional is taken to be financially constrained requiring payments to be non-negative. For parsimony, we limit all contracts to be linear. Let $w(y; \theta, x) = \alpha(\theta, x) + \beta(\theta, x)y$ denote the professional's contract implementing effort $e(\theta, x)$. Participation requires

$$u(w(y; \theta, x), e(\theta, x)) \equiv \alpha(\theta, x) + \beta(\theta, x)\theta x e(\theta, x) - \frac{(e(\theta, x))^2}{2} \geq 0 . \quad (2)$$

In addition, the contract must satisfy the professional's liquidity constraint⁸

$$\alpha(\theta, x) \geq 0 , \quad (3)$$

ruling out that he can buy out the innovator.

Separating contracts are contingent on the innovator's type. Let $\delta(\theta)$ denote the fixed payment from the consultant to the innovator and $\gamma(\theta)$ the incentive intensity of the contract. Further, $s(\theta)$ refers to the consultant's search effort if contracting with an innovator of type θ . Hence, the consultant's profit becomes

$$\begin{aligned} \pi(\theta, x) = & \theta x e(\theta, x) - \delta(\theta) - \gamma(\theta)\theta x e(\theta, x) \\ & - \alpha(\theta, x) - \beta(\theta, x)\theta x e(\theta, x) - c(s(\theta)) , \end{aligned} \quad (4)$$

Altogether, the consultant acting as a principal solves

$$\max_{(e(\theta, x), \delta(\theta), \gamma(\theta), \alpha(\theta, x), \beta(\theta, x), s(\theta))} E_{\theta} \{ E_x \{ \pi(\theta, x) | s(\theta) \} \} \quad (5)$$

subject to (2), (3), and

⁸The liquidity constraint actually requires $\alpha + \beta y \geq 0$. However, setting incentives will limit $\beta > 0$.

$$(e, x) = \arg \max_{(\tilde{e}, \tilde{x})} \alpha(\tilde{x}, \theta) + \beta(\tilde{x}, \theta)\theta x \tilde{e} - \frac{\tilde{e}^2}{2} \quad (6)$$

$$\delta(\theta) + \gamma(\theta)\theta E\{xe(\theta, x) | s(\theta)\} \geq v(\theta), \text{ for all } \theta \quad (7)$$

$$\theta = \arg \max_{\tilde{\theta}} \delta(\tilde{\theta}) + \gamma(\tilde{\theta})\theta E\{xe(\theta, x) | s(\tilde{\theta})\}, \text{ for all } \theta \quad (8)$$

where $v(\theta)$ denotes the innovator's expected profit if hiring the professional herself.

In the above problem, (7) and (8) constitute the participation and self-selection constraints for innovators. Given that the consultant offers separating contracts for innovators, the professional does not report on the value of the business idea θ . The truth-telling constraints on the part of the professional are therefore given by (6). In the remaining, we solve the problem by initially ignoring these constraints, thereby substituting (6) for

$$\beta(\theta, x)\theta x = e(\theta, x) . \quad (9)$$

Obviously, we need to verify that the resulting solution satisfies truth-telling.

3 The optimal tripartite arrangement

The above optimization problem (5) subject to the constraints (2), (3), (7), (8), and (9) exhibits the following characteristic feature:

Lemma 1: *Given any incentive contract with the professional and any profit-maximizing search function $s(\theta)$, the consultant will extract the entire rent from contracting with the innovator. The latter always receives her reservation income $v(\theta)$.*

Proof. Consider any effort $\hat{e}(\theta, x)$ induced by the incentive contract with

the professional. Assuming that (7) is binding implies

$$\begin{aligned} & \delta'(\theta) + \gamma'(\theta)\theta E\{x\hat{e}(\theta, x) | s(\theta)\} + \gamma(\theta)E\{x\hat{e}(\theta, x) | s(\theta)\} \\ & + \gamma(\theta)\theta \frac{\partial E\{x\hat{e}(\theta, x) | s(\theta)\}}{\partial s} s'(\theta) + \gamma(\theta)\theta E\left\{x \frac{\partial \hat{e}(\theta, x)}{\partial \theta} | s(\theta)\right\} = v'(\theta) \end{aligned} \quad (10)$$

Also, (8) yields

$$\delta'(\theta) + \gamma'(\theta)\theta E\{x\hat{e}(\theta, x) | s(\theta)\} + \gamma(\theta)\theta \frac{\partial E\{x\hat{e}(\theta, x) | s(\theta)\}}{\partial s} s'(\theta) = 0 \quad (11)$$

Since the rational consultant is able to anticipate $\hat{e}(\theta, x)$ and knows the distribution function $F(x, s)$, he can set

$$\gamma(\theta) = \frac{v'(\theta)}{E\{x\hat{e}(\theta, x) | s(\theta)\} + \theta E\left\{x \frac{\partial \hat{e}(\theta, x)}{\partial \theta} | s(\theta)\right\}} \quad (12)$$

and, by choice of $\delta(\theta)$, subsequently ensure that (8) is satisfied as well. In this case, his costs of compensating an innovator are minimized since the latter only receives her reservation income $v(\theta)$. ■

Generally, the innovators' participation and self-selection constraints (7) and (8) depend on the productive effort supplied by the professional. The two constraints are therefore not independent of the professional's incentive contract which must satisfy the constraints (2), (3), and (9). However, according to Lemma 1, the two sets of constraints can be separated in the following analysis. For every level of productive effort by the professional, there exists functions $\delta(\theta)$ and $\gamma(\theta)$ such that the innovators' participation and self-selection constraints are simultaneously satisfied with equality.

Now, consider the contract with the professional. It can be characterized as follows:

Proposition 1 *The professional's contract solving the overall optimization problem (5) subject to the constraints (2), (3), (7), (8), and (9) solely compensates this agent by allocating half of the new venture's net revenue y .*

Conditional on the innovator's type and the quality of the match x , the professional supplies effort $e^* = \frac{\theta x}{2}$, for $\theta = \{A, a\}$.

Proof. The constraints (2) and (9) jointly imply $\alpha(\theta, x) = 0$, for all (θ, x) . Hence, (3) is binding. Using this result and Lemma 1, (5) can be restated as

$$\max E_\theta \{ E_x \{ \theta x \hat{e}(\theta, x) - [\hat{e}(\theta, x)]^2 \} - v(\theta) - c(s(\theta)) \} , \quad (13)$$

where $\hat{e}(\theta, x)$ again refers to the induced effort level. The first-order condition reveals that the optimal effort supply then equals $e^*(\theta, x) = \frac{1}{2}\theta x$. From (9) the optimal incentive-intensity therefore satisfies $\beta(\theta, x) = \beta^* = \frac{1}{2}$, for all (θ, x) . ■

The optimal incentive contract for the professional is particularly simple. He receives a fixed share of the venture's revenue net of other production costs. There are no additional fixed payments to the professional. Designing this optimal incentive contract, the consultant does not require information concerning the innovator's type.

Consequently, the contract induces truth-telling of the professional which ensures that (6) can be replaced by (9) in the consultant's optimization problem. Moreover, the resulting symmetric information structure between the innovator and the professional constitutes the only source of potential benefits for the consultant if delegating the right to contract with the professional to the innovator. Since the consultant would not use the type-information even if available to himself, such benefits cannot arise.

It immediately follows:

Proposition 2 *There exist a unique optimal level of search activity $s^*(\theta)$ for the consultant. This activity level is inefficiently low.*

Proof. Inserting for $e^*(\theta, x)$ into (13) yields

$$\begin{aligned} & \max E_\theta \{ E_x \{ \frac{1}{2} (\theta x)^2 - \frac{1}{4} (\theta x)^2 |s(\theta) \} - v(\theta) - c(s(\theta)) \} \\ \iff & \max E_\theta \{ E_x \{ \frac{1}{4} (\theta x)^2 |s(\theta) \} - v(\theta) - c(s(\theta)) \} . \end{aligned} \quad (14)$$

Given the assumptions $F_s(x, s) < 0$, $F_{ss}(x, s) > 0$, $c'(s) > 0$, $c''(s) > 0$, and $c(0) = 0$ introduced in section 2, (14) possesses a unique solution characterized by the first-order conditions

$$\frac{\theta^2}{4} \frac{\partial E_x \{ x^2 |s^*(\theta) \}}{\partial s(\theta)} = c'(s^*(\theta)), \text{ for all } \theta. \quad (15)$$

Obviously, efficient search would imply $\frac{\theta^2}{2} \frac{\partial E_x \{ x^2 |s^{**}(\theta) \}}{\partial s(\theta)} = c'(s^{**}(\theta))$. Thus, $s^*(\theta) < s^{**}(\theta)$. ■

As shown in Lemma 1, the innovator only receives her reservation income. The source of the search inefficiency can therefore not be attributed to the contract with the innovator. Consequently, it must be induced by the incentive contract offered to the professional. In this respect, the following can be shown:

Proposition 3 *If the innovator pursues her stand-alone project, the professional will receive one half of this venture's net revenue as well. The professional then earns a rent equal to $u^*(\theta, x) = \frac{(\theta x)^2}{8} > 0$ and the innovator receives $P^*(\theta, x) = \frac{(\theta x)^2}{4} > 0$.*

Proof. By assumption, contracts can only be conditioned on the realized net revenue y although the innovator actually observes (θ, x) . Hence, the incentive-compatibility constraint (9) must again be satisfied as well. If the innovator decides to hire the professional on her own and pursue her stand-alone project, she therefore solves

$$\max_{(e(\theta, x), \alpha(\theta, x), \beta(\theta, x))} P(x, \theta) = \theta x e(\theta, x) - \alpha(\theta, x) - \beta(\theta, x) \theta x e(\theta, x) \quad (16)$$

subject to (2), (3), and (9)

Following the identical line of arguments used in the proof of Proposition 1 above, the optimal fixed payments and the optimal incentive intensities are given by $\alpha(\theta, x) = 0$ and $\beta^* = \frac{1}{2}$, for all (θ, x) , in this case as well. Also, the professional supplies the effort level $e^*(\theta, x) = \frac{1}{2}\theta x$ again.

By insertion,

$$P^*(x, \theta) = \frac{1}{2}(\theta x)^2 - \frac{1}{4}(\theta x)^2 = \frac{1}{4}(\theta x)^2 \quad (17)$$

and

$$\begin{aligned} u^*(\theta, x) &= \beta^* \theta x e^*(\theta, x) - \frac{1}{2}(e^*(\theta, x))^2 \\ &= \frac{1}{4}(\theta x)^2 - \frac{1}{8}(\theta x)^2 = \frac{1}{8}(\theta x)^2 \end{aligned} \quad (18)$$

■

Solving the moral hazard problem in contracting with the professional implies that the latter earns a positive rent. Propositions 1 and 3 reveal that this moral hazard problem arises for the same reason whether the professional contracts with an innovator or a consultant. In both cases the contract can only be conditioned on the realized net revenue y . The fact that the consultant - in contrast to the innovator - cannot observe θ is irrelevant with regard to the professional's ability to extract rent income. Moreover, the professional's rent derived from participating in such stand-alone projects of the innovator is the same as if contracting with the consultant.

Recall the optimization problem (14) defined in the proof of Proposition 2. The innovator's rent only affects the compensation costs by determining the level of her reservation income $v(\theta) = E_x\{P^*(\theta, x) \mid s = 0\}$. It reflects the opportunity costs of not pursuing her stand-alone project. However,

if contracting with the professional, the consultant himself is constrained in implementing the professional's supply of productive effort. He cannot extract the professional's rent until the latter also receives only his reservation income. Consequently, the consultant's search effort falls short of the efficient level.

Finally, it can now be obtained:

Proposition 4 *Consider pure tripartite partnerships in which the shares $\beta^* = \frac{1}{2}$, $\gamma^*(\theta) = \gamma = \frac{1}{2} \frac{E\{x^2|s=0\}}{E\{x^2|s^*(\theta)\}}$, and $\frac{1}{2}(1 - \frac{E\{x^2|s=0\}}{E\{x^2|s^*(\theta)\}})$ in the new venture are allocated to the professional, the innovator, and the consultant respectively. There are no additional fixed payments from the consultant to the innovator. The consultant implements the solution to his optimization problem (5) subject to the constraints (2), (3), (6), (7), and (8) by offering these pure tripartite partnership contracts..*

Proof. Given Propositions 1 and 2 above, it only remains to be shown that $\delta^*(\theta) = 0$ and $\gamma^*(\theta) = \gamma(s^*(\theta)) = \frac{1}{2} \frac{E\{x^2|s=0\}}{E\{x^2|s^*(\theta)\}}$ simultaneously satisfy the innovators participation constraints (7) and the self-selection constraints (8). Inserting for $e^*(\theta, x) = \frac{1}{2}\theta x$ into (12) reveals that

$$\begin{aligned} \gamma(\theta) &= \frac{v'(\theta)}{\frac{1}{2}\theta [E\{x^2|s^*(\theta)\} + E\{x^2|s^*(\theta)\}]} \\ &= \frac{\frac{1}{2}E\{x^2|s=0\}}{E\{x^2|s^*(\theta)\}} = \gamma^*(\theta) \end{aligned} \quad (19)$$

upon using $v(\theta) = E_x\{P^*(\theta, x)\}$ as derived in Proposition 3. The participation constraint then implies $\delta^*(\theta) = 0$. Insertion into (8) yields

$$\begin{aligned} \theta &= \arg \max_{\tilde{\theta}} \frac{\gamma^*(\tilde{\theta})\theta^2}{2} E_x\{x^2 | s^*(\tilde{\theta})\}, \text{ for all } \theta \\ \Leftrightarrow \theta &= \arg \max_{\tilde{\theta}} \frac{\theta^2}{4} E\{x^2 | s = 0\}, \text{ for all } \theta . \end{aligned} \quad (20)$$

With $\delta^*(\theta) = 0$ and $\gamma^*(\theta) = \frac{1}{2} \frac{E\{x^2|s=0\}}{E\{x^2|s^*(\theta)\}}$, innovators possess no incentives to misrepresent their types. Given that the consultant responds by choosing $s = s^*(\hat{\theta})$ if $\hat{\theta} \neq \theta$, the innovator would again only receive her reservation income. ■

The professional receives the share $\frac{1}{2}$ in the new venture and the consultant and the innovator can only distribute the expected value of the remaining half among them. Since both parties are risk-neutral, arranging a fixed payment between them cannot be optimal. The innovator would only accept such a payment if it is at least equal to the expected value of the share she would have to give up. However, such fixed payments would attract innovators with lower value projects and the consultant's compensation costs would not be minimized. Consequently, the consultant will optimally offer a pure partnership.

By virtue of (15)

$$\frac{\partial s^*(\theta)}{\partial \theta} = - \frac{\frac{\theta}{2} \frac{\partial E_x\{x^2|s^*(\theta)\}}{\partial s(\theta)}}{\frac{\theta^2}{4} \frac{\partial^2 E_x\{x^2|s^*(\theta)\}}{(\partial s(\theta))^2} - c''(s^*(\theta))} > 0 \quad (21)$$

According to (19), higher search effort then implies that the consultant's share in the new venture increases in proportion to the induced relative increase in expected net revenue. Correspondingly, the innovator's share decreases with higher project value.

Hence, although the consultant's search effort increases with the project value, innovators with lower value business ideas are not attracted by partnership contracts designed for high value projects. If they would choose such an offer and the consultant subsequently engages in excessive search, they would still only receive an expected income equal to the value of their stand-alone project. Thus, by misrepresenting their type innovators would induce a distortion of the consultant's search decision without being able to benefit

themselves.⁹

4 The case with binary search effort

4.1 Types of contracts with innovators

Given the above assumptions concerning the costs of search, the preceding analysis has shown that the consultant maximizes his expected profit by offering a separating menu of pure tripartite contracts. The specific sharing rule between the consultant and the innovator ensures that, although the innovator cannot observe the consultant's search effort, there does not exist a credibility problem. The consultant always receives the full benefit associated with the optimal search intensity $s^*(\theta)$.

However, the supply of consulting services may in fact be characterized by high fixed costs. In particular when offering his services to new ventures, the consultant must not only match innovators and professionals adequately. Given the time needed to set up new facilities, he must also be able to provide such matches in time before established firms can market a substitute innovation. A consultant specialized on attracting new ventures would therefore need a steady staff of expert employees. Rather than continuously choosing the search intensity, he would then only decide on whether or not to engage this staff in a particular project.

In this section we therefore limit the consultant's search effort to be bi-

⁹Finally, only Proposition 2 can now be verified to depend on the particular production technology assumed above. If, more generally, $y = h(x, \theta)e$ Lemma 1 as well as Propositions 1, 3 and 4 could be fully retained. Again, the consultant would maximize his expected profit net of the professional's expected rent. However, investigating only the respective first-order condition, comparisons with first-best search activities can be misleading due to multiple local maxima and corner solutions.

nary, $s \in \{0, 1\}$, with costs $c(1) = k > 0$ and $c(0) = 0$. Conditional on the innovator's type, the consultant can only choose whether or not to engage in active search. Suppose that it is not optimal to engage in active search given some low-value innovations. From the point of view of high-value innovators the credibility of the consultant's offer to search for an appropriate professional will then depend on whether low-value innovators will also be attracted by the contract. Moreover, even if active search is optimal for all innovator-types, the question remains whether all innovators will necessarily receive an identical contract offer.

In order to provide an illustrative presentation we further discuss a simplified case where $\theta \in \{a, A\}$, with $A > a > 0$. The fractions of A and a innovators are q and $(1 - q)$ respectively. For the two innovator types we define the fixed payments and the intensity parameters by $\delta(a) = d$, $\delta(A) = D$, $\gamma(a) = g$, and $\gamma(A) = G$. Recalling Proposition 1 above, we further let $\alpha^*(a, x) = \alpha^*(A, x) = 0$ and $\beta^*(a, x) = \beta^*(A, x) = \frac{1}{2}$ for the professional's contract. Given this notation, the consultant's profit from contracting with an A -type innovator is $\pi_A(y, x) = -D + (\frac{1}{2} - G)y$, while, if contracting with an a -type innovator, he earns $\pi_a(y, x) = -d + (\frac{1}{2} - g)y$.

If innovators decide to cooperate with a consultant, two types of contractual solutions can be distinguished. First, the consultant may offer a menu of contracts which induce a separation of innovator-types. These contracts must satisfy the self-selection constraints

$$D + G \frac{A^2}{2} E\{x^2 \mid s = s_A\} \geq d + g \frac{A^2}{2} E\{x^2 \mid s = s_a\} \quad (22)$$

$$d + g \frac{a^2}{2} E\{x^2 \mid s = s_a\} \geq D + G \frac{a^2}{2} E\{x^2 \mid s = s_A\} \quad (23)$$

where s_θ , with $\theta = \{A, a\}$, denotes the type-specific search activities in this case. Else, the consultant can pool both innovator-types under a single

contract. In this case, $d = D = \bar{\delta}$ and $g = G = \bar{\gamma}$ and \bar{s} denotes the consultant's search effort.

Cooperating with the consultant must be dominant for the innovator. Hence,

$$D + G \frac{A^2}{2} E\{x^2 \mid s = s_A\} \geq \frac{A^2}{4} E\{x^2 \mid s = 0\} \quad (24)$$

$$d + g \frac{a^2}{2} E\{x^2 \mid s = s_a\} \geq \frac{a^2}{4} E\{x^2 \mid s = 0\} \quad (25)$$

respectively

$$\bar{\delta} + \bar{\gamma} \frac{\theta^2}{2} E\{x^2 \mid s = \bar{s}\} \geq \frac{\theta^2}{4} E\{x^2 \mid s = 0\}, \text{ for } \theta = \{A, a\} \quad (26)$$

Finally, the consultant maximizes his expected profit. Given a separating menu of contracts, the consultant will choose $s_A = 1$, only if

$$\left(\frac{1}{2} - G\right) \frac{A^2}{2} (E\{x^2 \mid s = 1\} - E\{x^2 \mid s = 0\}) \geq k. \quad (27)$$

Also, $s_a = 1$ requires

$$\left(\frac{1}{2} - g\right) \frac{a^2}{2} (E\{x^2 \mid s = 1\} - E\{x^2 \mid s = 0\}) \geq k. \quad (28)$$

and $\bar{s} = 1$ will be chosen in the pooling contract if

$$\left(\frac{1}{2} - \bar{\gamma}\right) (E\{x^2 \mid s = 1\} - E\{x^2 \mid s = 0\}) \left[q \frac{A^2}{2} + (1 - q) \frac{a^2}{2} \right] \geq k \quad (29)$$

In principle, the following types of new venture firms may emerge:

- the innovator's stand-alone project organized as a partnership of equals between the innovator and a professional;

- tripartite partnerships of an innovator, a professional, and a consultant in which the professional receives the share $\frac{1}{2}$ of the firm and the other two partners split the expected value of remaining half among them;
- partnerships of equals between a consultant and a professional following a buy-out of the innovator by the consultant.

4.2 The optimal consulting contract

Within the current model framework, pooling both innovator-types under a single offer always induces a very specific contract structure:

Proposition 5 *Suppose a profit-maximizing consulting firm actually contracts with both innovator-types on identical terms. Such an optimal pooling contract specifies a pure tripartite partnership without additional direct payments to the innovators. The optimal pooling contract is given by $(\bar{\delta}, \bar{\gamma}) = (0, \bar{\Gamma}(\bar{s}; \bar{v}_A^I))$, where*

$$\bar{\Gamma}(\bar{s}; \bar{v}_A^I) = \frac{\bar{v}_A^I}{\frac{A^2}{2} E\{x^2 \mid s = \bar{s}\}} \quad (30)$$

and \bar{v}_A^I denotes the expected utility of A-type innovators which induces their voluntary participation in the pooling arrangement.

Proof. Given a pooling contract, the consultant's search effort \bar{s} cannot be chosen type-specific. Thus, suppose that there exists some pooling contract $(\bar{\delta}, \bar{\gamma})$, with $\bar{\delta} > 0$ and $0 < \bar{\gamma} < \frac{1}{2}$, such that the respective expected utilities of a-type innovators

$$\bar{v}_a^I = \bar{v}_a^I(\bar{s}, \bar{\delta}, \bar{\gamma}) = \bar{\delta} + \bar{\gamma} \frac{a^2}{2} E\{x^2 \mid s = \bar{s}\} \quad (31)$$

and A-type innovators

$$\bar{v}_A^I = \bar{v}_A^I(\bar{s}, \bar{\delta}, \bar{\gamma}) = \bar{\delta} + \bar{\gamma} \frac{A^2}{2} E\{x^2 \mid s = \bar{s}\} \quad (32)$$

satisfy (26). Hence, both innovator-types participate voluntarily.

The consultant's expected profit can be obtained as

$$\begin{aligned} \bar{\pi}(\bar{s}, \bar{\delta}, \bar{\gamma}) &= -\bar{\delta} - c(\bar{s}) \\ &+ \left(\frac{1}{2} - \bar{\gamma}\right) \left[q\frac{A^2}{2} + (1-q)\frac{a^2}{2} \right] E\{x^2 \mid s = \bar{s}\} . \end{aligned} \quad (33)$$

Then,

$$d\bar{v}_A^I = 0 \rightarrow \frac{d\bar{\delta}}{d\bar{\gamma}} = -\frac{A^2}{2} E\{x^2 \mid s = \bar{s}\} \quad (34)$$

and, by insertion, it follows that

$$d\bar{v}_a^I \Big|_{d\bar{v}_A^I=0} = d\bar{\gamma} \left[-\frac{A^2}{2} + \frac{a^2}{2} \right] E\{x^2 \mid s = \bar{s}\} . \quad (35)$$

At the same time,

$$\begin{aligned} d\bar{\pi}(\bar{s}, \bar{\delta}, \bar{\gamma}) \Big|_{d\bar{v}_A^I=0} &= d\bar{\gamma} \left[\frac{A^2}{2} E\{x^2 \mid s = \bar{s}\} \right. \\ &\left. - \left[q\frac{A^2}{2} + (1-q)\frac{a^2}{2} \right] E\{x^2 \mid s = \bar{s}\} \right] . \end{aligned} \quad (36)$$

Increasing $\bar{\gamma}$ and decreasing $\bar{\delta}$ such as ensure A -type innovators' participation increases the consultant's expected profit. Simultaneously, the expected utility of a -type innovators is reduced. Assuming that both innovator-types continue to participate, the optimal pooling contract for the consultant is therefore given by $(\bar{\delta}, \bar{\gamma}) = (0, \bar{\Gamma}(\bar{s}; \bar{v}_A^I))$, where the share $\bar{\Gamma}(\bar{s}; \bar{v}_A^I)$ is defined in (30) above.

However, suppose that adjusting the contract according to (34) reduces the utility of a -type innovators such that it falls short of their stand-alone production value. Given that he exclusively contracts with A -type innovators, let the expected profit of the consultant be denoted $\bar{\pi}_A(\bar{s}, \bar{\delta}, \bar{\gamma})$. For

every contract $(\bar{\delta}, \bar{\gamma})$, with $\frac{1}{2} > \bar{\gamma}$,

$$\begin{aligned}\bar{\pi}_A(\bar{s}, \bar{\delta}, \bar{\gamma}) &= -\bar{\delta} + \left(\frac{1}{2} - \bar{\gamma}\right) \frac{A^2}{2} E\{x^2 \mid s = \bar{s}\} - \bar{\pi}(\bar{s}, \bar{\delta}, \bar{\gamma}) \\ &= (1 - q) \left(\frac{1}{2} - \bar{\gamma}\right) \left(\frac{A^2 - a^2}{2}\right) E\{x^2 \mid s = \bar{s}\} > 0. \quad (37)\end{aligned}$$

Hence, if, in approaching $(0, \bar{\Gamma}(\bar{s}; \bar{v}_A^I))$, a -type innovators should choose their stand-alone project, the consultant's expected profit increases. ■

The arguments of the proof are illustrated in figure 1. Suppose that the contract $(\bar{\delta}^o, \bar{\gamma}^o)$ generates the expected utility \bar{v}_A^I for A -type innovators. The corresponding expected utility of a -type innovators is then given by $\bar{v}_a^{I_o}$. Equations (31) and (32) define indifference lines for the two innovator-types which intersect in the point $(\bar{\delta}^o, \bar{\gamma}^o)$. The slopes are given by (34) for A -types, respectively $\frac{d\bar{\delta}}{d\bar{\gamma}} = -\frac{a^2}{2} E\{x^2 \mid s = \bar{s}\}$ for a -type innovators.

The broken line also intersecting in point $(\bar{\delta}^o, \bar{\gamma}^o)$ constitutes the consultant's iso-profit line assuming that its expected profit equals $\bar{\pi}(\bar{s}, \bar{\delta}^o, \bar{\gamma}^o)$. Its slope is given by $\frac{d\bar{\delta}}{d\bar{\gamma}} = -[q\frac{A^2}{2} + (1 - q)\frac{a^2}{2} E\{x^2 \mid s = \bar{s}\}]$. Every $(\bar{\delta}, \bar{\gamma})$ -combination with $\bar{\gamma} > \bar{\gamma}^o$ on the indifference line for A -types is associated with higher expected profits for the consulting firm. Further, such adjustments of the pooling offer ensure the voluntary participation of A -type innovators. The contract $(0, \bar{\Gamma}(\bar{s}; \bar{v}_A^I))$ thus maximizes the consultant's expected profit, given that it must provide the reservation utility \bar{v}_A^I for A -type innovators. The corresponding increase in profits is indicated by the downward shift of the consulting firm's iso-profit line.

At the same time, the expected utility of a -type innovators is decreased. This effect is again indicated by a downward shift of the respective indifference line. The optimal pooling contract will only yield utility $\bar{v}_a^I < \bar{v}_a^{I_o}$ for a -type innovators. If $\bar{v}_a^I < \frac{a^2}{4} E\{x^2 \mid s = \bar{s}\}$, a -type innovators will not participate in this pooling contract. Yet, in this case the consultant's profit

are even higher. Hence, either the contract $(0, \bar{\Gamma}(\bar{s}; \bar{v}_A^I))$ constitutes an optimal pooling contract, or profit maximization of the consultant implies a separating policy.

Whether or not pooling the innovator-types under a single contract can be optimal then depends on the respective reservation utilities. If each innovator's reservation utility is given by the value of her stand-alone project, it can be shown:

Proposition 6 *Assume that the innovators' reservation utilities are given by $\bar{v}_\theta^I = \frac{\theta^2}{4} E\{x^2 \mid s = 0\}$, for $\theta = \{A, a\}$. Also, suppose that the consultant contracts with both innovator-types. Then, there exists a policy which separates innovator-types by offering the contract $(d, g) = (d^*, 0)$, with*

$$d^* = \frac{a^2}{4} E\{x^2 \mid s = 0\}, \quad (38)$$

to a-type innovators and the contract $(D, G) = (0, G^*)$, with

$$G^* = \frac{1}{2} \frac{E\{x^2 \mid s = 0\}}{E\{x^2 \mid s = 1\}}, \quad (39)$$

to A-type innovators. The consulting firm's expected profits derived from the separating policy $\{(d^*, 0); (0, G^*)\}$ are at least as high as under the optimal pooling contract. The separating contracts are strictly dominant if

$$\frac{a^2}{4} (-E\{x^2 \mid s = 0\} + E\{x^2 \mid s = 1\}) < k \quad (40)$$

Proof. Given $\bar{v}_A^I = \frac{A^2}{4} E\{x^2 \mid s = 0\}$, the optimal pooling contract yields $(\bar{\delta}, \bar{\gamma}) = (0, \bar{\Gamma}^0(\bar{s}))$ with $\bar{\Gamma}^0(\bar{s}) = \frac{1}{2} \frac{E\{x^2 \mid s=0\}}{E\{x^2 \mid s=\bar{s}\}}$. The respective expected profit of the consultant can therefore be obtained as:

$$\bar{\pi}(\bar{s}) = \left(\frac{1}{2} - \bar{\Gamma}^0(\bar{s}) \right) E\{x^2 \mid s = \bar{s}\} \frac{[qA^2 + (1-q)a^2]}{2} - c(\bar{s}) \quad (41)$$

Obviously, $\bar{\pi}(\bar{s}) = 0$, if $\bar{s} = 0$. Hence, profitable pooling implies $\bar{s} = 1$.

Now, consider the separating policy $\{(d, g); (D, G)\} = \{(d^*, 0); (0, G^*)\}$ defined in the proposition above. If a -types choose $(d, g) = (d^*, 0)$ and A -types select $(D, G) = (0, G^*)$, both innovator types just receive their reservation utilities given that $s_A = 1$ for the latter. Hence, the compensation costs for the consultant are minimized, since both (24) and (25) hold with equality.

Further, the incentive compatibility constraint for a -types (23) is satisfied with equality. However, according to (22), A -type innovators strictly prefer $(0, G^*)$ over $(d^*, 0)$. Thus, the policy $\{(d, g); (D, G)\} = \{(d^*, 0); (0, G^*)\}$ induces the self-selection of innovator-types and minimizes the compensation costs. Given $s_A = 1$, the expected profit of the consulting firm can therefore be obtained as

$$\begin{aligned} \pi^*(s_a, s_A) |_{s_A=1} &= (1 - q) \left[-d^* + \frac{a^2}{4} E\{x^2 | s = s_a\} - c(s_a) \right] \\ &\quad + q \left[\left(\frac{1}{2} - G^* \right) \frac{A^2}{2} E\{x^2 | s = 1\} - k \right] \end{aligned} \quad (42)$$

Upon inserting for $\bar{\Gamma}^0(\bar{s})$ from above, it follows that

$$\begin{aligned} &\pi^*(s_a, s_A) |_{s_A=1} - \bar{\pi}(1) \\ &= (1 - q) \left[\frac{a^2}{4} (E\{x^2 | s = s_a\} - E\{x^2 | s = 1\}) - c(s_a) + k \right] \end{aligned} \quad (43)$$

Obviously, $\pi^*(s_a, s_A) |_{s_A=1} - \bar{\pi}(1) = 0$, if $s_a = \bar{s} = 1$. However, given the separating policy, s_a constitutes a choice variable for the consultant. Then, $\pi^*(s_a, s_A) |_{s_A=1} - \bar{\pi}(1) > 0$, if (40) above is satisfied and the consultant chooses $s_a = 0$. ■

The arguments utilized in this proof are illustrated in figure 2. Assuming $s_A = 1$, type- A innovators are indifferent between all (D, G) -combination on the dotted line connecting $\frac{A^2}{4} E\{x^2 | s = 0\}$ and G^* and pursuing their stand-alone project. Since innovators are risk-neutral, these combinations also

induce identical minimum compensation costs for the consultant if they are chosen by A -types only. Further, type- a innovators are indifferent between all (d, g) -combinations on the solid line connecting d^* and G^* and pursuing their stand-alone project given that they anticipate $s_a = s_A$. However, only if the consultant actually chooses $s_a = s_A$ this line also constitutes the respective iso-profit line associated with minimum compensation costs.

A profitable pooling arrangement unconditionally specifies $\bar{s} = 1$. This contract must also ensure the participation of A -type innovators which implies $\bar{\Gamma}^0(\bar{s}) = G^*$. Then, only two cases are possible. First, if optimal search decisions given separating contracts imply $s_a = s_A = \bar{s} = 1$, the pooling contract and the separating policy induce identical expected profits for the consultant. In contrast, given that (40) is satisfied, the optimal separating policy implies $s_a = 0$. In this case, the consulting firm cannot draw on additional gains from active search when compensating a -types. Hence, the corresponding iso-profit line for the consultant when contracting with a -type innovators is given by the broken line connecting d^* and $\frac{1}{2}$ in figure 2.

If a -type innovators would opt for the contract $(0, G^*)$, they would not reveal their type. Thus, they expect that the consultant actively searches for professionals. Given this expectation, they are again indifferent between the contracts $(d^*, 0)$ and $(0, G^*)$. Then, as typically assumed in adverse selection models, a -type innovators can be taken to choose $(d^*, 0)$ and reveal their type. Hence, if (40) is satisfied, the separating offers induce higher profits because the consultant avoids inefficient search activities when contracting with a -type innovators.

Obviously, the contract $(d^*, 0)$ implies that the consultant buys out a -type innovators. They simply receive the price d^* for their business idea. Such complete buy-outs are feasible within the current model framework. The solution to the internal incentive problem implies that the professional always receives the share $\frac{1}{2}$ of the firm. Hence, although the consultant cannot

verify the professionals actual quality, he can implement this solution.

4.3 The search decision of the consultant

In a final step, it must be verified whether the consulting firm can credibly commit to engage in search. Depending on the search costs k , different contract offer structures can then be shown to result:

Proposition 7 (a) *If*

$$\frac{\theta^2}{4} (E\{x^2 \mid s = 1\} - E\{x^2 \mid s = 0\}) > k, \text{ for } \theta = \{A, a\}, \quad (44)$$

the consultant contracts with both innovator-types. In particular, it can offer a contract schedule $\{(\delta^, \gamma^*)\}$ which satisfies*

$$\delta^* = d^* - \frac{a^2}{2} \int_0^1 x^2 dF(x, 1) \gamma^* \quad (45)$$

for

$$\gamma^* \in [0, G^*] \quad (46)$$

where d^ and G^* are defined in Proposition 6 above.*

(b) *If*

$$\frac{A^2}{4} (E\{x^2 \mid s = 1\} - E\{x^2 \mid s = 0\}) > k \quad (47)$$

and

$$\frac{a^2}{4} (E\{x^2 \mid s = 1\} - E\{x^2 \mid s = 0\}) \leq k \quad (48)$$

the consultant offers a pure tripartite partnership leaving the share G^ to the participating innovator. In addition, he may offer to buy-out innovators by paying d^* for business ideas.*

(c) *If*

$$\frac{\theta^2}{4} (E\{x^2 \mid s = 1\} - E\{x^2 \mid s = 0\}) \leq k, \text{ for } \theta = \{A, a\}, \quad (49)$$

the consultant does not contract with innovators.

Proof. First, consider case (a). The consultant's search activity generates a positive surplus when cooperating with both innovator-types. Hence, he will set $s_a = s_A = 1$. Moreover, the contract choices $(d^*, 0)$ by a -type innovators and $(0, G^*)$ by A -type innovators have already been shown to minimize the respective compensation costs.

Given that $s_a = 1$, all contracts taken from the schedule $\{(\delta^*, \gamma^*)\}$ yield identical compensation costs if chosen by a -type innovators. Also, such innovators are indifferent between $(d^*, 0)$ and any other contract selected from this schedule. In contrast, A -type innovators strictly prefer $(0, G^*)$ over any other contract chosen from this schedule. Thus, given the schedule $\{(\delta^*, \gamma^*)\}$, the two innovator-types will self-select such that the compensation costs are minimized.

In case (b), active search in cooperations with a -type innovators will decrease the consultant's profit. Minimizing the compensation costs and separating the innovator-types can then be achieved by offering $(d, g) = (d^*, 0)$ to a -type innovators and $(0, G^*)$ to A -types. The consulting firm will not engage in active search in firms founded upon completely buying-out a -type innovators.

Thus, the expected profit from contracting with a -type innovators is equal to zero. The consultant may therefore also decide not to contract with such innovators at all. If exclusively offering the pure tripartite partnership contract $(0, G^*)$, both innovator-types are again indifferent between this contract and pursuing production on their own. Again, it can be assumed that they self-select appropriately.

Obviously, given case (c), it is generally inefficient to engage in active search. Yet, the consulting firm can only earn positive profits, if it chooses $s_\theta = 1$, for at least one innovator-type $\theta \in \{A, a\}$. ■

The current simple model framework proves capable to generate a variety of organizational structures for new ventures. The professional always receives the share $\frac{1}{2}$ in the venture. Then, consider case (a) of Proposition 7. The contract schedule $\{(\delta^*, \gamma^*)\}$ is illustrated by the solid line connecting d^* and G^* in figure 2. It includes the pure tripartite contract and the buy-out by paying the price d^* to acquire the business idea of low-value innovators.

A -type innovators always choose the optimal pure tripartite partnership contract $(0, G^*)$ which induces no direct payments by the consultant. In figure 2, this is indicated by the fact that the indifference line for A -type innovators is given by the dotted line connecting $\frac{A^2}{4}E\{x^2 \mid s = 0\}$ and G^* . Pure tripartite partnerships will therefore necessarily emerge in $(1 - q)$ -% of all cases. The innovator receives $G^* < \frac{1}{2}$ and the consultant claims $(\frac{1}{2} - G^*)$.

At the same time, a -type innovators may select any contract from the schedule $\{(\delta^*, \gamma^*)\}$. Hence, in q -% of all cases, the distribution of shares between the innovator and the consultant may vary. The contractual solutions range from the pure tripartite partnership discussed above to the buy-out of the innovator. Only in the former case, there will be no additional direct payments to the innovator. However, this case also implies that different innovator-types can in fact be “pooled” under a single offer. Further, buy-outs of innovators result in bipartite partnerships on equal terms between the consultant and professionals. Finally recall that the consultant always engages in active search to recruit the professional. Thus, offering only the contract $(0, G^*)$ does not constrain the consultant’s expected profit maximization.

Given case (b) of Proposition 7, the ambiguity with respect to possible tripartite partnership contracts is reduced. Again, $(1 - q)$ -% of all cases will yield pure tripartite partnerships without additional payments to the innovator. This contract attracts A -type innovators. The consultant will engage in active search to recruit the professional in such ventures. In ad-

dition, it may offer to buy-out a -type innovators by paying d^* for business ideas. The consultant does not engage in active search in such buy-outs. Hence, the remaining q -% of cases will either result in complete buy-outs of the innovator, or no contractual arrangement between the innovator and the consultant. Thus, there can also exist bipartite partnerships of innovators and professionals. Again, all bipartite contractual arrangements constitute partnerships on equal terms.

5 Summary and conclusions

The current study investigates a tripartite incentive contract between an innovator supplying a necessary intellectual asset, a professional assigned to productive tasks, and a consulting firm specialized in recruiting qualified personnel. Contracts can only be contingent on the venture's earnings gross of these parties' compensation costs. The liquidity-constrained professional will then always be compensated by receiving half of this revenue. This result is anticipated when the consultant offers contracts for innovators.

The consultant is ignorant with respect to the value of the innovator's business idea and the innovator cannot observe the consultant's actual search effort. Pure tripartite partnership contracts without additional fixed payments then implement the consultant's expected profit maximum. The sharing rule between the consultant and the innovator reflects the value of the project-specific search activity. All innovators receive their reservation income which is equal to the expected value of their stand-alone project. However, the consultant himself faces the professional's liquidity constraint when coping with the moral hazard problem. Consequently, the consultant's optimal search activity level is inefficiently low.

Assuming binary search activities then allows to address search optima

which constitute corner solutions. The self-selection of innovators characterized by “good” business ideas is again achieved through offering the pure tripartite partnership. If active search is optimal for low-value innovators as well, the contracts offered to innovators can be chosen from a schedule which includes the pure tripartite contract and the complete buy-out. In this case different innovator-types may therefore be pooled under an identical partnership contract. If active search is optimal for “good” projects only, innovators with “poor” business ideas may receive a buy-out offer. However, the consulting firm can also exclusively offer the pure tripartite partnership.

Given this contract, all three parties’ are solely compensated by receiving a share of the new venture’s net revenue. Distributing respective ownership shares will then implement this solution. While actually only being compensated for his consulting service, the consultant therefore appears to attain the role of a venture capitalist. Moreover, the model shows that, conditional on the assumptions concerning the cost structure associated with consulting services, a variety of ownership structures can emerge. There may exist tripartite partnerships between an innovator, a consultant and a professional, bipartite partnerships of equals between an innovator and a professional, and bipartite partnerships of equals between a consultant and a professional.

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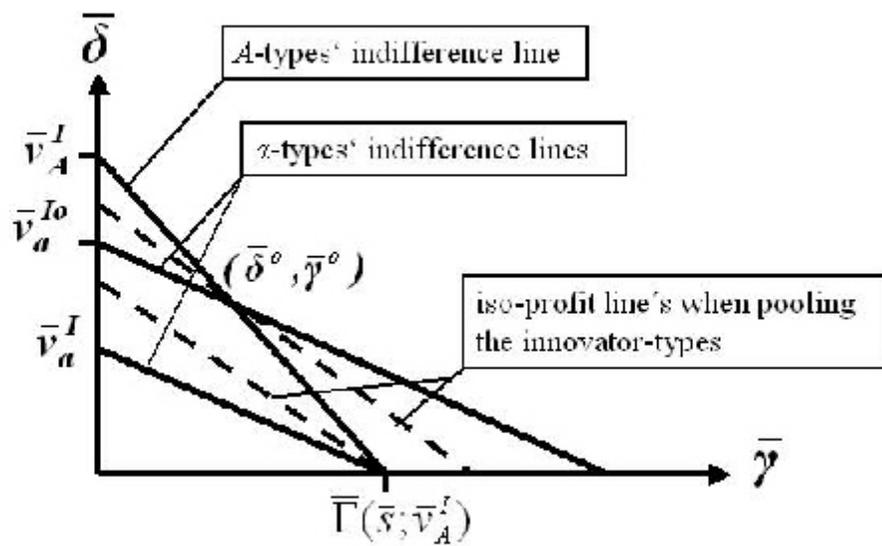


Figure 1: The optimal pooling contract

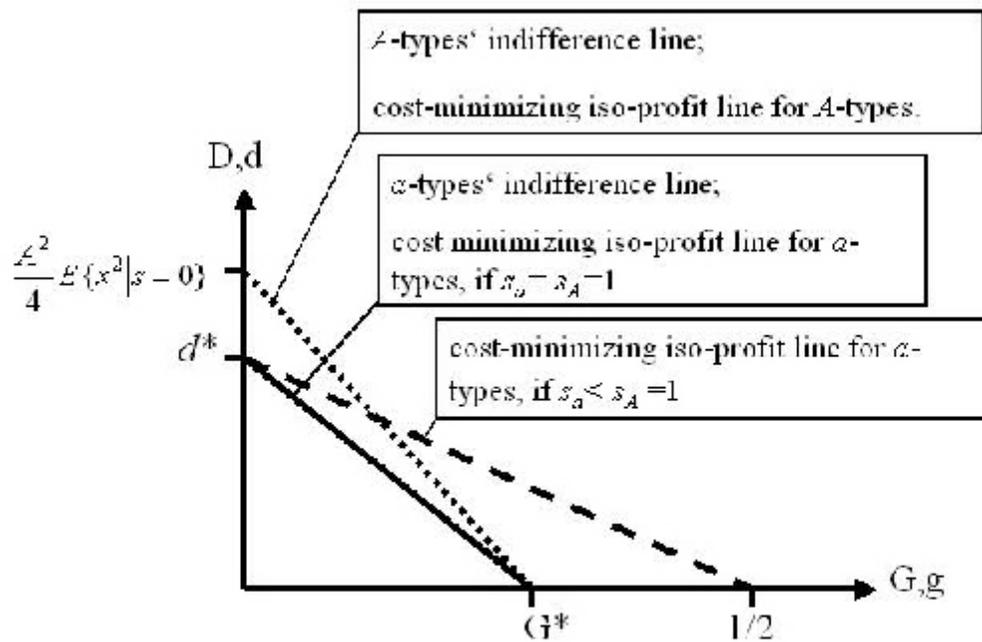


Figure 2: The self-selection of innovator-types