Venture capital syndication and the financing of innovation: financial versus expertise motives

Muriel Dal-Pont Legrand* and Sophie Pommet*

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Abstract

Venture capital firms are specific financial institutions that provide both funding and expertise for innovative projects. Some studies have tried to identify the sources of capital risk efficiency, and when syndication appeared as an important strategy (Manigart et al. 2006), however, there are few insights on its rationale. Within the analytical framework provided by the Soft (versus Hard) Budget Constraint literature, Huang and Xu (2003) already analysed the capacity of financial syndication to stop (vs refinance) short-run inefficient projects. Our objective in this paper is to define a syndication for expertise and to investigate the impact of syndication motivated by expertise on investment decisions and post-investment involvement of investors. The model introduces conditions when syndication related to expertise motives may be more profitable for venture capitalists than pure financial syndication.

*University of Nice-Sophia Antipolis and GREDEG CNRS, 250, Rue Albert Einstein Sophia Antipolis, F-06560 Valbonne Cedex, E-mail addresses: muriel.dalpont@gredeg.cnrs.fr.; sophie.pommet@gredeg.cnrs.fr.

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1 Introduction

The financing of innovation and particularly the financing of high tech firms is a crucial element in economic growth. On the one side, it is well known that the financial system in which firms operate matters for the financing of innovative companies, notorious for the dependence on external finance [Mayer (2002)]. On the other side, there is a persistence of different financial systems across countries. This scenario is often (over) simplified through the artificial separation of the Anglo-Saxon and Continental European countries, or still between European Common Law and Civil Law countries. Economists have begun to investigate financial structures more systematically, at the microeconomic level in order to show that the performance of firms depends on the ways that they are financed. It has been shown that the institutional structures of economic systems and the structure of financial institutions more precisely, matters for the financing of innovation. So, analyses of how new technology based projects are financed provide insights into these areas where the risks are so high that forms of governance and financing are crucial to success. It has been shown that some institutions, such as venture capital firms, are particularly favourable for the financing of projects characterised by high degrees of innovation. Indeed, venture capitalists apply mechanisms of corporate governance and mechanisms that enable the management of uncertainty, to add value to innovative projects [Gompers and Lerner (2004)]. Venture capital firms have been recognized as special financial intermediaries, providing funds but also expertise to innovative projects. It has been shown empirically that American (and Anglo-Saxon) venture capitalists generate significantly higher value from their investments than their European counterparts. This has led to more in depth analysis of the empirical evidence on the behaviour and performance of venture capital firms and the theoretical background that may explain this behaviour, in an attempt to order to clarify the observed gap in the performance of different countries (we compare Anglo-Saxon and Continental European countries). Empirical research shows that the features and behaviour of venture capital firms are among the most important factors explaining the differences in performance across countries. The important development of the venture capital industry since the late 1990s has stimulated interest in theoretical models that provide a rationale for the behaviour of these new financial intermediaries. Drawing on this research, in this paper we try to answer the question of how these particular financial institutions affect the performance of the R&D projects they finance? To answer this question we need to conduct direct comparison among the different organisational structures of venture capital firms within the different financial systems of various countries. Indeed, the behaviour of venture capitalists vis-à-vis the firms they finance, depends at least in part on their organisational structure. The objective of this paper is to analyse the specific impact of the behaviour of venture capitalist firms on the performance of the projects they finance. We look especially at the practice of looking for additional financial partners, which is usually called financial syndication\(^1\). Huang and Xu (2003) (hereafter HX) describe syndication as a credible commitment for investors to liquidate bad projects. They assume that syndication is driven by the motive of risk diversification. Casamatta and Haritchabalet (2007) provide a

\(^1\)Recent empirical work develops a quantitative evaluation of the importance of this practice: in 1997 60\% of venture capital was syndicated in Canada (Brander et al. (2002)), and in 2001 60\% was syndicated in the United States compared to only 30\% in Europe (Wright and Lockett (2003)).
survey of the literature which emphasises expertise as a motive for syndication, and de-
velop a theoretical model explaining the role of and interest in syndication for expertise.
In this paper, using the same theoretical framework as HX (2003), we define investors’
behaviour when the motivation for involvement in syndication is both risk diversifica-
tion and expertise; we examine the impact of these motivations in terms of investment
decision and post-investment involvement of venture capitalists. Our model shows that
in the case of syndication motivated by expertise, the capacity of the two investors to
agree on the reorganisation strategy for an inefficient short-run project allows venture
capitalists to promote long-run projects and to participate in the creation of value for
those projects through their technological and/or management experience. Our results
are compared with the ones obtained by HX, and we discuss the conditions under which
the expertise motive may be more profitable for venture capitalists than a motivation of
pure risk diversification. Moreover, since we adopt the analytical framework Soft (versus
Hard) Budget Constraint (SBC versus HBC) proposed by HX in order to study the re-
financing decisions made by venture capital firms, we can compare the performance of
different - SBC versus HBC - financial structures.

Section 2 presents the model and its assumptions. Section 3 first analyses the refinan-
cing decision in the case of HBC-financing and compares the performances of two alter-
native syndications, one driven by the motive of risk diversification (HBC-diversification)
and one driven by the motive of expertise (HBC-expertise). Section 3 then analyses the
decision in the case of SBC-financing, and compares the performance of the two financial
structures, SBC-financing versus HBC-expertise financing. A final section concludes.

2 The model

We propose a model that compares two financial structures : SBC versus HBC. When
a project is financed by a single venture capitalist, this corresponds to SBC financing.
This kind of financial structure generates what is known as a “SBC syndrome” [Kornai
et al. (2003)] and corresponds to a bias in committing to ex post refinancing of a short-
run inefficient project. HBC financing, on the other hand, has the involvement of several
investors in financing one project. So, venture-capital syndication is allied to a HBC finan-
cing structure. The presence of several investors provides a commitment to discontinue
short-run inefficient projects, which corresponds to a “short-termism” bias [Amable and
Chatelain (1995)]. Indeed, faced with a short-run inefficient project, the multiplicity of
investors generally does not allow its refinancing. Here, we propose a model based on a
HBC financing structure in which syndication is motivated by expertise. Whatever the
motivation for syndication, in both cases, syndication is characterised by multiple (in our
paper two) investors, an assumption that corresponds to a HBC financial structure, the
theory on which our model is built. 2.

We consider an economy with numerous entrepreneurs all with innovative projects
but no money to finance them, and numerous venture capitalists looking for projects to
finance. The venture capitalists can decide to finance a project on their own (SBC) or

2Cf. Dewatripont and Maskin (1995) for a reference to the HBC versus SBC literature.
to syndicate with a partner (HBC): this choice depends on the financial structure they want to adopt.

2.1 The nature of the projects

Our model has three periods and for simplicity we consider a zero discount rate. We suppose that among the entrepreneurs’ projects, a proportion $\alpha$ of them is short-run efficient and a proportion $1 - \alpha$ is short-run inefficient. The short-run inefficient projects require one additional period and a third investment in order to be completed and to become long-run efficient *ex post* projects. The paper considers the conditions under which such additional investment is provided. A short-run efficient project is then completed after two periods and needs an investment: $I_1 + I_2$ with $\hat{V} > I_1 + I_2$, $\hat{V}$ being the value generated by the short-run project which is profitable *ex ante*. A long-run project does not produce anything after the second period and requires additional financing in a third period, that is, a global investment of: $I_1 + I_2 + I_3$. Note that $I_3$ is associated with a reorganisation strategy aimed at improving the performance of the project. Potentially, these projects may reveal themselves as profitable or not at the end of the third period. A long-term project will be inefficient if the reorganisation strategy implemented is not the best strategy, and it will be efficient otherwise. It is only at the end of the second period that the investor(s) will decide to refinance (or not) the project according to the possibility (or not) of achieving agreement (or consensus) on the strategy to be implemented (*i.e.* the objective is to reorganise a project so as to improve the technology that is failing). Indeed, if short-run efficient projects are always terminated after two periods whatever the financing structure - SBC or HBC, then, the refinancing of long-run projects will depend on the shareholding structure (HBC versus SBC); see for example, Amable and Chatelain (1995); Dewatripont and Maskin (1995) and HX (2003). Then, the decision to invest in a third period is taken at the end of the second period under the condition that the various partners agree on the strategy to be implemented. Only projects where a unique strategy has been identified by investors as optimal will benefit from this additional financing. Consequently, even though they might have been efficient, projects will be liquidated each time the financial partners do not reach consensus on the strategy to be implemented. In our model, we focus on the refinancing condition of long term projects.

2.2 The sequence of investments

At date 0, nobody knows the nature of the project. *Ex ante* investment is necessary in order to reveal information.

At the end of the first period (date 1), only the entrepreneur knows the nature of the project (short-run efficient or not), not the investor(s). We consider that the entrepre-

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3 We suppose that the proportions $\alpha$ and $1 - \alpha$ are common knowledge.

4 We suppose here that $I_1 = I_2 = I_3$.

5 Such a hypothesis characterises innovative projects and means that *ex post* investment selection is more efficient than *ex ante* investment selection.
neur will perceive a private benefit (not necessarily a purely pecuniary one)⁶ \( b_t \) for his participation in the project \( t = 1, 2, 3 \). Since at date 1, the entrepreneur knows the nature of his project, he can decide whether to continue or not: if the decision is to stop the project he will only get a private benefit \( b_1 > 0 \). If the decision is to continue, then one additional unit of investment \( I_2 \) is provided by the investor(s) at date 2.

At the end of the second period (date 2), everybody can observe the project’s return:
- a short-run efficient project is completed at the end of period 2 and generates a private benefit for the entrepreneur \( b_2 > 0 \).
- a long-run project (i.e.: an inefficient short-run project) is still not profitable and investor(s) have to decide whether they prefer to liquidate the project or provide an additional investment in order to implement the necessary reorganisation strategy in order to make the project profitable in the long-run.

In the case of the investor(s) decision is to liquidate the project at date 2, the private benefit of the entrepreneur is worse than he could have expected after the first period \( b_2 < b_1 \). This hypothesis represents an incentive for the entrepreneur to stop a short-run inefficient project as soon as he is convinced that the investor(s) will not provide this additional investment. However, if the project benefits from \( I_3 \), a strategy is implemented to reorganise the project and to correct the sources of inefficiency.

The probability for an entrepreneur to obtain additional financing for the third period usually depends on the number of investors, but, as we show here, it also depends crucially on their capacity to share information concerning their diagnoses. More precisely, if the project is financed by a single investor, a case that corresponds to SBC, then such a project will systematically benefit from a refinancing decision. In this case, the return from project \( V \) is defined as: \( I_1 + I_2 > V > I_3 \), the project is efficient \textit{ex post}, but remains inefficient \textit{ex ante}. We can see that a single investor always has an incentive to provide a third unit of investment for a short-run inefficient project. Such projects provide a private benefit to the entrepreneur \( b_3 \), with \( b_3 > b_1 \).

If the project is co-financed by several (at least two) investors, it has been shown that difficulties arise over their agreeing on a reorganisation strategy and, in they may “agree to disagree”⁷ from the beginning of their cooperation. This result is also obtained in HX (2003) which analyses syndication among investors for a risk diversification motive (HBC-diversification). The authors show that under syndicated financing, all bad projects are liquidated at date 2, and the entrepreneur receives \( b_2 < b_1 \), which induces him to stop a bad project at the end of period 1.

Here we show that this result is affected if venture capital firms syndicate in order to share their (complementary) expertise on a project. We call this type of syndication HBC-expertise. In this case, “syndication is a response to the need to share informational resources in the \textit{ex ante} selection and \textit{ex post} management of investments” (Lockett and Wright, 1999, p. 307). Thus, even if a project will receive additional financing only if venture capital firms can agree on the strategy to be implemented, the way we define

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⁶Private benefit can be seen as professional experience accumulated by the entrepreneur through his work on the project or as (good) reputation as a successful manager of an efficient project...

expertise creates incentives for investors to share their private information on the project and renders consensus possible. When consensus on a strategy cannot be reached, then the project is liquidated. Projects that are financed for a third period obtain: $V_e > I_1 + I_2 + I_3$ and we suppose that the reorganisation strategy is always successful. The high value created here corresponds to the hypothesis that venture capital firms are essential and specific financial intermediaries because they can provide expertise and add value to the projects. We also suppose that a long-run project that benefits from the additional investment can only be efficient \textit{ex post}, with the entrepreneur in that case receiving a private benefit $b_3g$, with $b_3g > b_2g$ and the value of the project being defined as: $V_e > V$. This last hypothesis represents the idea that if a short-run project always leads to $b_2g$, whatever the financing structure (HBC or SBC), a long-run efficient project (i.e. a project that needs reorganisation) will require in the third period the involvement of the venture capital firms’ expertise, allowing them to add value to the innovative project. In this paper, we consider that venture capitalists can use their expertise in order to correctly evaluate information embodied in the signals coming from the projects, but also that they can use their expertise in order to take a good decision concerning the reorganisation of the project (i.e. venture capitalists give valuable advice). This means that expertise always results in the creation of value in the sense that it systematically allows improvement to the project’s performance. Here, we consider that each venture capitalist has unique expertise in a specific technological domain, that their expertise is complementary and that the venture capital firms use their respective expertise only at the time of project reorganisation. With reference to this last assumption, we specify that, in practice, when venture capitalists syndicate their investments, they can access specific skills that are different from the ones they possess, and which are (or not) complementary. We suppose that the expertise of venture capital firms is complementary since the value-added hypothesis is particularly validated when we consider that the venture capital firms that are syndicated hold complementary skills [Brander et al. (2002)]. Similarly, Hopp and Rieder (2006) show that firms that are able to benefit from the skill sets of syndicate partners are associated with higher levels of performance (measured by sales growth) than other firms.

Then we have: $b_3g > b_2g > b_3 > b_1 > b_2l \geq 0$ (cf. figure 1). In order to verify this equation, the private benefit perceived at the end of period 3, $b_3g$, needs to be relatively high \footnote{Amable and Chatelain (1995) use the same hypothesis.}. More precisely, we verify that: $\lambda b_3g + (1 - \lambda) b_2l \geq b_1$ where $\lambda$ represents the proportion of long term projects that benefit from a third investment and $(1 - \lambda)$, the proportion of projects that are liquidated at the end of the period \footnote{This condition encompasses the fact that the model considers the financing of innovative activities as driving profits, and the contributes to the hypothesis on the complementary expertises of the two investors. Note also that $b_3g$ depends on the degree of innovation embodied in the project.}. Then, if the value of $b_3g$ verifies $b_3g \geq \frac{b_1 - (1 - \lambda) b_2l}{\lambda}$, the entrepreneur has no incentive to liquidate the project at the end of the period 1.

Each investor obtains the following return $r_t$, with $t = 1, 2, 3$, $t$ representing the number of investment periods. Logically, the returns obtained for the project can be ranked as follows depending on the duration of the investment: $r_3g > r_2g > r_3 > r_1 > r_2l \geq 0$.
2.3 Syndication for an expertise motive

Two venture capital firms $A$ and $B$ decide to co-finance an innovative project, for instance, a new microprocessor concept which will improve computing performance. We suppose here that the motive of a syndication between $A$ and $B$ is driven by the need for (complementary) expertise. At date 2, venture capital firms observe the quality of the project: if the project appears inefficient in the short-run ($I_1 + I_2 > V$), investors have to evaluate the opportunity to refinance the project for a third period. This additional investment will be profitable only if the investors are able to identify “the” reorganisation strategy. In fact, investors have a choice between strategy $a$ and strategy $b$ and, in order to make that choice, they have to share their expertise. To be more precise, selection of “the right” strategy depends on signals $s_A$ and $s_B$ where $s_J = s_J^A, s_J^B$, and $J = A, B$. The signal $s_A$ (and respectively, $s_B$) is observed by the investor $A$ (and respectively, $B$). As in the HX (2003) model, each investor can only observe his own signal, the signal that is associated with the technology on which he is considered the expert. Let us suppose that investor $A$ can only observe the signal $s_A$ which evaluates electronics and that investor $B$ can only observe the signal $s_B$ which is related to computer science. The implementation of the optimal strategy will provide high profits for both, but each investor will receive a higher private benefit if the reorganisation is based on his particular technology. $E^*_J$ ($i = a, b$, the available strategies). Logically, if investor $A$ is in charge of the reorganisation of the project with strategy $a$, he will receive a high return $r_A^a$ as well as

11We assume here that the project can be reorganised in order to improve the part driven by electronics or the part that depends on computer science and that the two investors have a common interest: they need to be sure that they have correctly identified the source of inefficiency in the project.

12$E^*_J$ represents a positive externality measuring the private benefit of the investor $J$ in terms of reputation, of the additional knowledge accumulated through experimentation in the management of
a private benefit $E_A^a$. Idem for $B$. If strategy $a$ is identified as the optimal strategy, then we have: $r_A^a = r_B^b$ and $E_A^a > E_B^b$. Respectively, if $b$ is chosen, then we have: $r_A^b = r_B^b$ and $E_B^b > E_A^b$.

We can hypothesise that:

- the value of the project for $A$ (and respectively for $B$) is given by: $V_A^a = r_A^a + E_A^a$ (and $V_B^a = r_B^a + E_B^a$) if strategy $a$ is chosen. Logically, if strategy $b$ is chosen, then we have: $V_A^b = r_A^b + E_A^b$ and $V_B^b = r_B^b + E_B^b$.

- the value of the project for strategies $a$ and $b$ is given respectively by:

\[
V^a(s_A, s_B) = V_A^a(s_A, s_B) + V_B^a(s_A, s_B) \\
V^b(s_A, s_B) = V_A^b(s_A, s_B) + V_B^b(s_A, s_B)
\]

- there is a unique strategy or project reorganisation that must be implemented which will make the project efficient ex post at the end of period 3. If $s_A > s_B$, the best (and unique) strategy is $b$\textsuperscript{13}. If $s_B > s_A$, the strategy which has to followed is $a$.

We use the formula proposed in HX (2003) in order to prove the relationship between $A$ and $B$ must satisfy the first efficiency condition:

\[
\begin{align*}
\text{If } s_A > s_B, & \quad V_A^b(s_A, s_B) + V_B^b(s_A, s_B) > I_3 > V_A^a(s_A, s_B) + V_B^a(s_A, s_B) \\
\text{If } s_B > s_A, & \quad V_A^a(s_A, s_B) + V_B^a(s_A, s_B) > I_3 > V_A^b(s_A, s_B) + V_B^b(s_A, s_B) \\
\text{If } s_A = s_B, & \quad V_A^a(s_A, s_B) + V_B^a(s_A, s_B) = I_3 = V_A^b(s_A, s_B) + V_B^b(s_A, s_B)
\end{align*}
\]

Only one of the two strategies will generate a profit at the end of the third period. Under the hypothesis that agents are risk neutral, the relationship between $A$ and $B$ satisfies the second efficiency condition (2) : the outcome obtained with the wrong strategy is so bad that the expected net payoff of randomising between the two strategies is worse than liquidation,

\[
q V^b(s_A, s_B) + (1 - q) V^a(s_A, s_B) - I_3 < 0
\]

and

\[
q^{14} = \Pr(s_A > s_B)
\]

$1 - q(s_A, s_B)$ and $q(s_A, s_B)$ are the probabilities respectively associated by investors to the selection of the strategy $a$ or $b$.

\textsuperscript{13}If we return to our example, this means that in the project, the inefficiency comes from the computer science side. Then the strategy has to be based on improvement to that technology.

\textsuperscript{14}With $q \in [0, 1]$ knowing that $q$ depends on the values taken by $s_A$ and $s_B$. 

It is possible to prove that the two investors have a common interest in sharing their information, which by definition is the motive of expertise \(^{15}\). Each investor directly observes his own signal and by paying the cost of transfer \(T(s_A, s_B)\), can observe the signal of his partner. For instance, \(A\) observes \(s_A\) and \(B\) reveals his signal \(s_B\) to \(A\). In that case, \(A\) can now observe both \(s_A\) and \(s_B\). The identification of the optimal reorganisation strategy will be the outcome of observation of these two signals. The pairs of signals that can be observed are: \(\{ (s_A^h, s_B^l) , (s_A^l, s_B^h) , (s_A^h, s_B^h) , (s_A^l, s_B^l) \}\). We consider here that these pairs are equiprobable. Note that the degree of innovation is an important element, lack of knowledge about the technologies involved denies the specificity of the experts, preventing them from interpreting the signals correctly (i.e. the two partners can have difficulties in distinguishing between high (h) and low (l) signals). The probability of the following pairs of signals may then increase \(\{ (s_A^h, s_B^l) , (s_A^l, s_B^l) \}\) which means a lower probability of achieving consensus and hence determining a strategy. The direct consequence will be a lower probability \(\lambda\) for a project to receive additional financing.

We have two alternative scenarios.

First, that the two investors receive compatible signals: \(A\) observes \(s_A^h\) and \(B\) observes \(s_B^l\), then we obtain: \(s_A^h > s_B^l\) and the right strategy is \(b\); \(A\) observes \(s_A^l\) and \(B\) observes \(s_B^h\), and then we obtain: \(s_B^h > s_A^l\), and then the strategy is \(a\).

For all \(s_A^h > s_B^l\), we have: \(V_A^h(s_A^h, s_B^l) > V_A^l(s_A^h, s_B^l) \geq 0\) and \(V_B^h(s_A^h, s_B^l) > V_B^l(s_A^h, s_B^l) \geq 0\).

And for all \(s_B^h > s_A^l\), we have: \(V_A^l(s_A^l, s_B^h) > V_A^h(s_A^l, s_B^h) \geq 0\) and \(V_B^l(s_A^l, s_B^h) > V_B^h(s_A^l, s_B^h) \geq 0\).

Second, the two investors receive incompatible signals: \(A\) observes \(s_A^h\) and \(B\) observes \(s_B^h\) or \(A\) observes \(s_A^l\) and \(B\) observes \(s_B^l\) so that \(s_A = s_B\).

And for all \(s_A = s_B\), we have: \(V_A^h(s_A, s_B) > V_A^l(s_A, s_B)\) and \(V_B^h(s_A, s_B) > V_B^l(s_A, s_B)\).

In this case, the venture capital firms are not able to evaluate which of the strategies will be profitable: \(A\) always prefers to use its own strategy \(a\) (and \(b\) for \(B\) with strategy \(b\)). Because a random choice is not possible (cf. equation (2)), reorganisation is not possible. The project is liquidated after the end of period 2.

3 Refinancing decision

HX (2003) show that syndication could be considered a commitment by investors to stop short-run inefficient projects. Here, we examine if this result holds in the case of syndication for expertise. The elements characterise HBC-expertise are the following:

-Confidence that characterises the relationship between investors and allows them to share their specific information and to cooperate in order to identify the optimal strategy. This does not mean that all the projects that are inefficient at the end of period

\(^{15}\)In Section 3.1 we show that the two investors are induced to share their private information (i.e. to reveal the true value of their signal) because they both benefit from a good reorganisation of the project.
2 will receive additional financing: if the signals are not compatible, investors cannot discriminate between strategies $a$ and $b$, then, the venture capital firms cannot agree on a strategy and will decide to liquidate the project.

- We consider that long term projects that are reorganised will be more profitable than short-run efficient projects that are completed at the end of period 2.

We first solve the HBC-expertise model in order then to compare our result with the results obtained under HBC-diversification [HX (2003)].

### 3.1 HBC-expertise financing decision

At the end of period 2, investors discover the nature of the project. If the project is not efficient, they observe and compared $s_A$ and $s_B$. If the two signals are compatible, they agree to adopt the optimal strategy and they invest $I_3$.

**Proposition 1:** Projects where there is consensus on strategy benefit from an additional investment. These projects are efficient ex post since the strategy identified is the optimal strategy; moreover, these projects become profitable ex ante since they are reorganised by experts. The projects where no agreement is reached are liquidated.

**Proof:** We examine $A$’s incentive problem by fixing $s_B$ and we verify that there is an incentive compatibility condition for $A$ to tell the truth, which means that $q(s_A, s_B)$ and $T(s_A, s_B)$ are compatible and induce the investor $A$ (respectively, $B$) to reveal the true value of his signal $s_A$ (and respectively, $s_B$) so consensus can be identified. Then, when signals are compatible, the project is always reorganised at the end of period 2. $T(s_A, s_B)$ represents the payment made by $B$ to $A$ in order that $A$ reveals the true value of its signal\footnote{By symmetry, there will be a payment done by $A$ to $B$.}. Given $T(s_A, s_B)$ and $q(s_A, s_B)$, investor $A$ the true value of its signal only when the expected return of telling the truth is superior to the expected return obtained by the agent that is lying (i.e. sending a false signal).

We verify that $A$ has an incentive to reveal the true value of his signal to $B$.

\[
q(s_A, s_B)V_A^h(s_A, s_B) + (1 - q(s_A, s_B))V_A^a(s_A, s_B) + T(s_A, s_B) \geq \\
q(\hat{s}_A, s_B)V_A^h(\hat{s}_A, s_B) + (1 - q(\hat{s}_A, s_B))V_A^a(\hat{s}_A, s_B) + T(\hat{s}_A, s_B)
\]

where $\hat{s}_A$ represents the wrong signal given by $A$.

We now compare the incentive to lie about a signal $s_A$ when $s_A = s_A^h$ or when $s_A = s_A^l$. We consider here that the payment made by $B$ to $A$ is always the same, whatever $B$ observes.

If $s_A^h > s_A^l$, 

\[
q(s^h_A, s^l_B) V^h_A(s^h_A, s^l_B) + (1 - q(s^h_A, s^l_B)) V^a_A(s^h_A, s^l_B) + T(s^h_A, s_B) \geq \\
q(s^l_A, s^l_B) V^h_A(s^h_A, s^l_B) + (1 - q(s^h_A, s^l_B)) V^a_A(s^h_A, s^l_B) + T(s^l_A, s_B)
\]

Here : \(\hat{s}_A = s^l_A\).

\[
T(s^h_A, s_B) - T(s^l_A, s_B) \geq (q(s^l_A, s_B) - q(s^h_A, s_B)) V^h_A(s^h_A, s^l_B) + (q(s^h_A, s_B) - q(s^l_A, s_B)) V^a_A(s^h_A, s^l_B)
\]

(3)

If \(s^h_B > s^l_A\),

\[
q(s^l_A, s^h_B) V^h_A(s^l_A, s^h_B) + (1 - q(s^h_A, s^h_B)) V^a_A(s^l_A, s^h_B) + T(s^l_A, s_B) \geq \\
q(s^l_A, s^h_B) V^h_A(s^l_A, s^h_B) + (1 - q(s^h_A, s^h_B)) V^a_A(s^l_A, s^h_B) + T(s^h_A, s_B)
\]

Here : \(\hat{s}_A = s^h_A\)

\[
(q(s^l_A, s^h_B) - q(s^h_A, s^h_B)) V^h_A(s^h_A, s^h_B) + (q(s^h_A, s^h_B) - q(s^l_A, s^h_B)) V^a_A(s^h_A, s^h_B) \geq T(s^h_A, s_B) - T(s^l_A, s_B)
\]

(4)

We compare (3) and (4) in order to evaluate how the incentive for an investor to reveal the true signal depends on \(q(s_A, s_B)\) (probability to choose strategy \(b\)).

**Proposition 2 :** We have verified that : \((4) \geq (3)\), we now verify the hypothesis that agents always have an interest to reveal the truth.

**Proof :**

\[
(q(s^l_A, s^l_B) - q(s^h_A, s^l_B)) V^h_A(s^l_A, s^l_B) + (q(s^h_A, s^l_B) - q(s^l_A, s^l_B)) V^a_A(s^l_A, s^l_B) \geq \\
(q(s^l_A, s^l_B) - q(s^h_A, s^l_B)) V^h_A(s^l_A, s^l_B) + (q(s^h_A, s^l_B) - q(s^l_A, s^l_B)) V^a_A(s^h_A, s^l_B)
\]

We obtain :

\[
(q(s^l_A, s^l_B) - q(s^h_A, s^l_B)) (V^h_A(s^h_A, s^l_B) - V^a_A(s^h_A, s^h_B)) \geq \\
(q(s^h_A, s^l_B) - q(s^l_A, s^l_B)) (V^a_A(s^h_A, s^l_B) - V^h_A(s^h_A, s^l_B))
\]

In order to guarantee that there is a consensus on a reorganisation strategy, we must have : \(q(s^h_A, s^l_B) > q(s^l_A, s^h_B)\). We can show that such a condition is verified.

On the one side, we have : 

10
\[ V^a_A(s_A^l, s_B^h) > V^b_A(s_A^h, s_B^l) \geq 0 \quad \text{and} \quad V^b_A(s_A^h, s_B^l) > V^a_A(s_A^l, s_B^h) \geq 0. \]

On the other side, we have:

\[ V^a_A(s_A^l, s_B^h) > V^b_A(s_A^h, s_B^l) > 0 \quad \text{and} \quad V^a_A(s_A^h, s_B^l) > V^b_A(s_A^h, s_B^l) \geq 0 \]

even if on the average, \( V^a_A(s_A^l, s_B^h) = V^b_A(s_A^l, s_B^h) < I_3. \) This outcome is obtained because of the private benefit \( E^l \) (a positive externality) obtained by the investor when the project is reorganised under its own strategy. We then obtain: \( V^a_A(s_A^l, s_B^h) - V^b_A(s_A^l, s_B^h) < V^a_A(s_A^h, s_B^l) - V^b_A(s_A^h, s_B^l) < 0. \) Moreover, \( q(s_A^h, s_B^l) = q(s_A^l, s_B^h). \) Indeed, as outlined above, when signals are not compatible, no consensus is possible, and so the project is liquidated. Then, the probability to choose one of the other strategies is equal to 0. Then, to be verified, the incentive condition requires that \( q(s_A^h, s_B^l) > q(s_A^l, s_B^h). \) This implies that \( q(s_A^h, s_B^l) \) increases with \( s_A \) and that \( q(s_A^l, s_B^h) = 0 \) and \( q(s_A^l, s_B^h) \neq 0. \) With equation (1), for all \( s_B^h \) when \( s_A \) improves from \( s_A^l \) to \( s_A^h \) (i.e. \( s_A^h > s_B^l \)); the efficiency can be improved by increasing \( q(s_A, s_B) \), i.e. \( q(s_A, s_B) \) must increase with \( s_A \). With (1), the efficiency condition requires that \( q(s_A^l, s_B^h) = 0 \) and \( q(s_A^l, s_B^h) = 1. \) Then, the only general form for \( q(s_A, s_B) \) which can satisfy both the incentive condition and the first efficiency condition (1) is to verify that \( q(s_A, s_B) \) increases with \( s_A \). Then the decision to reorganise based on \( q = Pr(s_A > s_B) \) is more efficient than liquidation.

In order to be sure that such a reorganisation is possible, it is necessary to ensure that the entrepreneur has no incentive to stop the project at the end of period 1. As already shown, the entrepreneur does not have an incentive to stop the project since his private benefit \( b_{3g} \) obtained at the end of period 3 confirms that: \( b_{3g} > b_{2g} > b_3 > b_1 > b_{2l} \geq 0 \) with \( \lambda b_{3g} + (1 - \lambda) b_{2l} \geq b_1. \)

In contrast to HX (2003), we suppose that syndication allows the two investors to benefit from their mutual expertise in different fields. The type of syndication we define is essentially different from that proposed in HX (2003) on two counts:

- First, even if asymmetric information is always present in the signal each investor provides, in our case there is an incentive to share information. We suppose that each expert trusts the judgement of its partner and we do not consider there is a leader among the two experts (cf. Manigart et al. (2006) for arguments explaining that a cooperation based on a leadership is generally less efficient). Investor A considers the signal provided by investor B to be as credible as its own. It is this specific relationship based on confidence that allows the two investors to cooperate.

- Second, an expert by definition is an agent that is able to add value to an innovative project. Then, an expert will have a direct impact on the returns from the project. We consider that each of the experts can add value to the project when it is reorganised under the strategy based on their expertise: for instance, the investor A adds value to the project when the strategy implemented is A. The two investors nevertheless always receive a large profit (if not a private benefit) from the implementation of a successful strategy.
### 3.2 Efficiency of HBC financing: adding value versus pure risk diversification

Next, we compare the two types of syndication. Since our model is based on the model provided by HX (2003), we can easily compare the results of the two models. HX (2003) conclude that inefficient short-run projects are never reorganised. Indeed, the way they consider syndication, i.e., syndication for risk diversification, means that investors are not able to find a scheme that allows them to share their private information and, thus, the conflict of interest in choosing a reorganisation strategy cannot be resolved. Considering that $b_1 > b_2$ and that the entrepreneur knows this result, he will be induced to stop an inefficient project at the end of the first period, i.e., once he has discovered that the project is short-run inefficient. In a previous version of their paper, HX show that investors’ expected profits ($\Pi^{HBC-d}$) from an HBC-diversification syndication are:

$$
\Pi^{HBC-d} = \alpha \left( \hat{V} - I_1 - I_2 - 2c^{HBC} \right) + (1 - \alpha) \left( -I_1 - c^{HBC} \right)
$$

Here, $\alpha$ represents the proportion of short-run projects and $1 - \alpha$ represents the proportion of long-term projects. Efficient short-run projects (completed at date 2) generate a return $\hat{V}$. $c^{HBC}$ is a cost of coordination between the financial partners including a cost for collecting information. For simplicity, we assume that the project’s value is equal to 0 when it is dropped by entrepreneur at the end of the first period.

In the case of value-added syndication motives, investors’ expected profits ($\Pi^{HBC-e}$) are:

$$
\Pi^{HBC-e} = \alpha \left( \hat{V} - I_1 - I_2 - 2c^{HBC} \right) + (1 - \alpha) \left[ \lambda \left( \hat{V}_e - I_1 - I_2 - I_3 - 3c^{HBC} \right) + (1 - \lambda) \left( -I_1 - I_2 - 2c^{HBC} \right) \right]
$$

Here, the reorganised projects generate a return $\hat{V}_e$. $\lambda$ represents the proportion of refinanced projects. For simplicity, we assume that the project’s value is equal to 0 when it is liquidated by investors at the end of the second period.

The difference between the profits realised with HBC-expertise financing and those achieved through HBC-diversification financing is represented by the following equation:

$$
\Pi^{HBC-e} - \Pi^{HBC-d} = \alpha \left( \hat{V} - I_1 - I_2 - 2c^{HBC} \right) + (1 - \alpha) \left[ \lambda \left( \hat{V}_e - I_1 - I_2 - I_3 - 3c^{HBC} \right) + (1 - \lambda) \left( -I_1 - I_2 - 2c^{HBC} \right) \right] - \left( \alpha \left( \hat{V} - I_1 - I_2 - 2c^{HBC} \right) + (1 - \alpha) \left( -I_1 - c^{HBC} \right) \right)
$$

---


18 This model is the same as the one presented in HX (2003).

19 In order to simplify, in this model, we suppose that this cost is the same for the two motives for syndication that we are studying. We also suppose that this cost includes $T(s_A, s_B)$. 

12
After simplification, we obtain:

\[ \Pi^{HBC-e} - \Pi^{HBC-d} = (1 - \alpha) \left( -I_2 - e^{HBC} \right) + (1 - \alpha) \left( \hat{V}_e - I_3 - e^{HBC} \right) \]

If we examine the efficiency of those different financing structures, we can easily see that the outcome depends on \( \lambda \). More precisely, we can identify a value of \( \lambda^{*} \) such as \( \Pi^{HBC-e} = \Pi^{HBC-d} \).

We obtain that: \( \lambda^{*} = \frac{I_2 + e^{HBC}}{V_e - e^{HBC} - I_3} \). Then, we can deduce that: \( \Pi^{HBC-e} > \Pi^{HBC-d} \), if and only if \( \lambda > \lambda^{*} \). The greater the importance of the added-value obtained through expertise \( \hat{V}_e \), the more easily we can verify the last equation.

(Results). On the one side, the proportion \( \lambda \) of long term projects benefiting from refinancing decreases with an increase in the degree of project innovation. This means that HBC-expertise appears more efficient when investors know enough about the technologies involved in order to exert their expertise and to add substantial value to the project, which corresponds to \( \lambda > \lambda^{*} \). On the other side, project selection is less efficient in the case of HBC-expertise but, this inefficiency is compensated by the higher performance generated by the projects benefiting from expertise.

In brief, long-run projects are not systematically stopped after the first period as in HX (2003). Because the possibility to agree on a strategy exists, entrepreneurs do not take the decision to stop what they have identified as a short-run inefficient project. This might appear to be a disadvantage since all projects will benefit from a second investment. Nevertheless, some of the projects identified as inefficient at the end of the second period, will be financed for a third period. Indeed, the syndication based on HBC-expertise allows the financing of long term projects which, on the average, are much more profitable than short-run projects. This point is consistent with the empirical fact that, in general, specialised venture capital firms are much more profitable than generalist ones [Hege et al. (2006)], which could explain, at least in part, why US venture capital firms, which are specialized and more often use syndication for expertise, show higher performance than European ones. Our conclusions also validate the hypothesis of added-value provided by the capital risk industry, which is emphasised in Brander et al. (2002).

### 3.3 Efficiency of SBC financing versus HBC-expertise financing

Traditional results getting in the case of SBC financing

In the case the project is financed by a single venture capitalist, this investor has all the information : \( s_A \) and \( s_B \), which allows it to choose the best strategy such that the return from a project that is refinanced at the end of the third period, \( V^* (s_A, s_B) \) is higher than the cost of ex post refinancing, \( I_3^{20} \). In this case, a single investor is not able to commit to terminating a short-run inefficient project ex post. Since short-run inefficient projects are never liquidated at the end of the second period, then the entrepreneur has

---

20When \( s_A = s_B \), then \( I_1 + I_2 > V = I_3 \) i.e. the project is no more ex post efficient but there is still an incentive to refinance for the single investor in order to save the initial investments \( (I_1 + I_2) \).
no incentive to tell the truth at date 1 if he discovers that the project is short-run inefficient. Indeed, given $b_3 > b_1$, the entrepreneur will always choose to continue a long-run project after privately discovering its type, if the long-run project will be systematically refinanced by the investor at the end of the second period.

**Proposition 3**: The entrepreneur has no incentive to reveal the type of his project at date 1 and a single investor is not able to commit to terminating a short-run inefficient project at the end of the second period. We obtain the following result: a single investor will always refinance a long-run project for a third period.

**Proof**: When a project is financed by a single investor, the investor will have all the information $s_A$ and $s_B$ and this can be used to choose an *ex post* efficient strategy to reorganise the project such that $V^*(s_A, s_B) > I_3$. Given that the investment in innovative projects is irreversible, the first two units of investment are lost and since $V^*(s_A, s_B) > I_3$ then, the investor will always choose to reorganise a long-run project. So, the entrepreneur has no incentive to stop the project if he discovers its type at the end of the first period. Indeed, the private benefit accruing to entrepreneur from a long-run project that is refinanced at the end of the third period is higher than the private benefit from a long-run project that is terminated at the end of the first period: $b_3 > b_1$. Thus, if the entrepreneur anticipates that the project is always reorganised by the investor at date 2 then, he will also anticipate that he will receive the private benefit $b_3$. It follows that the entrepreneur will never reveal the type of his project at date 1 if the project is a long-run one. So, SBC financing introduces a bias towards inefficiency because long-run projects are always refinanced.

**Efficiency of SBC financing versus HBC-expertise financing**

We compare the impact of syndication for expertise with SBC financing. A short-run project always leads to $\hat{V}$, whatever the financing structure - HBC or SBC. The difference between the two structures of financing are based on the difference in the refinancing decision. Under a SBC financing structure, long-run projects are always refinanced at date 2 while under syndicated financing (for expertise), these projects are refinanced only if there is a consensus on the strategy to be implemented. If a consensus exists, a reorganisation strategy is implemented which leads to creation of a high value because of the involvement of venture capitalists’ expertise in the innovative project.

Then, investors’ expected profits $\Pi_{SBC}^*$ when projects are financed under a SBC financing structure are:

$$\Pi_{SBC}^* = \alpha (\hat{V} - I_1 - I_2 - c_{SBC}) + (1 - \alpha) (V - I_1 - I_2 - I_3 - c_{SBC})$$

Here, a long-run project that is reorganised by a single investor generates a return $\hat{V}$. $c_{SBC}$ is the cost of collecting the information under SBC financing.

The difference between the profits realised through HBC-expertise financing and the profits obtained through SBC financing is represented by the following equation:

$\text{We suppose that this cost for collecting information is lower than the cost of HBC financing } c_{HBC}^*$, which also includes a cost for coordinating the financial partners.
\[ \Pi^{HBC-e} - \Pi^{SBC} = \alpha \left( \hat{V} - I_1 - I_2 - 2e^{HBC} \right) + \\
(1 - \alpha) \left[ \lambda \left( \hat{V}_e - I_1 - I_2 - I_3 - 3e^{HBC} \right) + (1 - \lambda) \left( -I_1 - I_2 - 2e^{HBC} \right) \right] - \\
\left[ \alpha \left( \hat{V} - I_1 - I_2 - c^{SBC} \right) + (1 - \alpha) \left( V - I_1 - I_2 - I_3 - c^{SBC} \right) \right] \]

After simplification, we obtain:

\[ \Pi^{HBC-e} - \Pi^{SBC} = (1 - \alpha) \left( \hat{V}_e - I_3 - c^{HBC} \right) + (1 - \alpha) \left( -V + I_3 \right) + \left( -2e^{HBC} + c^{SBC} \right) \]

Ceteris paribus for all : \( \hat{V}_e > \left( \frac{2e^{HBC} - c^{SBC}}{1 - \alpha} \right) - \frac{(-V + I_3)}{\lambda} + I_3 + c^{HBC} \), when the proportion of long term projects benefiting from refinancing increases, HBC financing (syndication for expertise) is more efficient than financing by a single investor. The fact that \( \hat{V}_e \) is higher than \( V \) is in line with Brander et al.’s (2002) results, which show that syndicated projects are more profitable on average than projects financed by a single investor. This result provides validation for our “value-added” hypothesis.

### 4 Conclusion

The model proposed in this paper completes the analysis of syndication rationale provided in HX (2003), showing that investment syndication does not systematically represent a commitment to stop short-run inefficient projects, but can also work to promote an added value function, provided by venture capital firms. More precisely, our results show that the case of syndication for an expertise motive leads to a higher degree of refinancing than obtained in the case of syndication for risk diversification [HX (2003)].

Our model takes account not only of the hypothesis of “value-added” provided by venture capital firms, but also their role in the ex post selection of innovative projects. Indeed, our objective in the model was to highlight the competence of venture capital firms already known as intermediaries able to add value to the projects they finance. In contrast to HX, we show first that other syndication motives than the pure financial one should be taken into account, especially when new technologies are involved in the project being financed. Second, we define syndication for expertise and show that HBC-financing with an expertise motive does not systematically lead to a refinancing of short-run inefficient projects; indeed this type of financing has the capacity to stop short-run inefficient projects each time investors cannot achieve consensus on the strategy to be implemented.

The hypothesis of refinancing for the third period being strictly dependent on the existence of a consensus acts as a “filter”. This screening guarantees that projects that are refinanced will be efficient in the long term, but does not exclude the possibility that potentially efficient projects may be liquidated if no consensus on their reorganisation is achieved.

We have shown that the relative efficiency of a syndication motive driven by expertise compared to one driven purely by risk diversification will depend on the degree of innovation embodied in the project being financed. The model also shows that syndication
ceases to be the most efficient form of financing when the risk (uncertainty) becomes very high. This questions the general view of financial commitment by public institutions to research programmes concerning new technologies.

Our results show that the use and the choice of syndication could be an important determinant of venture capital industry efficiency in France or other Continental European countries. Indeed, the lower financial performance of venture capital industry in Europe is regularly identified in comparisons with the venture capital industry in Anglo-Saxon countries [Hege et al. (2006)]. Studies show that venture capitalists in France and Continental Europe are much less specialized than they are in the Anglo-Saxon countries. It should be noted also that the rate of syndication is lower for venture capitalists based in Europe, especially in France [Bottazzi and Da Rin (2002)] than for venture capitalists based in United States [Hege et al. (2006)]. We can extend the consequences of this specialisation default to the performance of venture capital firms in France and in Continental Europe more generally.

It should be noted that even if venture capital firms in the Anglo-Saxon countries seem to perform better than their counterparts in Continental Europe, it is not clear whether, at a macroeconomic level, it would be desirable for the European countries to imitate the Anglo-Saxon capital risk industry. Indeed, the diversity of institutions in each type of economy points to “institutional complementarity” [Amable (2005)], which results in implement coherent policies aimed at supporting the financing of innovation. As long as there is heterogeneity in the institutional structures across countries, there will be no unique capital risk industry model that is able effectively to finance new technology projects in the countries analysed. Each economy must find a way to make its capital risk industry perform better within the context of the established institutional structures.

In brief, it would seem that:

- HBC-expertise financing has a positive impact on project performance;

- a HBC financing structure (for expertise or risk diversification) does not allow the financing of long-run projects for which the degree of innovation is too high (i.e. disruptive innovation),

- a SBC financing structure allows the financing of disruptive innovation. According to Amable and Chatelain (1995), a centralized financial system (SBC) has a positive impact on national economy growth rates allowing the financing of long term projects as being potentially more efficient than short term projects. In their model, a centralized financial system finances innovation by a higher proportion, which results in increased production and a wider range of intermediary products and, thus, results in increased of production of the final product.

Those results have some implications for economic policy and, more especially, public policy. First, policy makers should be encouraged to finance disruptive innovations within a centralized, state controlled structure, which would be comparable to a SBC financing structure. Set up funds should be used to finance key sectors and disruptive innovation carriers and would have durable effects on economic growth. Second, policy makers should encourage the establishment of venture capital funds specialised in specific industry sectors or stages of development of particular projects. For instance, public funds could be
directed to already established specialised funds with the objective of creating an incentive for the continuation of this specialised funding to promote both higher specialization and greater and better use of syndicated investments.

References


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