Active Financial Intermediation and Market Efficiency: The Case of Fast-Growing Firms Financed by Venture Capitalists

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ABSTRACT

Financial market dynamics have recently given rise to intermediation in venture capitalism. Today, this is one of the paradigms of finance theories in relation to fast-growing companies. It is in this framework that we examined how venture capitalists' active intermediation contributes to enhanced efficiency between capital markets and fast-growing companies. More specifically, we developed an empirical model of the valuation of initial public offerings based on information produced by the company and by venture capitalists. Our findings indicate that venture capitalists fulfil an intermediation role in information production by providing expertise and validating information produced by the company. Moreover, it appears that companies financed by active venture capitalists are less under-valued than companies financed by hands-off venture capitalists.

I.   INTRODUCTION

In recent years, there has been some debate between financial economists on the difficulties experienced by fast-growing companies to communicate their quality to financial backers (Mc Kie-Masson, 1990; and Rajan and Zingales, 1995). The literature indicates that the nature of high-tech company assets implies risk levels for creditors that they refuse to assume or that they are only prepared to assume at excessive cost. Such companies favour equity financing, which means opening up the company's capital. This approach implies a change in the company's capital structure and control, thereby generating agency costs. In this situation, the models developed by Jensen and Meckling (1976), Leland and Pyle (1977) and Rock (1986) lead us to predict a decline in profitability when such changes in company control take place. This has also been noted empirically in the case of initial public offerings (IPO) by Jain et al. (1994), Mikkelson et al. (1997), Jain and Kini (1999), Pagano et al. (1998), and Coakley et al. (2004). Informational asymmetries between companies and the market encourage non-growth companies to opportunistically adopt behaviour that mimics fast-growing companies so as to raise capital on the stock market. Anticipating this strategy, the market demands information to manage the problem of reverse selection and this results in costs which grow with informational asymmetry. The signalling models underline the fact that undervaluation is a strategy used by shareholders in fast-growing companies to help stand out from non-growth companies. Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Renneboog et al. (2007) theoretically modelled the undervaluation of an initial public offering as the cost of the search for information, borne by investors to enable them to value the company. More specifically, these authors consider that stock market listings are achieved by initially offering a small proportion of the capital at an undervalued price. A second issue then completes the opening of the capital at the company's market price. This process immediately sanctions non-growth companies while satisfying the shareholders of fast-growing companies.

Research to date has suggested that problems experienced by organisations in communicating information about their growth opportunities and changes to their control structure impacts on the company's IPO valuation. Nonetheless, while company-specific factors generate informational differentials between the company and the financial markets, the theoretical and empirical work by Chemmanur and Fulghieri (1994) and Jain and Kini (1999) have highlighted the contribution of investment banks in the production of screening and monitoring information. This contribution thus partially remedies the lack of information which a company may suffer from.

Within this context, the aim of this study was to ascertain the extent to which information produced by venture capitalists can be considered as an extension of the information produced by the company, modifying the company's IPO valuation. Our findings indicate that the "ROE" (return on equity) and "percentage of voting rights owned by the public" variables are the best indicators of undervaluation, depending on whether a probabilistic or a linear approach is used. We also argue that venture capitalists fulfil an intermediation role of information production by providing expertise and validating information produced by the company. Moreover, it appears that companies financed by active venture capitalists are less undervalued than companies financed by hands-off venture capitalists.

The rest of the paper is organized as follows. Section 2 explores the theoretical bases and the empirical results on which the hypotheses are based. In section 3, we define the sample and methodology, while section 4 examines the firm's characteristics and the information produced by venture capitalists on IPO valuation. In section 5, we discuss whether there is complementarity between the information produced by venture capitalists and the company. The last section sets out our conclusions.

II.   IPO VALUATION

A.   The Company's Characteristics and Its IPO Valuation

Research initiated by Rock (1986) in the area of initial pubic offerings concurs that the extent of undervaluation increases with informational asymmetry. In such a scenario, undervaluation is seen as an information cost. In the literature, we identified several indicators of informational asymmetry (Coakley et al., 2004): i.e. financial performance, market to book value, the redeployment of assets, and the company's state variables (age and size). According to the models developed by Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Chemmanur and Fulghieri (1995) fast-growing companies need high profitability ratios and to undervalue their IPO in order to stand out from other companies. It is therefore not in the interest of non-growth companies to imitate fast-growing companies by having high profitability ratios if they are not in a position to support an undervalued price during the IPO.

Hypothesis 1.1: there should be a positive relationship between undervaluation and the company's pre-IPO financial performances.
Hypothesis 1.2: there should be a negative relationship between the company's financial performances and valuation differentials.

For Fama (1991), the company's market to book ratio is an indicator that can be used to predict future profitability. As Pontiff and Schall (1998) point out, this ratio "captures" the information regarding the company's future profits. The higher the market value to book value, the more likely the company is to generate future profits. This ratio is measured by the price at which the shares are listed in relation to their book value. A high market to book ratio also implies that the choice of growth opportunities are left to the discretion of the entrepreneur. Empirical studies conducted by Rajan and Zingales (1995) and Barclay and Smith (1995) tested the incidence of market to book ratio on a company's debt levels. The first study showed that the higher the ratio, the lower the company's level of debt. The second study highlighted a negative relationship between the maturity of the company's debt and growth opportunities.

Hypothesis 2.1: There should be a negative relationship between undervaluation and the market to book ratio.
Hypothesis 2.2: There is a positive relationship between the market to book ratio and valuation differentials.

The quality of the company's assets is also presented as a source of informational asymmetry since, according to Williamson (1988), the more difficult it is for the market

to value assets at their right price, the less the assets in question can be redeployed (i.e. disposed of to a third party). In our framework, we use the following ratio to measure the level of redeployment, namely, the company's intangible assets in relation to total assets.

Hypothesis 2.3: There is a negative relationship between the redeployment ratio and undervaluation. In other words, the higher the proportion of intangible assets, the more undervalued the company is likely to be.
Hypothesis 2.4: There is a negative relationship between the redeployment ratio and valuation differentials. In other words, the higher the proportion of intangible assets, the more likely the company is to have wide valuation differentials.

Finally, according to Ritter (1991) and Chemmanur and Fulghieri (1995), informational asymmetries are even greater when the company is young and small. In such cases, the company has low visibility because of its brief business history and high sensitivity to market fluctuations compared with older and larger companies.
We therefore suggest the following hypothesis:

Hypothesis 2.5: the younger the company, the more it tends to be undervalued.
Hypothesis 2.6: the smaller the company, the more it tends to be undervalued.
Hypothesis 2.7: valuation differentials decrease with the age of the company.
Hypothesis 2.8: valuation differentials decrease with size.

B.   The Structure of the Company's Control and Its IPO Valuation

The models referred to in the introduction and inspired by the theoretical foundations developed by Jensen and Meckling (1976) predict that the dilution of capital at the time of an IPO implies a divergence of interests between managers and shareholders, which generates agency costs. Faced with these structural changes, the managing entrepreneur may choose to under-price the shares that she/he issues in order to stand out from other companies. The models by Allen and Faulhaber (1989), Griblatt and Hwang (1989), Welch (1989) and Chemmanur (1993) demonstrate that entrepreneurs who manage fast-growing companies get a better market reception at the time of subsequent capital increases when they under-price the IPO. This approach maximises the revenues of "insider" shareholders to the extent that they can subsequently withdraw at a high market price. On the other hand, entrepreneurs owning shares in non-growth companies should sell these shares at the time of the IPO, trying not to undervalue them. Thus, a high proportion of listed shares leads to a dilution in the company's value and, consequently, a smaller profit for insiders who keep their shares following the IPO. Entrepreneurs owning a fast-growing company should, consequently, not only undervalue the initial listing price, but also float only a small proportion of the capital while maintaining their participating interest. Conversely, entrepreneurs owning shares in non-growth companies should not undervalue the listing price and should float a high proportion of the company's capital, i.e. sell a high proportion of their shares. Empirical studies show that in the United States, the initial shareholders continue to hold an average of 70.5% of their shares following an IPO (Jain and Kini, 1999) and 69.2% in Italy (Pagano et al., 1998). According to Slovin et al. (1994) the average undervaluation

of an IPO at the end of the first day of listing is 10% in the United States. Levis (1995) and Brennan and Franks (1997) respectively observe average undervaluation of 11.5% and 9.42% on the English market after the first week of listing, and medium-term undervaluation of 5.02% according to Brennan and Franks. The same authors also point out that new shares issued represent 28.4% and old shares sold represent 24%. On the basis of a sample of 272 companies, Gallais-Hamonno (1999) observed that the undervaluation is over 6% when the company listed subsequently carries out an SEO. The average undervaluation is 19.1% for companies which carry out an SEO, while it is 13.3% for the others.
We therefore consider that:

Hypothesis 4.1: the lower the proportion of shares offered on the stock market, the more the company tends to be undervalued.
Hypothesis 4.2: the lower the proportion of shares offered on the stock market, the lower the valuation differentials.
Hypothesis 4.3: the lower the proportion of voting rights offered on the stock market, the more the company tends to be undervalued.
Hypothesis 4.4: the lower the proportion of voting rights offered, on the market the lower the valuation differentials.
Hypothesis 4.5: the lower the proportion of shares sold on the stock market, the more the company tends to be undervalued.
Hypothesis 4.6: the lower the proportion of shares sold on the stock market, the lower the valuation differentials.

C.   The Contribution of Information Produced by Venture Capitalists on IPO Valuation

Theoretical models regarding the role of venture capitalists conclude that this role facilitates intermediation between companies and the financial market since it produces information. More specifically, venture capitalists carry out a control function in companies through their participation in the capital and the percentage of voting rights owned. This participation, which more often than not represents a minority interest, encourages them to acquire information about the company and its managers, notably helping to reduce agency conflicts (Kaplan and Strömberg 2001). This participation is an information signal for market investors. Moreover, the work by Kaplan and Strömberg (2003) suggests that the financing sequence (the number of financing rounds prior to the IPO) enables venture capitalists to minimise agency costs and improve their understanding of the company. Every time a new financing round is introduced, the company is obliged to produce information which increases the venture capitalists' expertise. The description of the venture capitalism activity by Sahlman (1990) highlights the use of sequence financing as a characteristic of the contracts implemented. Initially, venture capitalists only contribute a fraction of the capital needed for the complete development of the project. The renewal of financing is subject to the realisation of the intermediate objectives fixed. The advantage of sequence financing is that it is provides a withdrawal option and can in fact be considered as an option contract. The entrepreneur's decision to accept such a contract generates information as to his future plans, since the financing is renewed on the basis of the

information acquired during previous rounds. If the objectives are achieved, the entrepreneur's project is enhanced. On the other hand, the entrepreneur is also sanctioned by a loss in the value of his enterprise or may even be dismissed. Sequential investments enable entrepreneurs to focus on the tasks that they must accomplish and motivate them to achieve their goals. However, according to Gompers (1995), this method of financing can lead entrepreneurs to target short-term goals and neglect long-term objectives, thereby creating "myopia." In order to overcome this problem, venture capitalists establish intermediate medium-term objectives in the contract. These medium-term objectives are necessary to achieve the long-term goals. Venture capitalists therefore acquire information through their participating interests in companies. The empirical study by Fernandez and Lantz (2001) argued that the "pre-IPO percentage of voting rights owned by the syndication" and "the size of the syndication investment portfolio" variables are the most relevant in terms of predicting valuation differentials. These variables emphasise the importance of the expertise and screening role that venture capitalists contribute to the financial market to enable the latter to price an IPO as accurately as possible.

We thus deduce the following hypotheses:

Hypothesis 5.1: the more voting rights venture capitalists own, the lower the valuation differentials.
Hypothesis 5.2: the better the reputation of the syndication, the lower the valuation differentials.
Hypothesis 5.3: the more voting rights venture capitalists own, the lower the undervaluation.
Hypothesis 5.4: the better the reputation of the syndication, the higher the undervaluation.

Accordingly, in this study we propose examining the extent to which venture capitalists contribute to effective information in relation to the company's financial characteristics. We examine the contribution of information produced by venture capitalists to that of companies, first on valuation differentials and secondly on undervaluation.

III.   SAMPLE AND METHODOLOGY

A.   Sample

We tested the role of venture capitalists as financial market information producers in a sample taken from all the initial public offerings on the French Second and New Markets over a period from 1983 to 1999, by selecting all the companies supported by venture capitalists. We limited the present study to the above-mentioned period in view of the deep trend reversal on the financial markets that followed. The companies were identified on the basis of an examination of the IPO prospectus, which had to indicate the pre-listing and post-listing shareholding structure. Access to this information led us to eliminate 8 operations. We finally selected an exhaustive group of 75 operations, broken down as follows: 49 companies listed on the Second Market and 26 on the New Market. We deselected insurance companies, real estate companies, banks and financial institutions, thus reducing the sample to 63 companies.

We used guides published by the French Association of Venture Capitalists (AFIC) and the "Guide Annuaire des professionnels du haut de bilan de Capital-Finance" to help us to identify venture capitalists and to obtain information about their characteristics.

The information on companies listed on the stock market, as well as the stock market data, were communicated to us by Euronext.

B.   Methodology

The hypotheses to be tested meant establishing two types of measures of explained variables which were, firstly, the total valuation differentials and, secondly, the total undervaluation. As the aim of our study was to examine the short-term profitability of IPOs in order to determine whether the information produced by the company and venture capitalists has an impact on the valuation of the company by the financial markets, we chose a period of thirty days following the IPO. Our findings indicate that the market only integrates the information regarding the quality of the company after the first few days of its listing to a very limited extent. The cumulated returns are extremely low and often insufficient to test hypotheses given their low variances. After 30 days, the average of the cumulated returns is 3.54%, the median is nil, the standard error is 19.80% and the returns range from -40,80% to +61.70%.[1]

To establish our relationships, we used metric variables as explanatory variables. We therefore used linear regressions as the statistical method of analysis. However, we also tried to ascertain whether certain information production variables could explain the undervaluation situation or important valuation differentials as dichotomous variables. This led us to use logistic regressions as a supplementary method of analysis. We then systematically applied this twofold logistic and linear analysis to the whole of our study.

Undervaluation is considered to apply if the cumulated average returns are above 0%. In this case, the variable has a value of 1, and a value of 0 in the opposite case. The average of the valuation differentials, calculated from the absolute returns value, is 10.20%, the standard error is 9.55% and the median is 7.54%. The valuation differentials are considered as low if their values are above 7.54%. In this case, the dependent variable has a value of 0, and a value of 1 in the opposite case. The use of this presentation can be explained by our intention to explain undervaluation and low valuation differentials.

Graphic 1
Parameterization of the dependent variables of logistic regression
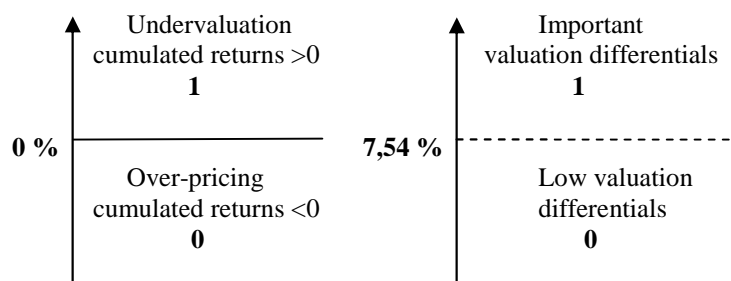
Like the percentage of shares owned by venture capitalists, the majority of independent variables have a wide range of values and high estimated coefficients of skewness and kurtosis. The share-owning variable, for example, has values which range from 3.65% to 99%, with a strong concentration towards low holdings. Its average is 33% and its standard error is 25.60%. This led us to systematically use a logarithmic transformation of the data.

IV. INCIDENCE OF THE COMPANY AND THE VENTURE CAPITALIST INFORMATION ON IPO VALUATION

In our empirical study, we first propose examining all the incidence of characteristics specific to the company's production of information on its IPO pricing. We then focus more specifically on the incidence of information production by venture capitalists on the IPO valuation of the company. We complete this empirical study with the construction of multivariate models, enabling us to highlight the contribution of information produced by venture capitalists compared with that of the company.

A. The Incidence of the Company's Performances and Characteristics on Its IPO Pricing

In this paper, we propose initially studying the relationships between the company's financial performances before its IPO and its post-IPO valuation and, secondly, examining the company's characteristics and its post-IPO valuation.

Table 1
Incidence of pre-IPO financial performance on the company's IPO valuation

	Typ. Reg.	Coef B	Sig/wald	Cte	sig.	% Clas	F	R^2
			Incidence on valuation differentials					
ROE	Log.	0,46	0,7	-0,16	0,14	55%	_	_
	Lin.	-2,31	0,7	10,51	_	_	0,7	0,3%
ROS	Log.	1,152	0,42	-0,87	0,8	54%	_	_
	Lin.	0,237	0,96	10,02	_	_	0,96	0,1%
AT	Log.	-0,4	0,44	-0,47	0,6	57%	_	_
	Lin.	-0,46	0,85	10,2	_	_	0,85	0,1%
Leverage	Log.	-0,6	0,15	-0,96	0,14	57%	_	_
	Lin.	1,26	0,5	12,01	_	_	0,5	0,7%
			Incidence on undervaluation					
ROE	Log.	4,627	,007	-0,54	,001	71%	_	_
	Lin.	9,16	0,27	2,27	_	_	0,27	2%
ROS	Log.	3,157	0,22	-2,08	0,07	55%	_	_
	Lin.	10,52	0,18	-3,47	_	_	0,18	2,9%
AT	Log.	0,95	0,09	-0,02	0,07	57%	_	_
	Lin.	0,75	0,82	3,5	_	_	0,82	0,1%
Leverage	Log.	-1,15	,012	-1,56	,007	57%	_	_
	Lin.	-3,31	0,22	-1,22	_	_	0,22	2%

[*] The most significant results are underlined

We measured the company's financial performance on the basis of its ROE (return on equity) for the financial year preceding the IPO. According to Sapusek (1998), this ratio averages 29.46% for German companies. For our sample of companies listed on the Second and New Markets, the average ROE is 18.1%. The return on equity can be re-written as the ROS (return on sales: net profit/sales) times the AT (asset turnover ratio: sales/assets) times the leverage ratio (assets/equity). In order to examine the incidence of the representative ratios of the companies' financial performances before their IPO pricing, we began by carrying out a logarithmic transformation of the data together with a scale shift, since certain companies were listed when they were generating losses.

We tested the existence of relationships between the ratios pertaining to the company's financial performance and its valuation by the financial markets using a simple logistic model. The findings did not enable us to establish a relationship between the valuation differentials and the return on equity ratios, return on sales, asset turnover and leverage ratios. On the other hand, companies which have a return on equity higher than 13% are likely to be undervalued in excess of 0.5. The ROE is a ratio which appears as a relevant predictive factor of undervaluation. In fact, the estimated parameters of the logistic model enabled us to classify 71% of the companies with an error threshold below 1%. The cumulated returns average was 1.24% for companies with an ROE of less than 13%, while it was 6.18% in the opposite case. The difference in the averages nonetheless remains insignificant (p value = 0.09). The leverage ratio also has a significant relationship with undervaluation. The estimated parameters are significant to the threshold of 1.3% of error (student-t) and show that the higher the equity, the lower the probability of undervaluation. As the asset turnover ratio has an error threshold of 9%, we cannot confirm that it has a significant relationship with the market valuation.

Linear regressions did not allow us to highlight a relationship between the ratios relating to the company's financial performances and the company's pricing. Our observations indicated that the higher the return on equity, the more likely the company is to be undervalued. This validates our hypothesis 1.1. On the other hand, hypothesis 1.2 was not validated as our analyses failed to identify a relationship between the company's financial performances before its IPO and the post-IPO valuation differentials. The last result is important since it demonstrates that the financial risk of growth companies is difficult to apprehend using financial performance measures.

When we address the relationships between the company's characteristics and its post-IPO pricing, the regressive and linear models constructed from the "market to book" ratio (MTB) did not allow us to establish a significant relationship between the company's book value in relation to its market price and the undervaluation or the valuation differentials (hypotheses 2.1 and 2.2 not validated). This result can be explained by the fact that the book value of fast-growing companies is not particularly informative as regards future performance. Conversely, the study of the incidence of asset redeployment capacity indicates that the probability of companies being under-priced falls with the proportion of intangible assets. Thus, a company which has over 11% of intangible assets is less likely to be under-priced. Although our result is only validated by the linear regression model, we should note that it runs counter to our initial hypothesis (hypothesis 2.3 invalidated). Moreover, we were unable to establish

the relationship between the company's asset redeployment capacity and valuation differentials (hypothesis 2.4 non-validated).

Table 2
Incidence of the firm's characteristics on its valuation

	Typ. Reg.	Coef B	t-/wall	Cte	K^2 sig.	% Clas	F sig.	R^2
			Incidence on valuation differentials					
Age	Log.	0,17	0,53	-0,51	0,52	57%	_	_
	Lin.	9,64	0,86	0,22	_	_	0,86	0,1%
Total Asset	Log.	-0,19	0,38	1,76	0,38	57%	_	_
	Lin.	2,3	0,11	-12,5	_	_	0,11	4,3%
Number of workers	Log.	-0,31	0,14	-2,99	,09	56%	_	_
	Lin.	1,49	0,11	2,55	_	_	0,12	4%
Capitalisat.	Log.	-0,6	0,06	9,47	0,04	62%	_	_
	Lin.	3,14	0,02	-39,9	_	_	0,02	8,7%
MTB	Log.	-,007	0,9	-0,07	0,76	53%	_	_
	Lin.	-0,46	0,62	11,8	_	_	0,62	0,4%
Redeployment ratio	Log.	1,03	0,64	-0,19	0,64	54%	_	_
	Lin.	-1,85	0,86	10,3	_	_	0,86	0%
			Incidence on undervaluation					
Age	Log.	0,02	0,93	0,06	0,95	54%	_	_
	Lin.	1,09	0,55	0,97	_	_	0,55	0,6%
Total Asset	Log.	-0,07	0,7	0,81	0,7	49%	_	_
	Lin.	2,73	0,09	-23,4	_	_	0,09	5,2%
Number of workers	Log.	-0,03	0,86	0,26	0,86	52%	_	_
	Lin.	2,08	0,12	-7,02	_	_	0,12	3,8%
Capitalisat.	Log.	-0,25	0,4	4,09	0,38	52%	_	_
	Lin.	0,58	0,76	-5,67	_	_	0,76	0,1%
MTB	Log.	0,24	0,24	-0,79	0,22	54%	_	_
	Lin.	-1,18	0,36	8,01	_	_	0,36	1,3%
Redeployment ratio	Log.	-4,36	0,07	0,51	0,06	65%	_	_
	Lin.	1,83	0,9	3,42	_	_	0,9	0%

[*] The most significant results are underlined

For state variables, it is worth noting that the average age of companies financed by venture capitalists and listed on the stock market is 11 years old. The company's age has no significant relationship with either valuation differentials or with undervaluation (hypotheses 2.5 and 2.7 invalidated). Variables relating to size show that the companies' average workforce is 165, the average value of assets is 19.5 million Euros and the average stock market capitalisation is 8.7 million Euros. Using simple logistic and linear models that we constructed for each of the variables, only the stock market capitalisation enabled us to demonstrate that there is a significant relationship between size criteria and valuation differentials. This relationship however runs counter to the hypothesis based on the size effect that we presented in the literature review. It would appear that the stock market capitalisation is more a problem of agency. According to the logistic regression model, when the stock market capitalisation is over 7.5 million

Euros, the probability of wide valuation differentials occurring is over 0.5. The linear regression model also highlights an ascending relationship between valuation differentials and the size of the stock market capitalisation, with an error threshold of 2% and 8.7% of explained variance. We cannot therefore validate hypotheses 2.6 and 2.8. These results led us to study the incidence of the factors relating to ownership and control of the company on its market valuations. These factors are expected to have a greater impact given that the market has difficulty pricing fast-growing firms solely on the basis of the generally used financial criteria.

B.   Incidence of the Company's Ownership and Control Structure on Its IPO Pricing

The average proportion of capital floated on the stock market is 12.1%, with an average undervaluation of 8.7%. The average percentage of shares offered (calculated in relation to the total post-IPO shares) averages 21.7% (median 21.5%) and the average percentage of voting rights is 17.5%. The percentage of shares issued is 10.7% of new shares and 11% of shares sold by insiders.

Our empirical test indicates that there is a negative linear relationship between undervaluation and the proportion of shares owned by the public, with an error threshold of 4.2%. It also appears that the probability of the company being underpriced decreases with the proportion of publicly-owned shares. There appears to be less likelihood of a company being underpriced when the public owns more than 21% of the capital (hypothesis 4.1 validated).

Table 3
Incidence of the company's ownership and control structure on its IPO pricing

	Typ. Reg.	Coef B	t-/wall	Cte	K^2 sig.	%Clas	F sig.	R^2
Incidence on valuation differentials								
% shares owned by the public	Log.	0,94	0,1	-3	0,09	60%	–	–
	Lin.	-4,6	0,07	24,3	–	–	0,07	3,6%
% voting rights owned by the public	Log.	0,7	0,1	-2,10	0,09	54%	–	–
	Lin.	-3,24	0,09	19,4	–	–	0,09	4,6%
% shares sold by the initial shareholders	Log.	0,02	0,32	-0,43	0,3	60%	–	–
	Lin.	-0,18	0,16	12,4	–	–	0,16	3,1%
Incidence on undervaluation								
% shares owned by the public	Log.	-1,03	0,07	3,3	0,06	60%	–	–
	Lin.	-7,35	0,04	26,2	–	–	0,04	6,6%
% voting rights owned by the public	Log.	-0,81	0,06	2,42	0,05	68%	–	–
	Lin.	-5,53	0,04	19,4	–	–	0,04	6,6%
% shares sold by the initial shareholders	Log.	-0,01	0,58	0,23	0,68	56%	–	–
	Lin.	-0,11	0,57	4,89	–	–	0,57	0,5%

* The most significant results are underlined

A study of the incidence of voting rights owned by the public also shows that the greater the market control over the company, the less likelihood there is that it will be underpriced. The estimated parameters of the logistic model are significant, with a threshold of 5%, enabling us to classify 68% of the companies listed. The parameters indicate that the probability of the company being underpriced is higher than 0.5 when the public owns more than 19% of the voting rights. Hypothesis 4.3 is therefore validated. On the other hand, the percentage of shares sold by the initial shareholders does not have a relationship with undervaluation and valuation differentials. Therefore hypotheses 4.5 and 4.6 are invalidated.

The tests relating to valuation differentials found an insignificant negative linear relationship between the latter and the percentage of shares owned by the public (7% error threshold). The logistic model relating to the latter variable also enables us to classify 60% of the companies with an error threshold of 9%. Although this result is not significant, it tends to indicate that the probability of significant valuation differentials is over 0.5 when the percentage of shares owned by the public is less than 20%. In this framework, we cannot validate hypotheses 4.2 and 4.4.

C.   Production of Information by Venture Capitalists and Valuation of IPOs

The theoretical models relating to the role of venture capitalists show that this role facilitates intermediation between the company and the financial markets since it produces information. We will now empirically examine the extent to which venture capitalists contribute to establishing informational efficiency in relation to the company's characteristics. We will examine the contribution of information production by capital investors in relation to that of the company regarding valuation differentials and undervaluation.

With reference to our literature review, the "pre-IPO percentage of voting rights owned by the syndication" and "the size of the syndication's investment portfolio" variables highlight the importance of the expertise and screening that venture capitalists contribute to the financial markets so that the latter can accurately value a company at the time of its IPO.

Table4

Incidence of controls by venture capitalists on a company's IPO valuation

% syndication voting rights	Typ. Reg	Coef B	Sig. Waldt	Cste	Sig.	Clas %	F	R^2 %
Valuation	Log.	-0.69	(0.02)	2.2	(0.02)	65	–	–
differentials	Lin.	-3.72	(0.05)	21.7	–	–	(<0.01)	11
Undervaluation	Log.	-0.88	(0.01)	2.84	(<0.01)	68	–	–
	Lin.	-4.37	(0.02)	17.1	–	–	(0.02)	8

* The most significant results are underlined

According to our sample, venture capitalists own 33.1% of the companies' pre-IPO capital on average, with a standard error of 25.60%. The regression results are summarised in the table above. We note a significant incidence on the variables relating to the percentage of capital owned by venture capitalists on valuation differentials. It seems that the probability of wide valuation differentials decreases with the percentage of capital owned by the syndication. The estimated logistic regression parameters enable us to reclassify 63% of the companies with an error threshold of 1%. The probability of low valuation differentials is higher than 0.5 when the syndication own more than 26% of the capital before the IPO. The total number of companies financed by venture capitalists where over 26% of their capital is owned by the syndication is 31. The average valuation differentials for this group are 7.33%, while the average valuation differential was 12.93% for groups where less than 26% of the capital was owned by the syndication. The Levene equality of variances test indicates that the valuation differentials are distributed in the same form between both groups. Consequently, the test to measure difference in averages is interpreted with the estimated parameters which consider the equality of the variances. The statistic t (p value) is –2.41, with a related probability of 0.019. We can therefore conclude that the averages of both groups of companies are significantly different (hypothesis 5.1 validated).

An examination of the incidence of the capital owned by venture capitalists on undervaluation shows that the probability of undervaluation decreases with the percentage of capital owned by the syndication (hypothesis 5.3 validated). The estimated parameters enable us to classify 67% of the companies with an error threshold of less than 1%. The logistic model indicates that if the syndication owns less than 28% of the capital, the company has over 0.5 probability of being underpriced. Linear regressions also point to a negative relationship between the percentage of capital owned by the syndication and undervaluation. The relationship is slight however, since only 6.7% of the variance is explained with an error threshold of 4%.

A possible explanation of this lower score may be that, above all, venture capitalists want a valuation that is as accurate as possible (low valuation differentials), expressed by the production of information that is highly significant for investors, and this is less true in the case of undervaluation. The findings suggest that the sharing of information which results from the existence of a syndication is highly appreciated.

Table 5
Size of the syndication of venture capitalists and IPO valuation

Syndication portfolio	Typ. Reg	Coef B	Sig. Wald	Cste	Sig.	Clas %	F	R^2 %
Valuation	Log.	0.53	(0.02)	-3.6	(0.02)	63	–	–
differentials	Lin.	1.32	(0.16)	1.08	–	–	(0.16)	3.2
Underpriced	Log.	-0.48	(0.03)	3.4	(0.02)	60	–	–
	Lin.	-0.38	(0.77)	6.3	–	–	(0.77)	0.1

We measured the reputation of the syndication by examining the cumulated size of the portfolio managed by venture capitalists. In our sample, the size of the syndication was 117.7 million Euros on average, with a high standard error of 219.2 million Euros and a median of 44.1 millions Euros. 76 venture capital firms participated in the transactions in question, bearing in mind that some of them took part in several transactions and that there were 2.25 venture capital firms per transaction on average. Our results are set out in the following table.

The results obtained from our sample point to a significant relationship between the size of the investment portfolio managed by the syndication and the valuation differentials, with an error threshold of 2%. This variable enables us to classify 63% of the companies. However, valuation differentials increase with the size of the syndication's investment portfolio. This finding runs counter to our initial hypothesis (hypothesis 5.2), namely that companies financed by little-known syndication have greater valuation differentials on average, in view of the reduced information screening. The test of the differences of averages shows that companies financed by syndications with a less well-established reputation have valuation differentials of 8.6% on average compared with 10.95% for larger syndications. The difference is 2.3%, which is not significant (p value = 0,365). The incidence of the size of the syndication of venture capitalists on the company's undervaluation is not validated and we cannot validate hypothesis 5.4.

While not highly significant, these findings suggest that the size of the syndication is not synonymous with accuracy in terms of pricing. An explanation for these observations can be attributed to diluted responsibility of venture capitalists in large syndications.

V.   IS INFORMATION PRODUCED BY FIRMS AND VENTURE CAPITALIST COMPLEMENTARY?

We now turn to whether there is complementarity between the variables relating to information produced by venture capitalists and the variables relating to information produced by the company. We analyze the incidence of IPO valuation differentials by developing multiple logistic regressive models with the following variables: stock market capitalisation, the percentage of voting rights owned by the public, the pre-IPO percentage of voting rights owned by the syndication of venture capitalists and the size of the syndication's portfolio.

Table 6

Multiple logistic regressions. Incidence of information variables produced by venture capitalists and the company on valuation differentials

	Coef. B	Sign	Cons	K^2 Mod.	Clas-sif.
pre-IPO % of voting rights owned by VC	1.09	0.003	13.27	0.0008	73%
Stock market capitalisation	-1.05	0.009			
pre-IPO % of voting rights owned by VC	1.85	0.0003	19.54	0.0000	81%
Size of syndication portfolio	-0.99	0.001			
Stock market capitalisation	-1.16	0.01			

The table above shows the most significant findings obtained from our analysis. It indicates that 73% of the companies can be classified using the constructed model by introducing the "pre-IPO voting rights of the syndication" and the "stock market capitalisation" variables. This first model indicates that the probability of low valuation differentials is higher when the voting rights owned by pre-IPO syndication and those of the public are high and the stock market capitalisation is low.

When the "size of the syndication's portfolio" is introduced into the model described above, the estimated parameters enable 81% of the companies to be classified, with an error threshold of less than 1%. The results show that the expertise and information screening function of venture capitalists make a significant contribution to estimating valuation differentials.

Linear regressions enabled us to identify the following variables as useful in explaining the variance of valuation differentials: the pre-IPO percentage of voting rights owned by the syndication, stock market capitalisation and the percentage of voting rights owned by the public. The correlations matrix reveals coefficients between these variables ranging from 0.27 to 0.38, allowing us to carry out a multivariate regression.

Table 7
Multivariate regression. Incidence of venture capitalists and
company variables on valuation differentials

	Coef. B	Sign.	Cons.	F sig Mod.	R^2
Pre-IPO % of voting rights owned by VC	-4.33	0.001	-52.87	0.000	32%
Capitalisation	5.5	0.000			
% voting rights owned by the public	-4.04	0.027			

The results of the multivariate regression show that the "pre-IPO percentage of voting rights of the syndication" variable makes a real contribution to estimating valuation differentials. By adding it to the initial model, we can explain 32% of the variance, while this figure was only 21% in the model constructed initially with the company's specific variables. This result demonstrates once again the contribution made by information produced by venture capitalists to that produced by the company.

The linear regressions used to study the incidence of variables specific to the company on undervaluation enabled us to identify only the "percentage of shares and percentage of voting rights owned by the public" variables as being significant. As these variables are strongly correlated, we cannot envisage constructing a multivariate linear model.

The study by the logistic regression model of the incidence of the production of information of variables specific to the company listed on undervaluation indicated that the ROE, the redeployment ratio and the percentage of voting rights owned by the public are the most relevant variables. The analysis which consists of developing multiple logistic models integrating these different variables shows that the introduction of the variables we identified does not produce better results. Both the different

combinations tested and the ascendant step-by-step method show that ROE is the most pertinent variable, and when another variable is added to the model, the quality of the latter decreases.

We will now examine whether adding the variables specific to the venture capitalist-produced information to the variables specific to the company-produced information can improve the quality of our models.

Table 8

Multiple logistic regression. Undervaluation and the production of information by venture capitalists and the company

	Coef. B	Sign	Cons	K^2Sig	Clas-sif.
pre-IPO % of voting rights owned by venture capitalists	-0.73	0.03	1.83	0.0005	70%
ROE	3.99	0.02			

The results of the multiple logistic regression (see table above) indicate that the model is significant, with a 1% error threshold, but it does not lead to any improvement in the predictive nature of the simple model constructed with the ROE variable. Therefore, in our view, the ROE variable is the best indicator of the probability of companies being underpriced.

VI.   CONCLUSION

Our study highlighted the role of venture capitalist intermediation in establishing an effective informational link between companies and financial markets. This work empirically validates theoretical work on financial intermediation initiated by Grossman and Stiglitz (1980), and more particularly by Chan (1983), and Admati and Pfleiderer (1994) in the area of venture capital.

Our analysis focused on defining the information production variables specific to the company which impact on the company's IPO valuation. Simple logistic models firstly highlighted the company's past financial performance, measured by the return on equity ratio, as a variable having the most significant incidence on the probability of the company being underpriced. This result provides empirical confirmation of the theoretical work by Allen and Faulhaber (1989), and Grinblatt and Hwang (1989) on the strategy of undervaluing fast-growing company IPOs. Finally, the logistic and linear regression models suggested that the percentage of voting rights owned by public shareholders is a variable which has a negative relationship with undervaluation. This finding emphasises the important contribution of the controls exercised by outside shareholders on the market valuation of companies. The construction of multivariate models did not enable us to improve the findings and suggest that the "ROE" and "percentage of voting rights owned by the public" variables are the best indicators of undervaluation, depending on whether a probabilistic or a linear approach is taken.

A comparison of these findings with those obtained on the incidence of information production by venture capitalists suggests that when a linear approach is

involved, the information produced by venture capitalists through the pre-IPO percentage of voting rights owned by the syndication gives a better idea of the undervaluation than with the "percentage of voting rights owned by the public" variable. When the probabilistic approach is used, the "ROE" variable enables the development of a far more powerful predictive model than that developed with the "pre-IPO percentage of voting rights owned by the syndication" variable. The construction of multiple logistic and linear models enabled us to identify an incidence on information production by capital investors on undervaluation in relation to the information produced by the company. This result indicates that undervaluation arises more from a stock market listing strategy than an informational problem, thus concurring with the models initiated by Rock (1986).

The study of valuation differentials shows that the information produced by venture capitalists has a significant incidence on the valuation of the company in relation to the information produced by the latter. We firstly observed that the variables relating to venture capitalists can be used to construct more relevant logistic models than those developed using company-specific variables. The models that integrate "stock market capitalisation" and the "percentage of voting rights owned by the public" variables have less significant parameters than those estimated using venture capital variables, and they have far lower predictive power. The variables relating to the production of information by venture capitalists, namely: "the pre-IPO percentage of voting rights owned by the venture capital syndication" and "the size of the investment portfolio of the syndication" enabled us to classify almost three-quarters of the sample. The multiple linear approach shows that it is possible to obtain a more powerful model with the "stock market capitalisation" and "percentage of voting rights owned by the public" variables than that constructed using the "percentage of voting rights owned by the syndication" variable. The construction of multiple models integrating the company-produced information and that produced by venture capitalists indicates a degree of complementarity. The probabilistic approach suggests that the integration of the "pre-IPO percentage of voting rights owned by the syndication," "size of the syndication's investment portfolio" and "stock market capitalisation" variables allows us to classify up to 81% of the companies. In addition, the model developed using estimated parameters clearly shows that a high level of information produced by venture capitalists helps to remedy the informational asymmetries presented by the company by reducing valuation differentials.

Likewise, the linear model which integrates the "pre-IPO percentage of voting rights owned by the syndication," "stock market capitalisation" and "percentage of voting rights owned by the public" variables explains 32% of the variance, and shows that valuation differentials are lower when venture capitalists produce the information.

On the one hand, our study suggests that the information produced by venture capitalists allows a significant balance to be established between a fast-growing company with equity needs and the financial markets. In fact the information produced by venture capitalists contributes to moderating the incidence of information that, in principle, is unfavourable for fast-growing companies and is favourable for non-growth companies. In addition, our study demonstrated that undervaluation appears to correspond more to an IPO strategy than to difficulties in communicating information regarding the quality of the company.

ENDNOTE

1. The results of the analyses with accumulated profits at 10 and 90 days are very close, those at 30 days being the most significant. At 10 days, the average is 4.58% and the standard differential is 16.08%. At 90 days, the average is 3.69% and the standard differential is 38.87%.

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