



EMPIRICAL STUDY ON VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENT PATTERNS: US & INDIA

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ABSTRACT

The study investigates dotcom influence on US VC industry, investment patterns comparisons across industries & exit strategies. The sample period considered is US data for a period of 1990-2009 from Venture Economics and Indian data for a period of 2004-2008 from Venture Intelligence. The dot-com effect is still persisting. The factors determining the investment patterns are mostly associated with monitoring and agency cost associated with firm. Firm's exiting via an M&A is frequently monitored for a long time and hence risky, responsible for lower fund raising. The data analyzed also shows the attractiveness as well as immaturity of Indian VC industry.

1 Introduction

Over the last two decades, the venture capital and private equity industry has emerged as an important area of finance and has attracted the attention

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of academic researchers and practitioners' aside. In addition, the VC industry had as well experienced several boom and bust cycles, but nothing of the magnitude of the tech bubble. Annual venture investing soared from under \$10 billion in mid 1990s to over \$100 billion in 2000, before plunging down to earth after the tech bubble burst (Green 2004). This bubble is thought to have altered the investment patterns of the VC industry. This study focuses at the Dot-Com influence on the investment pattern by comparing investment behaviour before and after dotcom.

Most of the VC/PE studies are conducted in developed market like US but developing countries like India has been given little attention. Studying investments pattern in India is important because of the following concern. Firstly the Indian Venture capital industry is the third largest in world in terms of investment next to UK which lags behind US and in terms of CAGR India ranks first (PWC Global Private Equity Report 2008). Secondly limited research has been done in India. Moreover with Indian economy growing at an average annual rate of more than 8 percent over the last five years and other macroeconomic factors and policies favourably complementing the growth, India has emerged as an attractive investment destination.

Venture capitalists ("VCs") invest in small private growth companies that typically do not have cash flows to pay interest on debt or dividends on equity. They receive capital from institutional investors (particularly pension funds), high net worth individuals and invest the deposits in entrepreneur firm (EF) over a period that generally ranges from two to seven years prior to exit. Venture Capitalist fund EF that is associated with huge asymmetric information. Sahlman describe three control mechanism to minimize these agency cost 1) the use of Convertible securities 2) Syndication of investments 3) Staging of investments. The study analyzes latter two perspectives at both firm and deal level across sectors, exit strategies and the dotcom influence.

The primary objective of this paper is to find out investment patterns in venture capital and private equity, through the predictions from agency theory along with syndication (Lerner 1994a, Brander, Amit and Antweiler 2002) and staging (Gompers 1995). Venture Capitalist evaluates projects by weighing different agency and monitoring cost associated with them. Round duration i.e. the intensity of monitoring should be negatively related to expected agency cost. Beside round duration, other investment patterns like size of each investment, syndication size, round level, burn rate also determines the agency cost.

Venture Capital is not so easy to access by Entrepreneur. Venture capitalists carefully select the firms to invest in, and also invests carefully i.e. in stages in order to keep a check on Entrepreneur. In average only one in three hundred business plans received by venture capitalist will be invested (Black and Gilson 1998). Venture Capitalist are generally interested in high growth firm's where the possibility of return is maximum and can be exited within the limited time (Pulatkonak and Sofianos 1999). VC invest the funds in a portfolio companies in exchange for equity shares and waits for exit. Even at the time of contract with EF, VCs define the possible exit route for their investments (Clercq, Fried, Lehtonen, and Sapienza 2006).

Exit decision is the most crucial phase in the life of a firm as it allows it to access public market. VC exit generally takes place after three to six years. In general there are a variety of exit strategies that VC might select, the five principle strategies being (Mackintosh, 1997; Cumming and Mackintosh, 2000a): an initial public offering ("IPO"), in which significant proportion of company is sold into public market; an acquisition exit, in which entire firm is brought by third party; a secondary sale, in which only VC shares will be sold to third party; a buyback, in which VC shares will be purchased by EF; and a write-off, in which walks away from the investment. As such, VCs derive their returns through capital gains in exit transactions. Bascha & Walz 2000 find that venture capitalists and entrepreneurs often have diverging interests with respect to different exit solutions (e.g., IPOs or trade sales). Entrepreneur are especially interested in IPO as exit as it allows them to regain control of their companies, however VC interests depends on the financial considerations at the time of exit.

Nikoskelainen and Wright (2007) find from a sample of 321 United Kingdom ('UK') private equity exits from 1995 to 2004 that IPOs had an average IRR of 136.9%, trade sales yielded 23.0%, secondary sales yielded 10.4%, and write-offs were associated with a return -21.5% (not 100% due to partial recovery of the investment). Since IPO and M&A provide the highest return, hence this study is concerned on firms exiting via IPO and M&A only. Cochrane (2005) also shows average log returns are 81% for IPOs and 50% for acquisitions based on a sample of United States ('US') VC investments from 1987 to 2000. As a result we can say that, profitable firm prefer IPO rather than M&A. The evidence indicates that the firm exiting via IPO are less frequently monitored for small period of time in comparison to firm exiting via M&A.

2 Review of Literature

Although various studies have looked at the theoretical and empirical literature that explores how VCs screen, select, finance, syndicate, monitor and advise their portfolio companies (Hellmann 1998; Bergemann and Hege 1998; Cumming and Mackintosh 2003 and Gompers and Lerner 1999; Lockett and Wright 2001). The behaviour of VC and Entrepreneurial firms and in terms of exit is still unexplored area in Venture Capital, despite of its importance for industry survival and economic growth. Moreover little work is done on influence of dot-com effect on Venture Capital Industry.

Industry

VC alleges that the information they breed and the services they provide are as important as funds infused. Hence monitoring they provide is valuable, which is also associated with some predictions about the firm. Thus, VCs operate in environments where their relative efficiency in selecting and monitoring investments gives them a comparative advantage over other investors. This suggests strong industry effects in venture capital investments (Amit, James and Zott 1998). Venture capitalists should be prominent in industries where informational concerns are important, such as biotechnology, computer software, etc., rather than in "routine" start-ups such as restaurants, retail outlets, etc. The latter are risky and require close monitoring. But, VCs still prefer projects where monitoring and selection costs are relatively low or where the costs of informational asymmetry are less severe (Amit, James and Zott 1998).

Syndication

Syndication adds value to the portfolio companies (Bygrave, 1987; Brander et al., 1999), spreading financial value at risk (Sahlman, 1990; Lerner, 1994; Lockett and Wright, 2001), improved investment decision making (Wilson, 1968; Lerner, 1994), information sharing on new, potential deals (Bygrave, 1987), social structural reasons such as establishment of status (Podolny, 2001), and window dressing (Lerner, 1994).

Chemmanur and Tian (2009) develop a theoretical rationale for the formation of syndicates in venture capital (VC) financing and analyze the dynamics of VC interaction subsequent to syndicate formation. They found that complex projects are likely to get financed by VC syndicates, syndication

in various rounds lead to more successful exits compared to those which switched to single VCs in later rounds. Additionally VCs forming a part of syndicate backing a successful firm's are more likely to form a syndicate backing future projects.

Wilson (1968) find that engaging several parties in investment decision-making may lead to increase in agency cost that tends to make the process of arriving at the final decision much slower and more cumbersome than if the firm acted on its own, even though joint decision-making may lead to better investment decisions .

Investment duration

Cumming and Macintosh 2001, used sample data from US and Canada to confirm the statistical significance of stage of firm at first investment, capital available to the venture capital industry on investment duration. Cumming and Johan (2010) formulate a theory of VC investment duration based on the idea that venture capitalists exit when the expected marginal cost of maintaining the investment is greater than the expected marginal benefit, and thereby relate VC investment duration to entrepreneurial firm characteristics, investor characteristics, deal characteristics, and institutional and market conditions.

Staging

Sahlman (1990) analyzes the staging decision, how the EF receives each round of financing from VC firms. Venture capital firms can stage their financing to mitigate information asymmetry and agency problems (e.g. Neher, 1999; Wang and Zhou, 2004). Gompers 1995 concludes venture capitalists need to monitor entrepreneurs closely and invest frequently, to learn about the effort of entrepreneurs and to reduce the agency costs of inefficient continuation.

Li (2007) analyzes the staging decision through real options perspective as a choice between holding the current option to invest and investing now to obtain the option to invest subsequently. The study concluded that market uncertainty encourages venture capital firms to delay investing at each round of financing, whereas competition, project-specific uncertainty and agency concerns prompt venture capital firms to invest sooner.

Exits

Wang and Sim (2001) conducted an empirical study in Singapore using survey data for the period 1990-1998. The study concluded that family owned, high technology industries tends to exit via IPO. Moreover IPO exit route is positively related to total amount of venture financing and total sales while being independent of frequency of finance rounds. These results reveal immaturity of Asia's capital market in comparison to west.

Giot and Schwiendbacher (2007) examined the time to 'IPO', 'Trade sale' and 'liquidation' for 6000 VC backed firms covering more than 20,000 investment rounds. They concluded that as time flows, likelihood of firm exiting via IPO increases with the time. However after reaching a plateau, non-exited investments have fewer possibilities of IPO exits as time increases. This sharply contrasts with trade-sale exits. The results also indicated that proximity of at least one VC fund makes trade sales more likely.

According to Bienz and leite (2008), highly profitable company that need few insights will go public, while less profitable company that require more control will be sold in trade-sale. This is consistent with empirical evidence that IPOs have higher rate of return than trade sales. Schwiendbacher (2001) introduces product characteristics into the analysis with the aim to identify their effect on the optimal exit decision on the financial market. Going public can be more profitable than a trade-sale when the product is sufficiently innovative.

Cumming and Johan (2008) investigated a sample of 223 entrepreneurial investee firms financed by 35 venture capital funds in 11 continental European countries. The results indicates pre-planned acquisition exits are associated with stronger investor veto and control rights, a greater probability that convertible securities will be used, and a lower probability that common equity will be used; the converse is observed for pre-planned IPOs.

According to Arif and Abdulkhadir, firm's with low investment duration exit through IPO route. Additionally IPO exit route is positively related to total amount of venture financing, total rounds and total funds participating.

Dot-com effect

M B Green (2004) made comparisons between pre-bubble, bubble and post-bubble investment patterns by state for location, stage and industry of investment. States with large levels of investment show well-balanced

investments across industries, while states with smaller totals do not. The bubble period was quite different from pre-dotcom and post-dotcom and had experienced larger absolute flows of capital, more and larger deals. Brent, David, Michael (2005) concluded that the survival rate of dot-com start-ups, is 48% and the number of dot-com start-ups, is approximately 50,000 and Dot-Com Era was a legitimate response to a technology shock.

Indian VC-PE industry

I.M. Pandey (1998) investigates the process of developing venture capital in India through TDICI. In the initial years they face a lot of problems, like in raising funds and evaluating prospective business. Initially they focused on high-tech industry but later on they shifted to profitable industry. Later on the firms get flourished and took initiatives to develop VC industry in India.

Rajan (2010) introduced a VC/PE data sample in India for the period 2004-2008. The results indicates large proportions are round 1 investment with dramatic decrease in subsequent rounds. Most of the investment are late stage and characterize by short duration. These factors don't favour long-term growth of VC industry in India.

3 Sample data and methods

3.1 Sample and data

The sample consist of US data from Venture economics for a period of firms which got exit through IPO & M&A between 1990-2009. Database itself is classifying three industry sectors 1) Information Technology 2) Non-High Technology 3) Medical/HealthCare/life-sciences. At firm level analysis sample data has been taken of those firms' which got it first round of funding after 1990 and exit before 2009. The firms where we don't have sufficient data has been removed. The period before dotcom consist of firm which got its first funding after 1990 and exit happened before 2000(included) whereas after dotcom period consist of firm which got first funding after 2000 and exit happened before 2009. The investment deals has been inflation adjusted to year 2009 by taking relevant factor from US Producer Price index (PPI) from Bureau of labour statistics (BLS).

The sample also consists of Indian data from Venture Intelligence for a period of 2004-2008. The investment deals amount has been inflation adjusted to year 2009 by taking relevant factor from Indian Consumer Price index (CPI) from Reserve Bank of India (RBI).

FIRM RELATED VARIABLE		DEALS RELATED VARIABLE	
FIRM'S AGE AT FIRST INVESTMENT	This is the difference between Company Inception date and first funding.	ROUND NUMBER	It's the chronological stage order in which the company gets funding.
TOTAL ROUNDS	This is the total number of stages EF undergone for getting funding before exit.	ROUND DURATION	This is the difference between two successive rounds.
TOTAL INVESTMENT IN A FIRM	This is total investment in a firm in all rounds before exit	ROUND AMOUNT INVESTMENT	This is the investment made in a round by number of investors
TIME TO EXIT	This is the difference between day when the EF get its first funding from VC and exit.	INVESTMENT DURATION	This is the difference between each investment date and exit
TOTAL FUNDS PARTICIPTED	This gives the total VC funds involved in funding in an Entrepreneur firm	NO. OF INVESTORS (SYNDICATION)	This is number of investors involved in a particular round or the syndicate size.
TOTAL INVESTORS PARTICIPTED	This is the total times VC funds participated in an Entrepreneur firm	BURN RATE	This refers to the consumption rate by VC
REINVESTMENT	This is the difference of total investors participated and total funds involved		

3.2 Hypothesis and Research Methodology

The research aimed to investigate the investment patterns related to deals as well as firm level in VC industry through One-way ANOVA results, multiple regressions and discriminant analysis. Moreover the purpose of the study is to find factors relevant to particular mode of exit. The study also focuses on patterns in different industries and the dotcom influence. Based on prior research the following hypotheses are proposed.

Dot-com Effect:

Dot-com has marked a unique mention in the VC industry as it marked a historical peak in terms of capital volume and valuations. The market collapse and had a major influence in venture capital market in terms of VC funds participation and investment. This bubble is thought to have altered the investment patterns of the VC industry.

H4.1 : Dot-com influence has a significant effect on the syndication level and funds participation.

H4.2 : Dot-com has a significant influence on the investment stage.

H4.3 : Dot-com has significant effect on Investment per deal and total requirement by a firm.

Frequency/amount of venture financing/ No. of investors participating:

According to Gompers (1995), the firms that go public receive greater total and number of rounds of venture financing than firms that are acquired. Chemmanur and Tian (2009) found that complex projects are likely to get financed by VC syndicates, syndication in various rounds lead to more successful exits. The evidence also indicates that staging allows gathering of information and monitor the firms' progress. If favourable information is received for EF, and it has the potential to go public VC will invest more times and large amount in that firm. According to Cumming and Johan (2010), favourable market condition lowers the investment duration, since investors will prefer early exit.

H2.1 : The frequency of venture financing is positively related to likelihood that VC will exit via an IPO.

H2.2 : The total amount of venture financing is positively related to likelihood that VC will exit via an IPO.

H2.3 : The VC syndication is positively related to likelihood that VC will exit via an IPO.

H2.4 : The reinvestment is negatively related to the time to exit.

H2.5 : Investment duration is negatively related to the investment done.

H2.6 : The VC syndication is negatively related to the investment duration.

Monitoring and Agency cost:

Venture capital investments require close monitoring and complex contracting concerning allocation of cash flow and control rights (Kaplan and Stromberg, 2003).

H3.1: Higher the project specific uncertainty, the sooner the firm will receive a stage financing

H3.2: Uncertainty and fund raising are negatively related.

H3.3: With the increase in rounds, Uncertainty (round duration) decreases.

H3.4: Syndication and uncertainty are positively related.

H3.5: Higher the profitability, lesser will be monitoring with less rounds

H3.6: Higher the uncertainty, the sooner the EF will receive its first financing.

4 Summary Statistics

Dot-com analysis

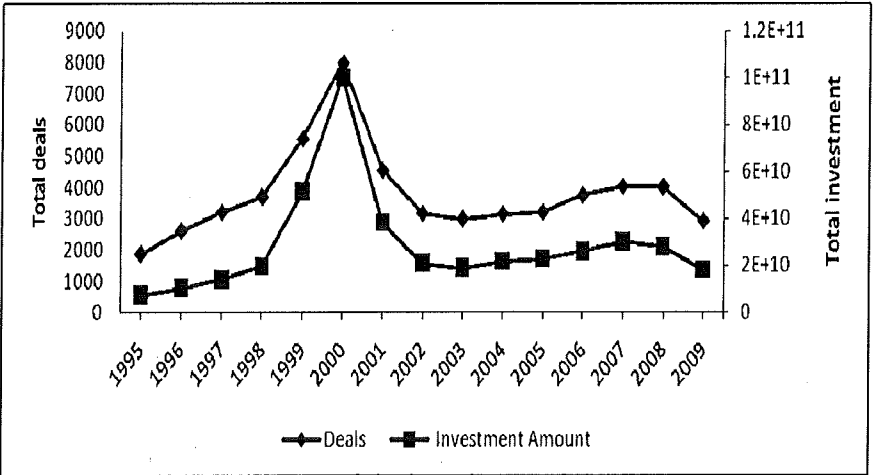


Figure 1: Variation of deals and investment across years

Source: Thomson Reuters

From the figure 1, it can be observed that, there has been a significant sharp decrease in both investment level and deals number after 2000 and later on it's getting smoothed out.

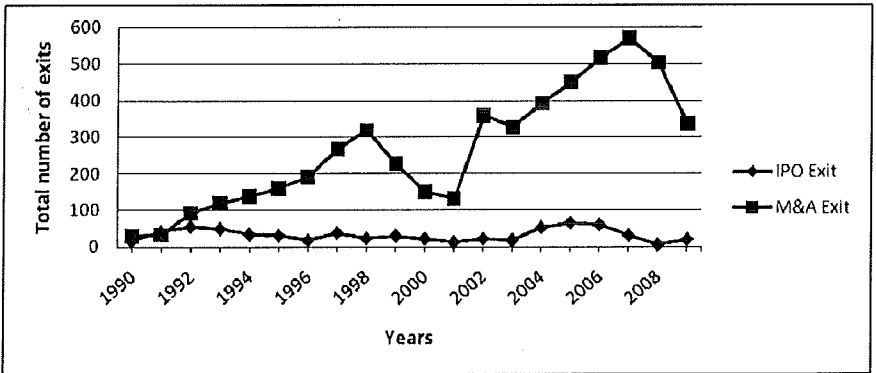


Figure 2: Variation of firms exiting via IPO and M&A across years

From Figure 2 we can say that there was a sharp decline after dot-com in firm getting easy exits both in IPO and M&A, but later on it got normalised. Moreover the M&A exits are around 90% of combined IPO and M&A.

Table 1: Influence of Dot-com on VC Investment patterns at deals level

Descriptive and ANOVA results at deals level	Time Periods				
	Before Dotcom (10887)		After Dotcom (6015)		Anova
	Mean	Std. Deviation	Mean	Std. Deviation	Sig.
RoundNumbers	3.06	2.70	3.52	2.38	0.00
Number of Investors ea. Round	2.72	2.41	3.28	2.49	0.00
Round duration	1.44	1.71	1.41	1.26	0.15
Round Amount Inv.(\$ 000)	15367.34	58386.43	22572.37	127940.44	0.00
Burn Rate	35355.06	455090.77	28061.97	167863.77	0.23
Investment Duration	4.24	2.85	2.95	1.84	0.00

From table 1 we conclude that round duration, pre/post dotcom is same i.e. informational asymmetry between EF and VC is same. But investment amount per deal, investor participation has increased. Hence we can say that syndication level has increased after dot-com which might be responsible for infusing more funds in an investment. Investment duration has significantly decreased after dot-com and this might be the reason for more investor participation, since they prefer early exits. Moreover after dot-com investment is happening more at later rounds compare to pre-dotcom. There is no significant difference in the burn rate by VCs.

Table 2: Influence of Dot-com on VC Investment patterns at firm

Descriptive and ANOVA result at firm level	Time Periods				
	Before Dotcom (724)		After Dotcom (781)		Anova
	Mean	Std. Deviation	Mean	Std. Deviation	Sig.
Firm's age at first investment	3.02	4.24	3.36	4.02	0.11
Time to exit	3.00	1.95	3.28	1.78	0.00
Total rounds	2.96	1.95	2.49	1.76	0.00
Total Funds	5.06	4.22	4.37	3.55	0.00
Total Investors	7.97	7.85	7.48	7.70	0.23
Reinvestment	2.90	4.45	3.11	4.86	0.39
Total amount invested in firm (\$ 000)	43746.16	113081.72	54917.71	242382.87	0.26

From Table 2 it can be determined that there is no dot-com influence on firm for getting it first funding by VC. The total requirement of funds for a firm before exit, is still the same and the number of times investor participated in a firm and reinvestment is uninfluenced by dot-com. Dot-com lead to root out most of the inexperienced venture capitalist hence total funds has significantly decreased. Hence it supports H4.1.

Since reinvestment is same ,but total funds has decreased and from table 1 it was conclude that investor participation each round has increased ,this concludes that after dot-com less VC funds are participating more number of times in an EF. Hence it supports hypothesis H4.1.

Dot-com has a significant influence on time taken by a firm from its first funding to get exit. It has increased due to liquidity constraints, but from table 1 it was concluded that investment duration has significantly decreased after dot-com. This concludes that, after dot-com VC funds are participating more in later stages. Hence it supports hypothesis H4.2. Investment per deal has increased but the requirement for a firm is still the same after dot-com which supports our hypothesis 4.3.

Table 3: Splitting of observation to verify existence of dot-com effect.

DESCRIPTIVES	ANOVA			ANOVA			ANOVA		
	Mean	Sig.		Mean	Sig.		Mean	Sig.	
Round Numbers	1996-2000	2.65	0.00	2001-2004	3.28	0.00	1996-2000	2.65	0.00
	2005-2009	4.21		2005-2009	4.21		2001-2004	3.28	
Number of Investors ea. Round	1996-2000	2.87	0.00	2001-2004	3.22	0.10	1996-2000	2.87	0.00
	2005-2009	3.33		2005-2009	3.33		2001-2004	3.22	
Round time	1996-2000	1.44	0.00	2001-2004	1.55	0.00	1996-2000	1.44	0.00
	2005-2009	1.04		2005-2009	1.04		2001-2004	1.55	
Round Amount Inv.	1996-2000	20902.65	0.79	2001-2004	25226.45	0.17	1996-2000	20902.65	0.04
	2005-2009	20317.04		2005-2009	20317.04		2001-2004	25226.45	
Burn Rate	1996-2000	48519.72	0.04	2001-2004	49004.76	0.15	1996-2000	48519.72	0.97
	2005-2009	107935.5		2005-2009	107935.50		2001-2004	49004.76	
Investment Duration	1996-2000	4.09	0.00	2001-2004	3.41	0.00	1996-2000	4.09	0.00
	2005-2009	1.83		2005-2009	1.83		2001-2004	3.41	

Table 3 gives the more detailed information on the dot-com effect on the US economy. Time period has been further split to give a detailed perspective on dot-com effect on today's date. The major findings were that dot-com effect is still persisting in terms of investor's participation. For the period 1996-2000 and 2001-2004 the investor participation has significantly increased, but there was no such significant difference between 2001-2004 and 2005-2009. This concludes us that dot-com has a severe impact on the investor participation and VC feels syndication beneficial for the investment. Moreover investment duration has been significantly dropped after the dot-com bubble. This means VC investors are not participating in early stages, and this is not good for a long-term perspective of US VC industry.

Exit Strategy analysis:

Table 4: VC Investment pattern across Exit Strategy at deals level

Descriptive and ANOVA results at deals level	Exit Strategy				
	IPO (856)		M&A (16046)		Anova
	Mean	Std. Deviation	Mean	Std. Deviation	Sig.
Round Numbers	2.49	1.93	3.26	2.63	0.00
Number of Investors ea. Round	2.15	1.94	2.96	2.47	0.00
Round duration	2.10	2.33	1.39	1.51	0.00
Round Amount Inv. (\$ 000)	111121.43	334868.33	12960.06	44690.39	0.00
Burn Rate	168805.12	117111.90	25502.06	289050.99	0.00
Investment Duration	3.46	2.95	3.80	2.59	0.00

In Table 4, it can be seen that exit strategy has significant influence on all the investment variables reflecting the matured US VC industry. Firm's exiting via M&A are associated with low round duration that means frequent monitoring by VC due to more informational asymmetry between EF and VC as compared to IPO. This is responsible for higher syndication size and staging in firms exiting via M&A. Literature has also mentioned that profitable firm's require less monitoring. Burn rate in IPO is significantly higher than M&A since firm's exiting via IPO are infused with lots of funding.

Table 5: VC Investment pattern across Exit Strategies at firm level

Descriptive and ANOVA result at firm level	Exit Strategy				
	IPO(230)		M&A(3020)		Anova
	Mean	Std. Deviation	Mean	Std. Deviation	Sig.
Firm's age at first investment	3.93	5.55	2.86	3.88	0.00
Time to exit	3.80	2.62	4.73	2.90	0.00
Total rounds	2.76	2.31	3.43	2.44	0.00
Total Funds	4.08	4.20	6.55	5.63	0.00
Total Investors	6.73	8.82	10.92	11.23	0.00
Reinvestment	2.66	5.47	4.38	6.56	0.00
Total amount invested in firm	200322.68	460691.66	39848.75	63407.18	0.00

In Table 5, at firm level also it can be seen that exit strategy has a significant influence on investment pattern. Firm's exiting via M&A are getting first funding earlier, so if uncertainty is more the firms age at first investment will be low. In support with the literature, firms exiting via IPO give more return, thus it can be concluded that profitable firm require less monitoring supporting H3.5. Moreover more funds have reinvested multiple times in M&A as compared to IPO. Similar to deal level, total investment in firms exiting via IPO are significantly higher than M&A.

From Table 4 and Table 5 it can be conclude that the M&A firms are frequently monitored for a long period of time, indicating more informational asymmetry .Hence resulting in lower fund raising along with more syndication and stages. Thus it opposes H2.1, H2.3 and supports H2.2.

Table 6: Influence of round no. on investors participation

Syndication	Significance	
	IPO	M&A
Staging	0.147445	0.000
Coefficient	.63	.006

From Table 6 it can be concluded that, in firm's exiting via M&A, staging has a significant positive influence on syndication but this is not the case with IPO.

Table 7: Discriminant Analysis for analysing Exit Strategy

Tests of Equality of Group Means			Standardized Canonical Discriminant functions	Structure Matrix
Variables	Wilks' Lambda	Sig.		
Total amount invested in firm	0.917	0.000	0.946	0.879
Total Investors	0.991	0.000	-0.444	-0.283
Time to exit	0.993	0.000	-0.177	-0.242
Total rounds	0.995	0.000	0.181	-0.208
Firm's age at first investment	0.995	0.000	0.19	0.198

Classification Results

		Exit Strategy	Predicted Group Membership		Total
			IPO	M&A	
Original	Count	IPO	105	125	230
		M&A	159	2,861	3,020
	%	IPO	45.7	54.3	100.0
		M&A	5.3	94.7	100.0
91.3% of original grouped cases correctly classified.					

Exit strategy is significantly and chronologically influenced by, total amount invested in a firm, total times investment made, time to exit, total rounds and firm's age at first investment respectively. Discriminant model was able to classify approx 91% of the observations correctly.

Industry analysis

Table 8: Industry influence and VC Investment pattern across different industries at deals level

Descriptive and ANOVA results at deals level	Industry sectors								ANOVA Sig.
	Information Technology(11580)		Non-High Technology(2692)		Medical/ Healthcare(2630)		Mean	Std. Deviation	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation			
Round Numbers	3.26	2.62	2.75	2.49	3.55	2.56			0.00
Number of Investors ea. Round	3.12	2.52	1.91	1.53	3.06	2.65			0.00
Round duration	1.27	1.29	2.07	2.24	1.48	1.66			0.00
Round Amount Inv. (\$ 000)	13117.18	51323.72	44322.69	191459.60	12115.34	40801.56			0.00
Burn Rate	25952.57	220494.51	76652.58	825786.47	17803.71	87069.87			0.00
Investment duration	3.62	2.50	4.15	2.89	4.13	2.72			0.00

From Table 8, it can be concluded that industry has a significant influence on all investment variables reflecting again the matured VC industry. In Information Technology and Medical/Healthcare industry round duration is low, hence uncertainty is high. Hence these firms are associated with more syndication size and staging, supporting H3.4. Information technology and Medical/healthcare industry are high-tech industry which is associated with a lot of risk, hence informational asymmetry between EF and VC is high. Non-High technology sector, which is associated with low risk (Higher round duration), hence associated with the maximum investment each round, supporting H3.4. Consequently, Burn rate is also significantly higher for Non-High Tech industry. Investment duration is significantly higher for Non-High tech industry as it is less uncertain, Hence investor feel safe in its investment and continuously invest in that EF.

Table 9: Industry influence and VC investment pattern across different industries at firm level

Descriptive and ANOVA result at firm level	Industry Class								ANOVA Sig.
	Information Technology(2248)		Non-high technology (556)		Medical/ Healthcare (446)		ANOVA Sig.		
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation			
Firm's age at first investment	2.76	3.62	3.84	5.37	2.69	3.89	0.00		
Time to exit	4.46	2.74	4.79	3.11	5.52	3.14	0.00		
Total rounds	3.43	2.34	2.60	2.24	4.12	2.83	0.00		
Total Funds	6.88	5.68	3.50	3.21	7.36	6.20	0.00		
Total Investors	11.32	11.34	5.67	6.35	13.29	12.85	0.00		
Reinvestment	4.44	6.65	2.16	3.88	5.94	7.63	0.00		
Total amount invested in firm	42127.41	65841.66	95196.07	310727.61	42121.07	60309.85	0.00		

From Table 9, it can be concluded that industry has significant influence on all firm level investment parameters. In High-tech industries, firms have more number of rounds with more funds participation but total investment in a firm before exit is low. Reinvestment is least in Non-High technology firms, due to less uncertainty the maximum investment takes place in few rounds. High tech firms are receiving first financing earlier than non-high tech, supporting H3.4.

Multiple Regressions:

Table 12: Relationship across investment done in a deal and other investment patterns.

Dependent Variable: Round Amount Inv.					
Independent Variable	Model 1	Model 2	Model 3	Model 4	Significant
Exit	-0.221	-0.215	-0.219	-0.218	0.000
Round duration		0.064	0.065	0.059	0.000
Number of Investors ea. Round			0.059	0.065	0.000
Round Number				-0.045	0.000
R Square	0.049	0.053	0.056	0.058	
Adjusted R Square	0.049	0.053	0.056	0.058	

From table 12 it can be concluded that, Investment in a deal is significantly influenced by Exit strategy VCs have in mind, Round duration, Investors participation and round number. If round duration is more, less uncertainty, hence investment will be more. It supports H3.2. If more number of investors is interested in investing, investment will be more. The surprising result is that with the increase in round, investment is decreasing.

Table 13: Regression analysis between round duration in a deal and other investment patterns

Dependent Variable: Round duration					
Independent Variable	Model 1	Model 2	Model 3	Model 4	Significant
Round Number	-0.126	-0.129	-0.125	-0.122	0.000
Industry		0.099	0.090	0.089	0.000
Exit			-0.082	-0.069	0.000
R Square	0.016	0.026	0.032	0.036	
Adjusted R Square	0.016	0.026	0.032	0.035	

It can be concluded from table 13 that round duration is significantly influenced by round numbers, industry and exit strategy VCs have in mind. With the increase in round the future perspective of a firm will be cleared, hence uncertainty i.e. round duration will decrease. This supports H3.3.

Table 14: Regression analysis between investment duration and other investment patterns

Dependent Variable: Investment Duration						
Independent Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Significant
Round duration	0.285	0.297	0.300	0.292	0.289	0.000
Exit		0.095	0.079	0.084	0.085	0.000
Round Amount			-0.058	-0.060	-0.058	0.000
Industry				0.054	0.054	0.000
Number of Investors ea. Round					-0.044	
Adjusted R Square	0.081	0.090	0.094	0.096	0.098	

From table 14, it can be determined that Investment duration has been significantly influenced by round duration, exit strategy, industry and the investors participation at each round. If round duration is less i.e. less uncertainty, investors are ready to stay for a long time in the firm. If investment amount in a round has been increased that means the market is positive, hence investment duration will increase which is supporting H2.5. With the increase in syndication, the chance of getting early exit will increase, hence investment duration will decrease. This supports H2.6.

Table 16: Regression analysis between Total investment in a firm and other investment patterns

Dependent Variable: Total amount invested in firm			
Independent Variable	Model 1	Model 2	Significant
Independent variable	Model 1	Model 2	Significant
Exit Strategy	-0.288	-0.306	0.000
Total Funds		0.157	0.000
R Square	0.083	0.107	
Adjusted R Square	0.083	0.107	

At firm level from table 6 we can determine that total investment in a firm before exit is significantly influenced by exit strategy i.e. more for IPO. This supports H2.2. With the increase in funds available the source of investment in a firm increases, hence total amount invested in a firm will increase.

Table 17: Regression analysis between Time to exit and other investment patterns

Independent Variable	Dependent Variable: Time to exit						Significant
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	
Total rounds	0.53	0.53	0.46	0.47	0.47	0.50	0.00
Industry Class		0.10	0.11	0.11	0.11	0.11	0.00
Total Funds			0.10	0.12	0.12	0.14	0.00
Firm's age at first investment				0.08	0.08	0.08	0.00
Total amount invested in firm					-0.03	-0.03	0.00
Reinvestment						-0.05	0.00
R Square	0.28	0.29	0.30	0.31	0.31	0.31	
Adjusted R Square	0.28	0.29	0.30	0.30	0.31	0.31	

It can be determined from Table 17 that time to exit has been significantly influenced by total rounds, industry, total funds, firm's age at first investment, total amount invested in a firm and reinvestment. Thus if the firm gets it funding early, time to exit will decrease. If the funds committed are more the firm is doing well, hence the time to exit will increase. If the total investment in a firm increase, time to exit will decrease as investor preference to get exit will increase. If the fund get involved in reinvesting, their preference to get exit will increase the time to exit will decrease. This supports H2.4.

5 Indian Venture Capital and Private Equity Industry

Among developing countries, India has a big role in VC industry. The VC industry started here in 1964 though it is formally recognized in developed market like the US since 1940s. Pre-globalization, India was witnessing a very slow growth. But post 1991, India experienced tremendous growth in the number of deal, total investment, deal size etc. According to Price Waterhouse Coopers (PWC) Global private Equity report 2008, India was the recipient of highest PE-VC report investments in Asia -Pacific Region and only behind US and UK worldwide in 2007. India had moved from 14th rank with a share of only 1.5% in 2004 to 3rd rank with a share of 7% in total PE-VC investment worldwide in 2007. In spite of this appealing action in PE-VC investment arena in India, there are very few studies done in India VC-PE investments.

Table 18: Industry influence and investment patterns across different exit strategies

Description and ANOVA analysis	Industry						ANOVA Sig.
	Information Technology		Non-High Technology		Medical/Healthcare Technology		
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	
Investment duration(year)	1.25	0.82	0.99	0.72	1.79	1.71	0.222
Time to exit(months)	17.78	9.71	14.01	9.97	21.80	20.84	0.343
Round Amount Inv. (\$ mn)	36.92	136.95	34.53	56.60	21.91	28.63	0.236
Round numbers	1.26	0.59	1.29	0.73	1.36	0.72	0.389
Total investors	1.53	1.07	1.25	0.71	1.15	0.43	0.000
Burn Rate	10.09	68.20	8.37	22.35	4.15	5.61	0.778
Round Duration(months)	14.6	9.54	11.78	9.44	12.94	11.77	0.067
Firms age at first investment(year)	1.67	1.22	1.74	1.31	1.33	1.00	0.664

From the table 18, it can be determined that industry doesn't have significant influence on all investment variables except burn rate and round duration. Hence it reflects the immaturity of Indian VC/PE industry. In contrast with US, uncertainty is more in non-high tech industry as compared to high tech industry. VC are frequently monitoring Non-high tech firms which are less risky that means either VC are less aware of the industry or the firms are generating less funds .

Table 19: Investment patterns across exit strategies

Descriptive and ANOVA analysis	Exit Strategy				
	IPO		M&A		Anova
	Mean	Std. Deviation	Mean	Std. Deviation	Sig.
Investment duration(year)	0.82	0.59	1.81	0.80	0.000
Time to exit (months)	10.74	7.22	24.43	8.26	0.000
Round Amount Inv.(\$ mn)	38.26	90.33	30.13	41.67	0.677
Round number	1.82	1.23	1.67	1.20	0.592
Total investors	1.22	0.47	1.38	0.71	0.203
Burn Rate	5.79	11.59	3.18	4.37	0.355
Round Duration (months)	6.22	10.69	17.2	11.27	0.000

From table it can be determine that, Exit strategy has a significant influence on investment duration, time to exit and round duration. Investment duration is significantly higher for M&A than IPO and IPO firms' are getting early exit. But the round duration is lower in IPO firm, which means they are involved with more uncertainty and are raising more and more funds quickly. In contrast with US there is no significant difference in investment made in IPO and M&A.

5 Comparative Analyses

Table 20: Comparisons of US and Indian VC Patterns across Exit Strategies

Descriptive of economies across Exit Strategy (2004-2008)	IPO		M&A	
	INDIA	US	INDIA	US
Investment duration	0.82	1.68	1.81	2.18
Round Amount Inv. (\$ mn)	38.26	187.48	30.13	13.47
Round number	1.82	2.90	1.67	3.97
Total investors	1.22	2.15	1.38	3.40
Burn Rate	5.79	228.67	3.18	20.92
Round Duration	0.69	1.31	1.43	1.17

From above comparison it can be determined that in India VCs are investing for a short period of time as compared to US. This means VCs value addition in Indian firm is very low as they are getting in to just get early exit. Similarly investment in US is done in more rounds, which shows how much time VC is coming to monitor the firm. In the same way syndication is more in US firms as compared to India. Hence it can be concluded that Investment deals made in firms exiting via M&A are far greater for US compared to India. In contrast with US, IPO firm are frequently monitor rather than M&A. Firms which have exited through IPO are raising their funds more frequently and for less period of time just to get early exit. Hence it shows how it is attracting huge foreign investments.

Table 21: Comparisons of US and Indian VC Patterns across Industries

Descriptive across	Industry					
	Information Technology		Non-High Technology		Medical/Healthcare Technology	
	INDIA	US	INDIA	US	INDIA	US
Investment duration	1.25	2.14	0.99	2.22	1.79	2.17
Time to exit	1.48	2.46	1.17	2.34	1.82	2.45
Round Amount Inv. (\$ mn)	36.92	13.12	34.53	71.94	21.91	25.11
Round numbers	1.26	4.14	1.29	2.75	1.36	3.74
Total investors	1.53	3.29	1.25	2.47	1.15	4.47
Burn Rate	10.09	18.67	8.37	98.63	4.15	37.63
Round Duration	1.21	1.11	.98	1.39	1.07	1.34
Firms age at first investment	1.67	2.97	1.74	3.92	1.33	3.4

From above comparison, it can be concluded that, in contrast with US, VCs in non-high tech firm are raising funds frequently and getting early exit. In India, investment per deal is thrice the times of US investments. In contrast with US, in India syndication is least in medical/healthcare as compared to other industry. In terms of firm's getting its first funding Indian firms are following US firms, where non-high tech firms are getting late funding than high tech.

6. Conclusions

Agency concerns between EF and VC is of major concern and should be properly embarked upon. Informational asymmetry between EF and VC like diverging interest for getting exit from the firm, private benefits can exert a push on investors to remain outside. This study proposes predictions like, First, firm's exiting via M&A are associated with more uncertainty, hence more syndication as well as less fund raising. Dot-com has a significant influence on VC industry persisting even today. Indian VC industry shows both attractiveness and immaturity and it should learn from US.

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