

# Influence of Venture Capitalists – Evidence From Finland

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**Abstract:** ...

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## 1 Intro

Question: How does the venture capitalists advising and monitoring influence the portfolio company outcomes.

- motivation (size, growth to understand what you get: international and finland)
- literature references (gap in the literature)
- VC's effort: motivation, theory, busy boards
- contribution: instrument, causality, population data, Finland

## 2 Venture Capitalist, Monitoring and Advising

### 2.1 Institutions

Venture capitalists operate on specific way, which I describe next. The venture capitalists invest professionally to private companies - usually star-ups. The significant difference to e.g. bank funding is that the investors actively monitor the development of the company and also provide advice beyond the funding. One more important difference also in the difference between venture capitalists and angel investors. The angel investors invest only their own money<sup>1</sup> while venture capitalist also manage other investors money.

The structure of venture capital firm is such that the venture capitalist are partners in the firm. First the venture capitalists raise funds from institutional investors. Then the venture firm acts as a general partner in the venture fund and the institutional investors take a role of limited partners. The venture firm and the particular partners responsible for the fund run the daily operations of the fund, which they get a fee to cover the costs. The age of the fund is limited either by law or by contract usually to ten years. After the investment cycle has passed the proceeds are distributed to the limited partners and finally to the general partners i.e. venture firm. During the lifetime of the fund the GPs first screen the companies to invest in. Next they develop the companies and finally get them ready for selling either through Initial Public Offering - IPO or direct sale. In Finland the IPOs have been rare possibly due to the size of the market.

In general the venture investments in Finland follow the same outline as in the US where the industry has spread around the world ((Pajarinen, Rouvinen and Ylhäinen 2016), (Gompers, Gornall, Kaplan and Strebulaev 2016)). So far the distinctive features have been relatively small size of the industry and the companies. This often translates to the exit being direct sale either to another venture capitalist or to a established company instead of IPO.

### 2.2 Literature Review

#### 2.2.1 Theoretical Framework

There is early theoretical literature that has discussed the agency issues and also the role of advising/monitoring regarding venture capital investments. Few influential early theory papers are Admati and Pfleiderer (1994), Gompers (1995), and Casamatta (2003). Gompers (1995)

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<sup>1</sup>There are consortium or angel investors but in general the distinction comes from the legal structure.

argue that the by using staged financing the venture capitalists can alleviate the entrepreneurs' moral hazard problem by staging the financing correctly and thus make the investment profitable without full time monitoring.

Casamatta (2003) argue that the venture capital financing is actually double moral hazard situation where both the entrepreneur and the venture capitalist needs right incentives to work for the project. She analysis different incentive needs and shows that common stocks are good tool to provide high incentives for the venture capitalist while convertible bonds are good way to incentivize the entrepreneur. The main difference between (Gompers 1995) and (Casamatta 2003) is that in the latter the venture capitalist has advising role while in the former the venture capitalist monitors the activity of the entrepreneur. My work aims to measure the combined effect of these activities.

Schindele (2006) takes an approach where the venture capitalists have two separate tasks they can perform: monitoring and advising. They both improve the expected return of the project but through different channel: while the advising improves outcomes of the project the monitoring curbs the private benefit the entrepreneur can get from the project. The main result of her model is that wealth constraint entrepreneur prefers to contract with venture capitalist instead of the single-role financier such as bank. The logic is that since bank cannot engage in the monitoring and advising activities the funding from the bank would be unfeasibly expensive. Unfortunately, my data does not allow me to distinguish the difference of these two channels and thus I concentrate identifying the joint influence.

### 2.2.2 Empirical Evidence

The closest papers to mine are (Bernstein, Giroud and Townsend 2016) and (Colombo, D'Adda, Malighetti, Quas and Vismara 2017). They both utilize the introduction of new airline routes between cities as exogenous variation to pin-down the impact of venture capitalists monitoring activities. The results for both point to the same direction that the increased monitoring has a positive effect on IPOs and patenting activity.

Other branch of literature that has parallels to my research is the busy board literature. Fich and Shivdasani (2006) argue that the busy boards are associated with weak corporate governance and poor performance. Field, Lowry and Mkrtchyan (2013) argue that it seems to depend on the life cycle of the firm. They find that busy boards are beneficial for venture capital backed firms that do IPO. They hypothesize that the advising and monitoring needs depend on the stage of the firm's life cycle. Established firms do not benefit from the new connection the busy board can provide but need more hands on monitoring.

In a recent paper Hauser (2018) provides more evidence for the perspective that board members who have more time for their firm do provide positive impact. They use acquisitions as an exogenous shock to the number of board seats the people hold. Their argument is that the board members do not endogenously influence in the take-over bid and thus from the other companies perspective the acquisition is an exogenous shock. The board members used to be 'busy' but after the merger their workload decreases and Hauser (2018) conclude that more time is beneficial for the firm outcomes. The set of companies they analyze is again public listed companies.

### 3 Data

My dataset consists of four main elements: 1) The investment data from the Finnish Venture Capital Association<sup>2</sup> or FVCA, 2) The board composition data from the Patent and Registry Office of Finland, 3) Company balance sheet data and Finnish Longitudinal Employer-Employee Data or FLEED from Statistics Finland and 4) European Patent Office for the patent application data for the Finnish companies. I verified and augmented the investment data also from Thomson Reuter's VentureXpert database, crunchbase.com and the venture firms own websites. Thomson Reuters added some earlier investments into the dataset. I believe to have a comprehensive dataset of the Finnish venture capital market for the whole history of the industry.

The investment data from the FVCA consist of the name and registry id of the company invested in and the year of the first investment. The Patent and Registry Office dataset includes the information about the board members, CEOs, the year of the registration and the possible year of the bankruptcy and de-registering of the company. Also mergers and acquisitions are listed in the data. Balance sheet data of the companies list the most important registry figures of the companies including, number of employees, sales, earnings, liabilities, and equity. My data consists of 691 portfolio companies. FLEED contains 160 different variables of the people between 15-70 who live in Finland.

For my purposes I define a venture capitalist to be a person who is simultaneously board member or CEO of a venture firm and holds also a board role in one of the portfolio companies. This approach can exclude people who do not take active role in the venture firms management but operates actively in the portfolio company. Unfortunately, I do not have a way to identify these individuals. I argue given the partnership structure of the venture firms makes the number relatively small since I observe 178 venture capitalists in my data. The probability that an entrepreneur of a portfolio company would sit in a board of a venture firm is unlikely. Given this definition I was able to find all the venture capitalists who live in Finland from the FLEED. My matched dataset is an unbalanced panel over the years 1996 to 2015.

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#### 3.1 Descriptives

- who are the investors?
- what kind of companies (compare to e.g. all the same age/size etc.)
- graphs towards regressions(?)

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<sup>2</sup>I thank FVCA for sharing their data.

## 4 Econometric Analysis

- endogeneity problems
- instrument and why it works!
- results
- interpretation
- robustness

When considering the question how the venture capitalist impacts the companies' outcomes we encounter two <sup>3</sup> main endogeneity problems. First, the selection of the companies who get venture financing is not random. I avoid this problem by analyzing only the companies that have obtained the funding from a venture capitalist. This selection arises from both the entrepreneurs side who decide to seek funding and from the venture capitalists side who decides the set of possible applicants. Naturally, this means that my results cannot be directly extended to all the other companies.

Second endogeneity issue is that the venture capitalists can choose how many companies they take in their portfolio and thus they vary the intensity of their advising and monitoring activities. First of all I need a measure for the advising and monitoring intensity. I use the total number of board seats the venture capitalist has at time  $t$ . The logic naturally comes from the fact that there is limited number of hours in a day to allocate and if there are more companies in the portfolio there is less time for each. This choice of the number of companies in the portfolio is naturally an endogenous choice and this problem needs to be addressed. Optimal experiment<sup>4</sup> to study this would be that the venture capitalists would be randomly assigned to the boards of the companies that some venture capitalist has decided to finance. The key part would be that different investors would have different number of companies to advice. I will discuss about the instrument in the next section.

One drawback of using the board seats as a measure of time allocation is that large number of board seats can also create positive externalities. This line of thinking has been applied in the busy board literature Field et al. (2013). Basically this means that my estimates will have two interpretations, which I at least in this point cannot distinguish from each other. One, the more board seats the less time the investor has for one company and this is expected to have negative impact effectiveness of monitoring and advising. Two, the venture capitalists with a lot of board seats have a lot of connections and they can generate positive outcomes for the companies by utilizing these connections. In the worst case these effect are in work simultaneously and negate each other.

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<sup>3</sup>One concern I have heard is that only companies that do not have anything to lose report their financial data to the government registry within required schedule. In my case I do not think this issue to be particularly worrisome since most of my data is old enough that I expect even the slowest of the companies to have reported the data.

<sup>4</sup>One relevant assumption here still is that the venture capitalists are high work ethic individuals and they exert full effort

## 4.1 Instrumental variable

Given the endogeneity problem I am looking for exogenous variation in the number of board seat the venture capitalists hold. My solution to this issue is to use the institutional setting of the industry. The industry standard is that a venture fund's lifetime is limited by a contract to 10 years<sup>5</sup>. The first and last years of the fund the venture capitalists hold fewer board seats than in the mid-life years. The data from Finland supports this. I argue that this phenomena gives me exogenous variation and thus I can use the age of the fund as an instrument for the number of board seats the venture capitalist holds.<sup>6</sup>

One feature of my instrument is that I unfortunately cannot use simultaneously venture capitalist and year fixed-effects. This problem is to certain extent similar to year-cohort-age identification in Rodgers (1982a). In my case the venture capitalist fixed effect captures the cohort effect and although not perfectly collinear with my instrument the remaining variation when both of the fixed effects are included reduces to comparing the outcomes of companies in particular year whose venture capitalists have the equally aged fund and share unobservable characteristics. Given the relatively small number of Venture Capitalists (178) in my data it is not surprising that there is not much variation left. This leaves me with the choice of excluding either year or venture capitalist fixed-effect. Since I am not interested in the coefficients of the fixed effects itself I will introduce macro controls instead of year fixed effects Since I am not trying to identify either of the actual fixed effects my approach is to include sufficient controls for the effects (Rodgers 1982a, Rodgers 1982b). Even with the rich dataset of individuals FLEED offers I can more convincingly control for the year effects that influence the all venture capitalist by using a set of macro controls (number of funds, gpd growth, interest rate). Then my identification hinges on the company shocks to be uncorrelated with the age of the fund.

## 4.2 Regression Specification and Identification

My estimation equation is as follows:

$$\begin{aligned} y_{ijt} &= \beta X_{ijt} + \gamma BoardSeats_{j,t-1} + \alpha_i + \alpha_j + \alpha_g + \varepsilon_{ijt} \\ BoardSeats_{ijt} &= \pi Z_{jt} + \beta X_{ijt} + \kappa_i + \kappa_j + \kappa_g + \xi_{ijt} \\ Z_{jt} &=: AvgFundAge_t + AvgFundAgeSquared_t \end{aligned}$$

where portfolio company  $i$ , venture capitalist  $j$ , venture group  $g$ .  $X_{ijt}$  are the macro and time varying company controls.  $\alpha_i$  is company fixed effect,  $\alpha_j$  is venture capitalist fixed effect, and  $\alpha_g$  is venture group fixed effect.  $Z_{jt}$  is the proposed instrument.

The company fixed effects de-mean the company unobservable quality. So, the companies are the same up to the observables. This means that we're comparing how the same quality

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<sup>5</sup>Usually there is also a clause in the contract allowing the extension of the fund for two years if the limited partners agree on the proposition. The timing structure comes mainly from the US where the structure is imposed by the law.

<sup>6</sup>One argument against this idea is that the investors have other things to take care of at the beginning and at the end of the fund. I do not have conclusive evidence against this claim. The possibly effect of this is to push my estimates towards zero. Making my estimates more of a lower bound.

companies in the same industry would react. Clustering on the company level means that it is allowed that the errors of the company  $i$  are serially correlated over the years but the errors between different companies are independent. Venture capitalist fixed effect de-means the unobserved ability and possible style factors of the venture capitalist. This means that we compare similar venture capitalists over time. The crucial element here is that we can control the innate ability, which is otherwise difficult to control. The important assumption here is that the company shocks are not allowed to be correlated across companies but are assumed to be independent. I argue that this is not quite as strict assumption as it sounds at first because of the fixed effects that do control the systematic differences in levels.<sup>7</sup>

## 5 Results

The main question I aim to answer is the impact of venture capitalist on the company outcomes such as sales growth, probability of bankruptcy etc. while controlling for the money invested and experience of the venture capitalist. The main idea is a venture capitalist has fixed number of hours a day and those hours need to be allocated between the portfolio companies. Now, the more portfolio companies the VC has the less time he has for one company. The venture fund lasts 10 years, which means that at the beginning and at the end there should be less portfolio companies than in the middle part of the life span.

Table (1) reports the first stage with two different instrumental variable. The right columns instrumental variable is discussed in the Appendix B. The first stage result of column 1 show the coefficients that are in line with the hypothesized shape of the board seats relative to the fund age. As a whole the instrument is on the weak side but not totally invalid.

Table (2) reports the regression results for OLS and IV specifications. I have three sets of outcome variables: 1) the business growth, which here is measured by the personnel growth, 2) innovativeness, which is measured by the patent applications and granted patents, and 3) the company exit outcome, which is measured by a bankruptcy in the following three years.

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<sup>7</sup>Problems would arise if the true model would include e.g. interaction of the venture capitalist ability and industry. It would lead to inconsistent estimates for the standard errors.

Table 1: First stage

	<i>Dependent variable:</i>	
	BoardSeats <sub>t-1</sub>	BoardSeats <sub>t-1</sub>
$\Delta$ Capital Invested <sub>t</sub>	0.010 (0.042)	0.007 (0.042)
GDP growth <sub>t</sub>	-0.005 (0.015)	0.005 (0.015)
Interest rate <sub>t</sub>	0.131** (0.062)	0.091 (0.059)
Number of founded funds <sub>t</sub>	-0.022** (0.010)	-0.020** (0.010)
Company Age <sub>t</sub>	0.121 (0.109)	0.076 (0.082)
Company Age squared <sub>t</sub>	-0.002 (0.004)	0.001 (0.003)
Average Fund Age <sub>t</sub>	0.453*** (0.129)	
Average Fund Age squared <sub>t</sub>	-0.043*** (0.010)	
Other VCs board seats		0.003*** (0.001)
Observations	2,585	2,586
VC and Company FE	✓	✓
R-squared	0.808	0.808
Adjusted R-squared	0.750	0.748
F-statistics(excl. instr.)	9.753***	13.11***

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01



Table 2: IV: Fund Age, S.E clustered on company level

	<i>Dependent variable:</i>							
	$\Delta$ Personnel		Patent applications		Granted patents		3yr P(B'ruptcy)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
$\Delta$ Capital Invested $_{t-1}$	0.129*** (0.039)	0.128*** (0.043)	-0.019 (0.017)	-0.019 (0.017)	-0.002 (0.011)	-0.002 (0.011)	-0.005* (0.003)	-0.005** (0.003)
GDP growth $_t$	0.014 (0.013)	0.015 (0.013)	0.084 (0.007)	0.083 (0.007)	0.004 (0.007)	0.004 (0.006)	-0.001 (0.001)	-0.000 (0.001)
Interest Rate $_t$	0.038 (0.043)	-0.004 (0.045)	0.029 (0.024)	0.050 (0.036)	0.019 (0.017)	0.022 (0.022)	-0.004 (0.003)	-0.000 (0.004)
Founded Funds $_t$	-0.001 (0.009)	0.006 (0.010)	-0.010 (0.006)	-0.010 (0.006)	-0.007 (0.004)	-0.007 (0.005)	-0.001 (0.001)	-0.002* (0.001)
Company Age $_t$	-0.258*** (0.056)	-0.306*** (0.074)	-0.034 (0.033)	-0.031 (0.040)	-0.017 (0.020)	0.008 (0.026)	-0.000 (0.006)	0.014** (0.006)
Company Age squared $_t$	0.012*** (0.003)	0.013*** (0.003)	0.001 (0.002)	0.000 (0.002)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.000)	-0.000 (0.000)
Board Seats $_{t-1}$	0.005 (0.016)	0.247* (0.136)	-0.003 (0.013)	-0.019 (0.118)	-0.007 (0.009)	-0.026 (0.089)	-0.002 (0.001)	-0.029** (0.013)
Observations	2,585	2,585	2,585	2,585	2,585	2,585	2,585	2,585
VC and Company FE	✓	✓	✓	✓	✓	✓	✓	✓
R-squared	0.376	0.278	0.775	0.775	0.741	0.740	0.628	0.571
Adjusted R-squared	0.185	0.057	0.706	0.706	0.662	0.661	0.515	0.440
F-statistics	1.969***	1.712***	11.27***	11.26***	9.349***	9.32***	5.538***	4.804***

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

## 6 Remarks

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APPENDICES

**A APPENDIX A: Clustering**

One question is the correct level of clustering. First of all the portfolio companies have most likely serially correlated errors and thus one dimension to cluster the standard errors is the portfolio company level. But the other important dimension to consider is the venture capitalist dimension. It is possible that the venture capitalists' shocks are serially correlated and thus needs to be addressed. If I would cluster the standard errors on the venture capitalist level it would mean that I assume individual venture capitalists working for the same venture capitalist group to have uncorrelated errors. This seems unlikely to be true. Thus clustering on the venture group level would be one solutions. This still assumes that the different venture groups do not have correlated errors which might not be true since they are operating on the same market but given that the venture groups have their distinct style it is not totally implausible. Clustering on the venture group level raises a new concern which is the small number of clusters (24). Unfortunately, the literature (Cameron and Miller 2015) does not have a clear solution how to correct the bias from finite sample with multiway-clustering. I will report the alternative standard errors here.

**B APPENDIX B: Leave-one-out Instrument**

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