



Yale SCHOOL OF MANAGEMENT

August 4, 2016

More than Money: Venture Capitalists on Boards

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Contributions

- Explore the structure and composition of boards of directors of private VC-backed companies.
- Identify determinants of board membership in venture capital investments.
- Identify value-adding actions that VCs take for portfolio companies as board members.



Motivation (1)

- Boards of directors of public companies affect financial performance.
 - Baysinger and Butler (1985)
 - Yermack (1995)
- Little work has been done size on and composition of private VC-backed companies.
 - Rosenstein, Bruno, Bygrave, and Taylor (1993)
 - Lerner (1995)
- With a comprehensive data set, we can contribute.



Main Findings (1)

- Boards of directors of private VC-backed companies are small and independent.
 - Median size = 4
 - Composition = 2 VC, 1 outsider, 1 insider
- As the board size increases, the number of VC board members and independent board members increase, while the number of insiders stays the same.



Motivation (2)

- Little work has been done on determinants of board membership in VC investing.
 - Lerner (1995) found the following to be positively correlated with board membership
 - Geographical proximity
 - VC firm's age
 - VC firm's size
 - VC firm's investment stake



Main Findings (2)

- The following are positively correlated with board membership in VC investing.
 - Geographical proximity
 - VC firm's quality measured by past investment success
 - VC firm's professional network size
 - VC firm's prior relationship with founder
 - Lead investor status



Motivation (3)

- Does venture capital return come from deal selection or post-investment value-adding activities?
- Deal selection
 - Kaplan and Schoar (2005)
 - Gompers, Kovner, Lerner, and Scharfstein (2010)
- Post-investment contribution
 - Tian (2011)
 - Brander, Amit, and Antweiler (2002)



Motivation (3)

- Examine VC's role in recruiting outside managers and outside board members to firm
- Survey papers have highlighted role that VCs play in recruiting talent to their portfolio companies
 - Gorman and Sahlman (1989)
- Do VCs recruit talent for portfolio companies?
- Is it mediated by board membership?



Main Findings (3)

- Novel instrument allows us to look at causal implications of VC board service on value-added activities.
- Successful and well-connected VC board members recruit more outside managers and board members from their network than the average VC investor.



Data

- Dow Jones VentureSource
 - Investment data for 1978-2012
 - Board of directors and management data
 - Portfolio company office location data
- Pratt's Guide to Private Equity and Venture Capital
 - Hand collected data from annual volumes
 - Venture capital firm office location data by year



Summary Statistics

Number of portfolio companies	16,140
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Industry	Number	Percent
Business and Financial Services	2,870	17.78%
Consumer Goods	118	0.73%
Consumer Services	1,848	11.45%
Energy and Utilities	196	1.21%
Healthcare	3,025	18.74%
Industrial Goods and Materials	315	1.95%
Information Technology	7,768	48.13%

Geography	Number	Percent
U.S.	10,354	64.15%
Non-U.S.	5,786	35.85%

Number of deals	55,091
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Round number	Number	Percent
1	23,112	41.95%
2	13,755	24.97%
3	8,396	15.24%
4	4,682	8.50%
5+	5,146	9.34%

Investment stage	Number	Percent
Start up	3,676	6.67%
Product development	20,156	36.59%
Generating revenue	28,829	52.33%
Profitable	2,430	4.41%

Board membership & recruiting	Number	Percent
Deals that yielded board membership	22,721	41.24%
Deals with at least 1 related outside managers	3,793	6.88%
Deals with at least 1 related outside board member	5,303	9.63%
Average related outside managers	0.088	N/A
Average related outside board members	0.111	N/A



Structure of Private Companies' Boards

Board size	All			
	n	Mean	Median	s.d.
Insider	16,140	0.98	1.00	0.61
Outsider	16,140	1.39	1.00	1.40
Venture capitalist	16,140	1.92	2.00	1.45
Individual investor	16,140	0.15	0.00	0.47
Board observer	16,140	0.05	0.00	0.28
Board size	16,140	4.51	4.00	2.17

Board size	1 to 4			
	n	Mean	Median	s.d.
Insider	8,529	0.84	1.00	0.58
Outsider	8,529	0.72	1.00	0.85
Venture capitalist	8,529	1.17	1.00	0.96
Individual investor	8,529	0.09	0.00	0.33
Board observer	8,529	0.02	0.00	0.14
Board size	8,529	2.85	3.00	1.03

Board size	5 to 8			
	n	Mean	Median	s.d.
Insider	6,931	1.11	1.00	0.59
Outsider	6,931	1.99	2.00	1.34
Venture capitalist	6,931	2.61	3.00	1.31
Individual investor	6,931	0.22	0.00	0.56
Board observer	6,931	0.08	0.00	0.33
Board size	6,931	6.01	6.00	1.01

Board size	9+			
	n	Mean	Median	s.d.
Insider	680	1.42	1.00	0.72
Outsider	680	3.76	4.00	2.03
Venture capitalist	680	4.24	4.00	1.94
Individual investor	680	0.29	0.00	0.77
Board observer	680	0.20	0.00	0.69
Board size	680	9.91	9.00	1.31



Defining Past Relationships

- A person is coded as having a prior relationship with a VC firm if he or she had worked, in any capacity, for a startup that the VC firm had invested in.
- The VC firm is assumed to “know” every employee at the startup, when it invests in the startup.



Defining VC Firm Network Size

- A VC firm's network is composed of everyone who has worked at a startup that the VC firm invested in prior, to making the particular investment in question.
- A VC firm's network increases in size as the firm invests in more startups.
- In a given year, a VC firm has a “large” network if the size of its network is larger than that of the median VC firm.



Determinants of Board Membership

- Unit of observation
 - First investments at the firm-level
- Dependent variable
 - **Board membership** = 1 when VC firm got a board seat from investment and = 0 otherwise
- Fixed effects
 - Year, industry, investment stage
- Robust standard errors clustered at the portfolio company-level



Independent Variables

- **Relationship with founder:** dummy variable = 1 if founder had worked at a portfolio company that the VC firm had invested in.
- **Lead investor:** dummy variable = 1 if the VC firm is a lead investor in the round as indicated in the data.
- **High success ratio:** dummy variable = 1 if the VC firm's percentage of previous deals that IPO-ed is greater than that of the median VC firm.
- **Number of VC firms in round:** number of VC firms investing in that round of investment.
- **Large network:** dummy variable = 1 if the VC firm has a larger-than-median network of managers/board members.
- **Minimum distance:** distance in miles between the VC firm's office that is nearest to the portfolio company's office.



Determinants of Board Membership

Round 1

Independent Variables	(1)	(2)	(3)
Relationship with Founder	1.408*** [0.086]	1.413*** [0.087]	1.409*** [0.087]
Lead Investor	2.220*** [0.068]	2.206*** [0.068]	2.214*** [0.068]
Number of VC Firms in Round	0.873*** [0.009]	0.876*** [0.009]	0.874*** [0.009]
High Success Ratio	1.617*** [0.047]		
Large Board Member Network		1.651*** [0.053]	
Large Manager Network			1.650*** [0.053]
Year fixed effects?	Yes	Yes	Yes
Investment stage fixed effects?	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes
Constant	0.849* [0.073]	0.810** [0.070]	0.807** [0.070]
Observations	23,112	23,112	23,112



Determinants of Board Membership Rounds 2 or Later

Independent Variables	(1)	(2)	(3)	(4)	(5)
Relationship with Founder	1.465*** [0.143]	1.385*** [0.135]	1.320*** [0.129]	1.292*** [0.127]	1.301*** [0.128]
Lead Investor	3.316*** [0.115]	3.274*** [0.113]	3.212*** [0.111]	3.209*** [0.111]	3.218*** [0.112]
Number of VC Firms in Round	0.935*** [0.006]	0.935*** [0.006]	0.930*** [0.006]	0.928*** [0.006]	0.929*** [0.006]
Minimum Distance		0.999*** [0.000]	0.999*** [0.000]	0.999*** [0.000]	0.999*** [0.000]
High Success Ratio			1.325*** [0.051]		
Large Board Member Network				1.637*** [0.071]	
Large Manager Network					1.562*** [0.068]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
Investment stage fixed effects?	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes
Constant	0.568*** [0.105]	0.650*** [0.123]	0.540*** [0.103]	0.460*** [0.089]	0.470*** [0.091]
Observations	20,453	20,453	20,453	20,453	20,453



Outside Manager Recruiting

- Unit of observation
 - First investments at the firm-level
- Dependent variable
 - Number of related managers who started working at the portfolio company on or after the investment date
- Related managers are non-founding managers who have a prior relationship with the investing VC firm.



Outside Manager Recruiting (OLS)

Independent Variables	(1)	(2)	(3)	(4)	(5)
Board Seat	0.055*** [0.003]	0.045*** [0.003]	0.044*** [0.003]	0.015*** [0.003]	0.008*** [0.003]
Lead Investor	0.014*** [0.004]	0.013*** [0.004]	0.014*** [0.004]	0.012*** [0.004]	0.013*** [0.004]
Number of VC Firms in Round	-0.002** [0.001]	-0.006*** [0.001]	-0.003*** [0.001]	-0.003*** [0.001]	-0.003*** [0.001]
US	0.075*** [0.003]	0.067*** [0.003]	0.063*** [0.003]	0.066*** [0.003]	0.062*** [0.003]
High Success Ratio		0.083*** [0.003]		0.067*** [0.003]	
Large Manager Network			0.084*** [0.003]		0.067*** [0.003]
Board Seat*High Success Ratio				0.044*** [0.006]	
Board Seat*Large Manager Network					0.049*** [0.005]
Investment stage fixed effects?	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes
Constant	0.019** [0.008]	-0.015* [0.008]	-0.026*** [0.008]	-0.004 [0.008]	-0.013 [0.008]
Observations	55,091	55,091	55,091	55,091	55,091



Outside Board Member Recruiting (OLS)

Independent Variables	(1)	(2)	(3)	(4)	(5)
Board Seat	0.025*** [0.003]	0.013*** [0.003]	0.011*** [0.003]	-0.002 [0.003]	-0.006* [0.003]
Lead Investor	0.024*** [0.004]	0.022*** [0.004]	0.024*** [0.004]	0.022*** [0.004]	0.023*** [0.004]
Number of VC Firms in Round	-0.004*** [0.001]	-0.006*** [0.001]	-0.006*** [0.001]	-0.006*** [0.001]	-0.006*** [0.001]
US	0.026*** [0.005]	0.016*** [0.004]	0.014*** [0.005]	0.016*** [0.005]	0.013*** [0.005]
High Success Ratio		0.099*** [0.003]		0.091*** [0.004]	
Large Board Member Network			0.109*** [0.003]		0.101*** [0.004]
Board Seat*High Success Ratio				0.022*** [0.006]	
Board Seat*Large Board Member Network					0.023*** [0.005]
Investment stage fixed effects?	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes
Constant	0.115*** [0.010]	0.075*** [0.010]	0.056*** [0.010]	0.081*** [0.010]	0.062*** [0.010]
Observations	55,091	55,091	55,091	55,091	55,091



Endogeneity Concern

- Board membership may be endogenously related to recruiting
 - Startups that are more likely to benefit from a manager or outside board member who belongs to a VC firm's network may be more likely to give a board seat to that VC firm



Sarbanes-Oxley as IV

- Enacted July 30th, 2002
- U.S. federal law that enhances standards for boards, management, and accounting at all public companies listed in the U.S.
- SOX should raise the likelihood of board membership for VC firms because startups require greater expertise to go public.
 - While SOX doesn't directly affect private, venture capital-backed companies, if they want to go public, would want greater independence and expertise in order to go public.
 - Those firms that don't intend to go public in US should not be affected. This includes non-US venture capital-backed firms.
- SOX should not affect the incentive of VCs to recruit outside manager or board member from their network.



Likelihood of Board Membership

Year	All		US		Non-US	
	Number of deals	Board rate	Number of deals	Board rate	Number of deals	Board rate
1997	2,355	38.90%	2,105	39.00%	250	37.60%
1998	3,433	38.10%	2,850	38.60%	583	35.30%
1999	7,440	35.40%	6,002	34.70%	1,438	38.30%
2000	12,920	36.30%	9,450	33.80%	3,470	43.00%
2001	6,399	40.10%	4,249	38.80%	2,150	42.70%
2002	3,908	44.40%	2,665	44.00%	1,243	45.20%
2003	3,520	47.80%	2,457	49.60%	1,063	43.60%
2004	3,793	46.80%	2,640	48.90%	1,153	41.90%
2005	3,695	49.50%	2,561	52.30%	1,134	43.20%
2006	3,783	47.60%	2,580	50.20%	1,203	42.20%
2007	3,845	46.40%	2,672	49.70%	1,173	39.00%



Difference-in-Differences

- SOX only affects public companies listed in the U.S. so VC investments made in the U.S. is the experimental group.
- SOX does not affect public companies listed outside of the U.S. so VC investments made outside of the U.S. is the control group.



Difference-in-Differences (OLS)

Independent Variables	(1)	(2)	(3)	(4)
SOX	0.019** [0.009]	0.011 [0.009]	0.024*** [0.009]	0.024*** [0.009]
US	0.007 [0.006]	-0.008 [0.007]	-0.014** [0.006]	-0.010 [0.006]
SOX*US	0.074*** [0.010]	0.081*** [0.010]	0.070*** [0.010]	0.072*** [0.010]
Lead Investor	0.196*** [0.005]	0.191*** [0.005]	0.192*** [0.005]	0.191*** [0.005]
Number of VC Firms in Round	-0.024*** [0.001]	-0.026*** [0.001]	-0.026*** [0.001]	-0.026*** [0.001]
High Success Ratio		0.122*** [0.004]		
Large Manager Network			0.149*** [0.005]	
Large Board Member Network				0.152*** [0.005]
Investment stage fixed effects?	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes
Constant	0.501*** [0.011]	0.446*** [0.011]	0.412*** [0.011]	0.408*** [0.011]
Observations	55,091	55,091	55,091	55,091



Outside Manager Recruiting (2SLS)

Independent Variables	(1)	(2)	(3)	(4)	(5)
Board Seat	0.428*** [0.066]	0.423*** [0.067]	0.434*** [0.064]	0.268* [0.153]	-0.021 [0.269]
Lead Investor	-0.063*** [0.015]	-0.063*** [0.014]	-0.065*** [0.014]	-0.059*** [0.015]	-0.052*** [0.016]
Number of VC Firms in Round	0.008*** [0.002]	0.007*** [0.002]	0.007*** [0.002]	0.006*** [0.002]	0.005** [0.002]
US	0.062*** [0.004]	0.058*** [0.004]	0.058*** [0.004]	0.055*** [0.005]	0.049*** [0.006]
High Success Ratio		0.037*** [0.009]		-0.024 [0.052]	
Large Manager Network			0.027*** [0.010]		-0.110 [0.074]
Board Seat*High Success Ratio				0.174 [0.149]	
Board Seat*Large Manager Network					0.448* [0.246]
Investment stage fixed effects?	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes
Constant	-0.165*** [0.034]	-0.180*** [0.031]	-0.184*** [0.028]	-0.120* [0.063]	-0.016 [0.102]
Observations	55,091	55,091	55,091	55,091	55,091



Outside Board Member Recruiting (2SLS)

Independent Variables	(1)	(2)	(3)	(4)	(5)
Board Seat	0.044 [0.056]	0.037 [0.056]	0.073 [0.053]	0.122 [0.185]	-0.172 [0.298]
Lead Investor	0.020* [0.012]	0.018 [0.012]	0.011 [0.011]	0.015 [0.013]	0.015 [0.012]
Number of VC Firms in Round	-0.003** [0.002]	-0.005*** [0.002]	-0.004** [0.002]	-0.005*** [0.002]	-0.005*** [0.002]
US	0.025*** [0.005]	0.016*** [0.005]	0.013*** [0.005]	0.018*** [0.006]	0.008 [0.007]
High Success Ratio		0.096*** [0.008]		0.129* [0.069]	
Large Board Member Network			0.099*** [0.009]		0.020 [0.095]
Board Seat*High Success Ratio				-0.095 [0.197]	
Board Seat*Large Board Member Network					0.256 [0.304]
Investment stage fixed effects?	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes
Constant	0.106*** [0.029]	0.065** [0.026]	0.031 [0.023]	0.032 [0.074]	0.120 [0.109]
Observations	55,091	55,091	55,091	55,091	55,091



Falsification Test

- For each real investment, we created one counterfactual investment with:
 - Same time frame (+/- 6 months of real investment)
 - Same industry
 - Same investment stage
 - Same geographical region
- Drop investments with no counterfactual pair



Falsification Test

- Unit of observation
 - First investment at the firm-level and its counterfactual pair
- Dependent variable
 - Number of outside manager (board member) at the portfolio company
- Fixed effects
 - Industry and investment stage



Falsification Test

Independent Variables	Related Managers		Related Board Members	
	(1)	(2)	(3)	(4)
Board Seat	0.004 [0.003]	0.003 [0.003]	0.001 [0.003]	0.001 [0.003]
Invest	0.010*** [0.002]	0.010*** [0.002]	0.022*** [0.002]	0.022*** [0.002]
Large Manager Network	0.032*** [0.001]	0.003 [0.002]		
Invest*Large Manager Network	0.041*** [0.004]	0.042*** [0.004]		
Board Seat*Large Manager Network	0.063*** [0.005]	0.062*** [0.005]		
Large Board Member Network			0.028*** [0.001]	-0.002 [0.002]
Invest*Large Board Member Network			0.068*** [0.004]	0.068*** [0.004]
Board Seat*Large Board Member Network			0.028*** [0.005]	0.027*** [0.005]
High Success Ratio		0.041*** [0.002]		0.040*** [0.002]
Investment stage fixed effects?	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes
Constant	0.020*** [0.006]	0.018*** [0.006]	0.028*** [0.006]	0.025*** [0.006]
Observations	102,616	102,616	102,616	102,616



Conclusion

- Boards of directors of private VC-backed companies are small and dominated by independent directors.
- Prior relationship with founder, lead investor status, VC firm quality, geographical proximity, and network size are important determinants of board membership.
- Successful and well connected VC firms **on the board** do most of the recruiting for key managers and outside board members.
- These results indicate that VCs add post-investment value.

