ONLINE APPENDIX

Getting Tired of Your Friends:

The Dynamics of Venture Capital Relationships

by Qianqian Du and Thomas Hellmann

This online appendix contains the following five sections. Appendix A presents additional tests as robustness checks to our main regressions. Appendix B shows the list of top 50 VCs between 1990 and 2012. Appendix C provides an example of how we construct the pairs of top 50 VCs for each company-round. In Appendix D, we illustrate the patterns of VC coinvestments by figures. Finally, we give an example of indirect partners in Appendix E.

Appendix A. Additional Tests

Table A.1. Robustness check on non-linearity

The sample includes 1,420,945 VC-pair-company-round observations between 1990 and 2012. In Panel A, the dependent variable is Coinvestment, a dummy variable to indicate whether the VC-pair coinvests in the current round. In Panel B, the dependent variables are IPO in Column (1) and EXIT in Column (2) to proxy for investment performance. IPO is a dummy variable to indicate whether or not the company has an IPO while Exit is a dummy variable to indicate whether or not the company has an IPO or gets acquired by another company. The rest of the variables are defined in Table 1. All regressions apply the Linear Probability Model. All standard errors are double-clustered at the VC-pair level and the company level, and they are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Coinvestments

	(1) Coinvestment	(2) Coinvestment	(3) Coinvestment
Past-coinvestments	-0.019***	-0.036***	-0.043***
	(0.004)	(0.005)	(0.008)
Past-coinvestments^2		0.001***	0.001**
		(0.000)	(0.001)
Past-coinvestments^3			-0.000
			(0.000)
Round-amount	0.189***	0.189***	0.189***
	(0.009)	(0.009)	(0.009)
Company-age	-0.006***	-0.006***	-0.006***
	(0.002)	(0.002)	(0.002)
Other controls	Yes	Yes	Yes
Deal FE	Yes	Yes	Yes
VC Pair FE	Yes	Yes	Yes
Observations	1,420,945	1,420,945	1,420,945
R-squared	0.352	0.352	0.352

Panel B: EXIT performance

	(1) IPO	(2) Exit
Past-coinvestments	-0.709	0.201
	(0.455)	(0.470)
Past-coinvestments ^2	0.010	-0.040*
	(0.022)	(0.023)
Past-coinvestments ^3	-0.000	0.001**
	(0.000)	(0.000)
Round-amount	7.336***	3.232***
	(0.940)	(0.995)
Company-age	-0.138	0.250
	(0.396)	(0.433)
Other controls	Yes	Yes
Deal FE	Yes	Yes
VC Pair FE	Yes	Yes
Observations	9,390	9,390
R-squared	0.422	0.361

Table A.2. Robustness check on percentage of past-coinvestments

The sample includes 1,420,945 VC-pair-company-round observations between 1990 and 2012. The dependent variable in Column (1) is Coinvestment, a dummy variable to indicate whether the VC-pair coinvests in the current round. The dependent variable in Column (2) is IPO, a dummy variable to indicate whether or not the company has an IPO. The dependent variable in Column (3) is EXIT, a dummy variable to indicate whether or not the company has an IPO or gets acquired by another company. The rest of the variables are defined in Table 1. All regressions apply the Linear Probability Model. All standard errors are double-clustered at the VC-pair level and the company level, and they are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Coinvestment	(2) IPO	(3) Exit
Past-coinvestments %	-4.989***	-150.107*	-120.180
	(1.758)	(81.962)	(88.265)
Same-company	62.162***	0.043	-0.365
	(1.132)	(1.377)	(1.450)
Round-amount	0.189***	7.298***	3.226***
	(0.009)	(0.943)	(0.988)
Company-age	-0.006***	-0.139	0.251
	(0.002)	(0.398)	(0.446)
Experience-avg	0.219***	0.017	-1.174
	(0.031)	(3.894)	(4.534)
Industry-avg	0.824***	2.875	7.052
	(0.080)	(11.528)	(12.521)
State-avg	0.983***	-5.133	18.393*
	(0.072)	(9.389)	(10.319)
Stage-avg	0.412***	-35.254***	-18.935*
	(0.089)	(9.016)	(10.005)
Deal FE	Yes	Yes	Yes
VC-Pair FE	Yes	Yes	Yes
Observations	1,420,945	9,390	9,390
R-squared	0.352	0.422	0.360

Table A.3. Robustness check on VC-year fixed effects

The sample includes 1,420,945 VC-pair-company-round observations between 1990 and 2012. The dependent variable in Column (1) is Coinvestment, a dummy variable to indicate whether the VC-pair coinvests in the current round. The dependent variable in Column (2) is IPO, a dummy variable to indicate whether or not the company has an IPO. The dependent variable in Column (3) is EXIT, a dummy variable to indicate whether or not the company has an IPO or gets acquired by another company. The rest of the variables are defined in Table 1. All regressions apply the Linear Probability Model. All standard errors are double-clustered at the VC-pair level and the company level, and they are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Coinvestment	(2) IPO	(3) Exit
Past-coinvestments	-0.025***	-0.434***	-0.347*
	(0.004)	(0.149)	(0.193)
Same-company	62.149***	-0.479	-0.644
	(1.129)	(1.460)	(1.663)
Round-amount	0.186***	6.711***	2.894***
	(0.009)	(0.822)	(0.944)
Company-age	-0.006***	-0.152	0.381
	(0.002)	(0.300)	(0.352)
Experience-avg	-0.376***	-9.261	-5.969
	(0.081)	(8.568)	(9.955)
Industry-avg	0.870***	5.753	18.841
	(0.080)	(11.605)	(13.752)
State-avg	1.007***	-14.954	13.946
	(0.070)	(9.538)	(11.242)
Stage-avg	0.446***	-35.874***	-20.923**
	(0.086)	(9.259)	(10.507)
Industry/State/Stage/Rd FE	Yes	Yes	Yes
VC-Pair FE	Yes	Yes	Yes
VC1-Year FE	Yes	Yes	Yes
VC2-Year FE	Yes	Yes	Yes
Observations	1,420,945	9,217	9,217
R-squared	0.353	0.573	0.509

Table A.4. Control variables of different VC characteristics

The sample includes 1,420,945 VC-pair-company-round observations between 1990 and 2012. The dependent variable in Column (1) is Coinvestment, a dummy variable to indicate whether the VC-pair coinvests in the current round. The dependent variable in Column (2) is IPO, a dummy variable to indicate whether or not the company has an IPO. The dependent variable in Column (3) is EXIT, a dummy variable to indicate whether or not the company has an IPO or gets acquired by another company. The rest of the variables are defined in Table 1. All regressions apply the Linear Probability Model. All standard errors are double-clustered at the VC-pair level and the company level, and they are reported in parentheses. We use ***, **, and * to denote significance at the 1%, 5%, and 10% levels, respectively.

	(1) Coinvestment	(2) IPO	(3) Exit
Past-coinvestments	-0.020***	-0.348**	-0.320*
	(0.004)	(0.149)	(0.182)
Same-company	62.160***	0.030	-0.421
	(1.132)	(1.379)	(1.449)
Round-amount	0.189***	7.324***	3.261***
	(0.009)	(0.937)	(0.996)
Company-age	-0.006***	-0.138	0.266
	(0.002)	(0.399)	(0.437)
Experience-avg	0.244***	1.490	0.481
	(0.033)	(4.040)	(4.599)
Experience-diff	-0.014*	-0.462	-0.246
	(0.009)	(0.812)	(0.848)
Industry-avg	0.881***	0.239	10.049
	(0.083)	(11.783)	(12.771)
Industry-diff	-0.254***	9.454	-10.612
	(0.068)	(8.687)	(9.649)
State-avg	1.012***	-4.689	16.639
	(0.074)	(9.353)	(10.283)
State-diff	-0.085*	-1.401	7.861
	(0.048)	(7.019)	(7.550)
Stage-avg	0.415***	-34.939***	-20.656**
	(0.091)	(9.301)	(10.256)
Stage-diff	-0.045	-0.537	12.745
	(0.089)	(11.321)	(12.083)
Deal FE	Yes	Yes	Yes
VC-Pair FE	Yes	Yes	Yes
Observations	1,420,945	9,390	9,390
R-squared	0.352	0.422	0.361

Appendix B. List of Top 50 Venture Capital Firms 1990 – 2012

Accel Partners	Kleiner Perkins Caufield & Byers
Advanced Technology Ventures	Lightspeed Venture Partners
Advantage Capital Partners	Matrix Partners
Alta Partners	Mayfield Fund
ARCH Venture Partners	Menlo Ventures
Atlas Venture Advisors Inc	Mohr Davidow Ventures
Austin Ventures, L.P.	Morgenthaler Ventures
Battery Ventures LP	MPM Capital LLC
Benchmark Capital	New Enterprise Associates, Inc.
Bessemer Venture Partners L P	North Bridge Venture Partners L P
Canaan Partners	Oak Investment Partners
Charles River Ventures	Polaris Venture Partners
Crescendo Venture Management LLC	Redpoint Ventures
Crosspoint Venture Partners	Rre Ventures LLC
Domain Associates LLC	Sequoia Capital
Draper Fisher Jurvetson International Inc	Sevin Rosen Funds
FirstMark Capital LLC	Sigma Partners
Flagship Ventures	Sutter Hill Ventures
Foundation Capital	TL Ventures
Foundry Group LLC	US Venture Partners
General Catalyst Partners LLC	VantagePoint Capital Partners
Greylock Partners	Venrock, Inc.
Highland Capital Partners LLC	Versant Ventures, Inc.
Institutional Venture Partners	Village Ventures Inc
InterWest Partners LLC	Warburg Pincus LLC

Appendix C. An example of constructing pairs of top 50 VCs

We follow several steps to construct our sample of 1,420,945 observations at the VC pair-company-round level.

First, we start with companies which have received financing from at least one of the top 50 VCs in our sample.

Second, for each financing round, we first define "involved VCs" from the top 50 VCs. These are VC firms that invest in the current financing round or any previous round in the company.

Third, for each financing round, we then define the "not involved VCs" from the top 50 VCs. These include all top VCs that are not included in the set of the "involved VCs".

Fourth, the possible pairs of VCs are formed by all top VCs except those formed by VCs that are "not involved VCs".

For example, if *Accel Partners* is the only involved VC for the *second* financing round of *California Ventures Company*, the possible pairs in the second round include a total of 49 pairs formed by *Accel Partners* and the rest 49 VCs that are not involved.

If *Warburg Pincus LLC* and *Sequoia Capital* are the two involved VCs for the *third* round of the *California Ventures Company*, there are a total of three involved VCs (e.g. *Accel Partners, Warburg Pincus LLC, and Sequoia Capital*). The possible pairs include the three pairs formed by the three relevant VCs and 141 pairs formed by each of the involved VC with the rest 47 VCs that are not involved, resulting in a total of 144 possible pairs of top VCs which could possibly invest in the third round of the *California Ventures Company*.

Appendix D. Figures

Figure D.1. HHI of VCs' portfolio of coinvestment partners

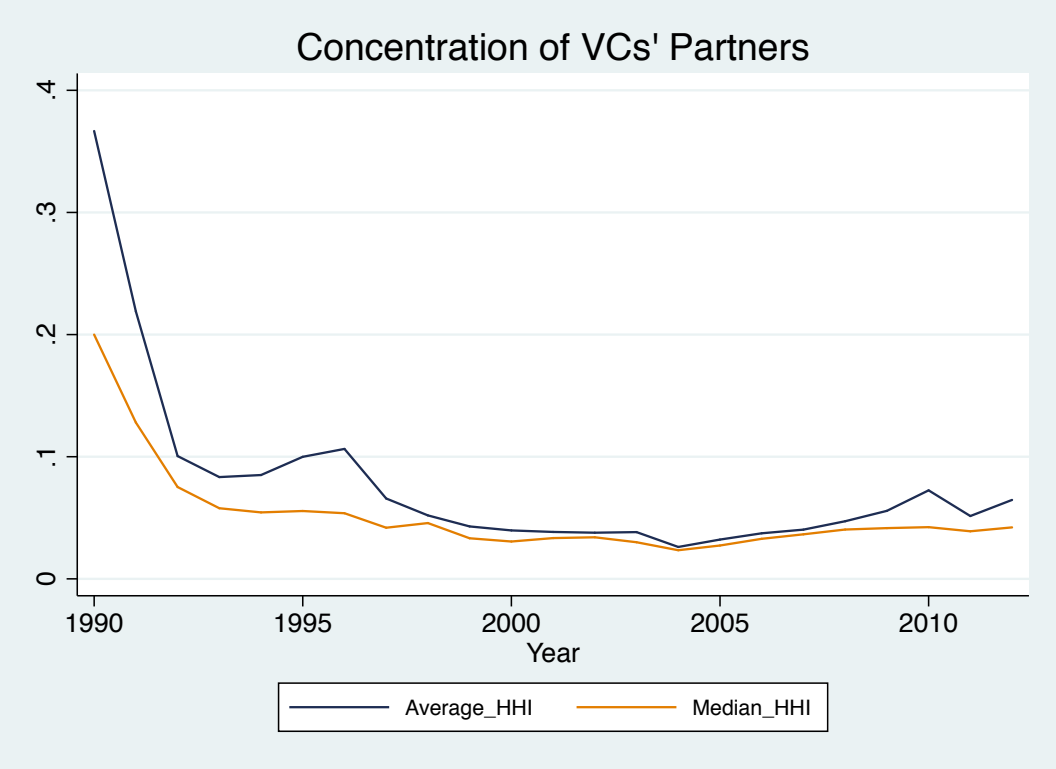


Figure D.2. Number of all possible pairs formed by the Top 50 VCs

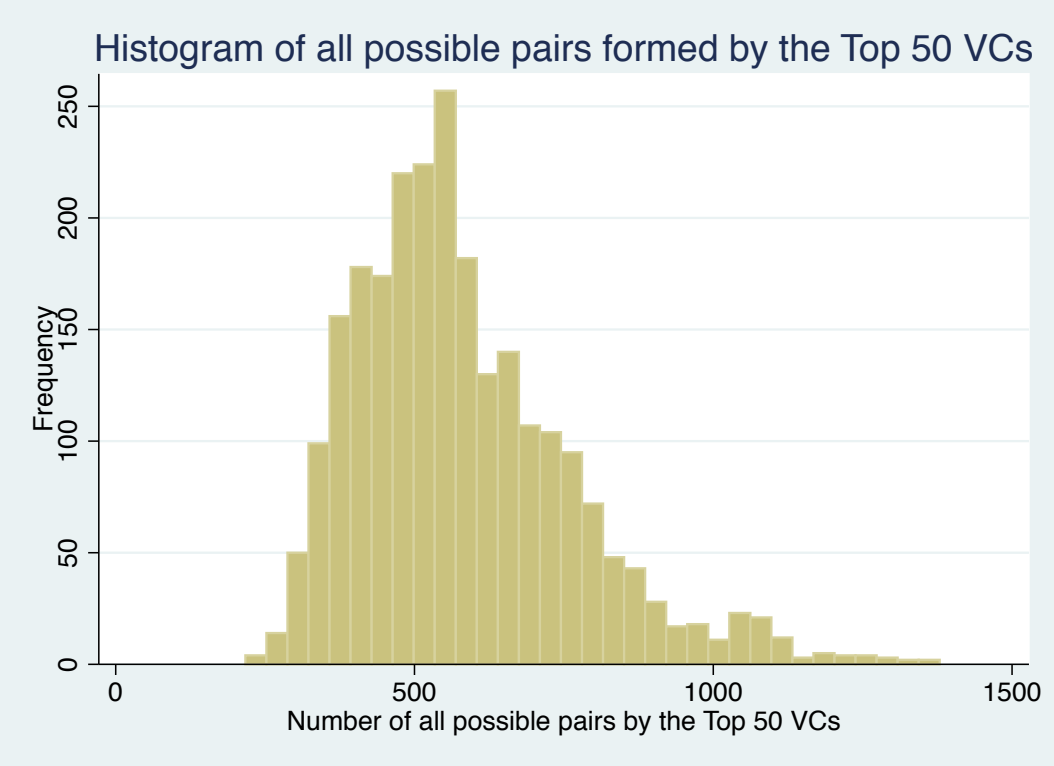
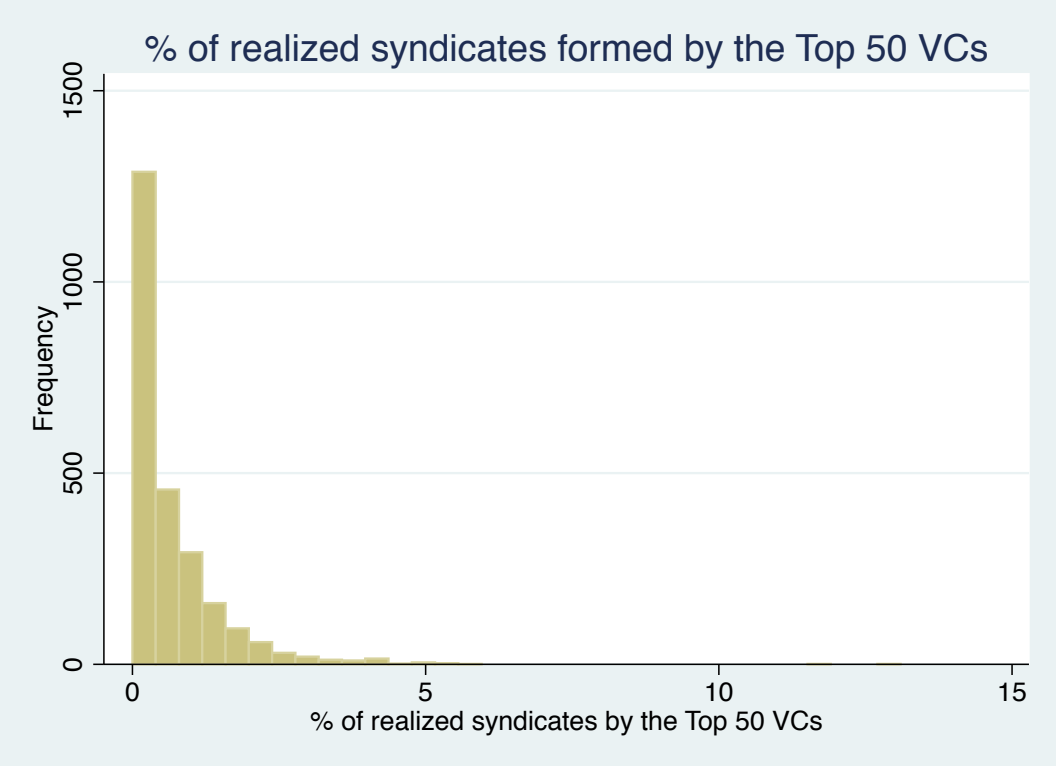
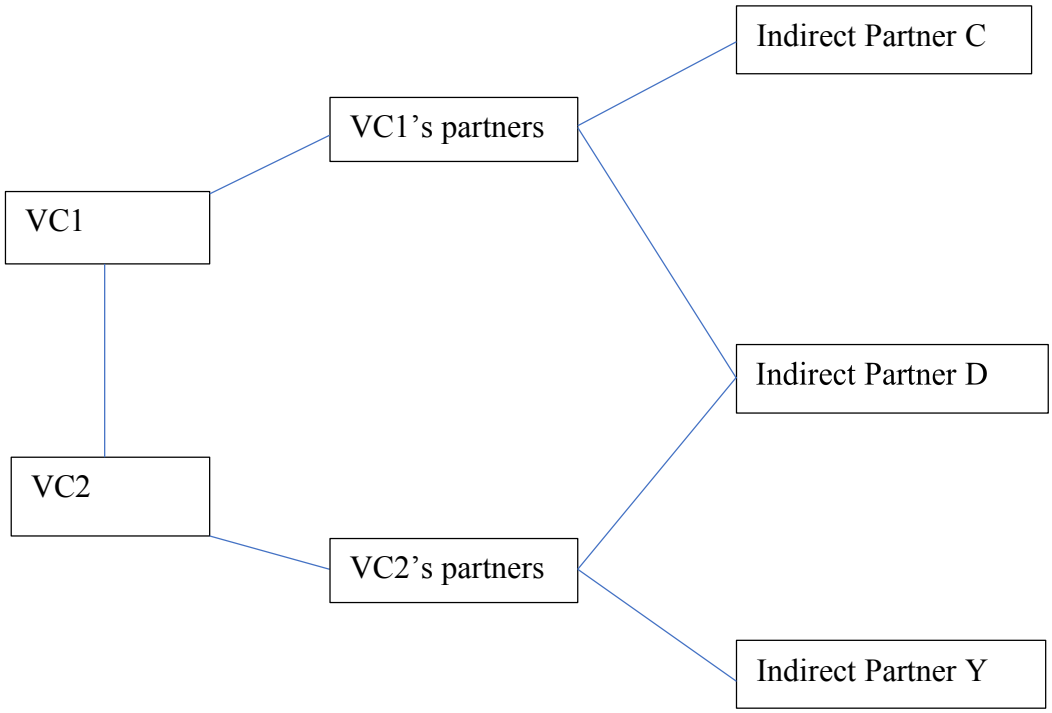


Figure D.3. Percentage of pairs that are realized coinvestments by the Top 50 VCs



Appendix E. Definition of indirect partners



Every line represents a coinvestment relationship. Based on the above figure, VC1 has two indirect partners C and D while VC2 has two indirect partners D and Y. VC1 and VC2 *never* coinvest with their indirect partners C, D, and Y. The total number of indirect partners for VC1 and VC2 is 3, that is, C, D, and Y.