Internet Appendix for "The Impact of Venture Capital Monitoring"

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ABSTRACT

This appendix presents supplementary results, discussion, and details regarding data construction. Section I presents various robustness tests as well as the results of our regional analysis. Section II describes how we merge VentureXpert with the NBER patent database. Section III discusses how we calculate travel times between portfolio companies and VCs. Section IV provides a back-of-the-envelope calculation to shed additional light on the magnitudes of our estimates. Section V discusses the regional analysis. Section VI shows our survey questions.

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I. Supplementary Tables

Table IAI
Aggregate Travel Patterns

This table shows the effect of the treatment on aggregate passenger flows between cities. The data on passenger flows are obtained from the Airline Origin and Destination Survey (DB1B), a 10% sample of airline tickets from reporting carriers collected by the U.S. Bureau of Transportation Statistics. Observations are at the city pair level and *Treatment* is defined as in Table IV. The sample is restricted to city pairs that correspond to treated and control pairs in Table IV. City pairs for which the optimal means of transportation is to drive are excluded. The sample period is from 1993 to 2006. Standard errors, clustered by city pair, are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Log(Passengers)	(2) Log(Passengers)	(3) Log(Passengers)
Treatment	0.155***	0.145***	
	(0.0467)	(0.0307)	
Treatment(-1)			-0.0421
			(0.0286)
Treatment(0)			0.167***
			(0.0368)
Treatment(1)			0.160***
			(0.0372)
Treatment(2+)			0.109***
			(0.0356)
Pair FE	Yes	Yes	Yes
Year FE	Yes	No	No
MSA(Origin) × Year FE	No	Yes	Yes
MSA(Destination) × Year FE	No	Yes	Yes
R^2	0.928	0.948	0.948
Observations	35498	35498	35498

Table IAII
Placebo Test

Panel A repeats the analysis of Table IV, but replaces each company's real VC with a random placebo VC. Placebo VCs are required to be located in the San Francisco, San Jose, Boston, or New York MSAs, and they cannot be from the same MSA as any of the company's real VCs. The treatment indicator is then constructed as in Table IV, based on these placebo VC relationships. Panel B compares mean VC MSA characteristics (in the treatment year) for real and placebo treatments. Standard errors, clustered by portfolio company, are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Effect of Placebo Treatment

	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.000317	0.00243	0.00201	0.00465
	(0.0186)	(0.0272)	(0.00427)	(0.00591)
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes
R^2	0.663	0.569	0.479	0.442
Observations	125638	125638	125638	125638

Panel B: Real vs Placebo Treatment Characteristics

	Real Treat		Placebo Treat		Difference	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Err
VC MSA Income (Billions)	161.1	201.4	189.4	207.2	28.4***	8.11
VC MSA Population (Millions)	4.85	5.56	5.76	5.99	0.92***	0.23
VC MSA Income Per Capita (Thousands)	33.1	12.1	33.4	11.1	0.33	0.46
VC in Northern California	0.087	0.28	0.35	0.48	0.26***	0.016
VC in New York Tri-State	0.22	0.42	0.23	0.42	0.0068	0.016
VC in New England	0.19	0.39	0.42	0.49	0.23***	0.018
Observations	1131		1554		2685	

Table IAIII
Additional Robustness

All regressions presented in this table are variants of the baseline specification in Table IV. Panel A restricts the control group to those control pairs whose average distance matches the average distance in the treatment group. That is, we exclude short-distance control pairs so that the average distance is the same in both groups. Panel B controls for heterogeneous time trends by interacting baseline characteristics (distance, funding, patents, and experience, all measured in the first year of the pair) with year fixed effects. Panel C uses alternative definitions of the dependent variables. HJT CPP adjusts for truncation in citations per patent by using the estimated shape of the citation-lag distribution following Hall, Jaffe, and Trajtenberg (2001). HJT WPC represents citation-weighted patent counts (Trajtenberg (1990)), again using the HJT method to adjust for citation truncation. Relative CPP normalizes three-year citations per patent by the mean citations per patent for other patents granted in the same year and technology class. Panel D controls for MSA-industry-year fixed effects. Industries are partitioned according to VentureXpert's major industry groups. In Panel E, we cluster standard errors by both portfolio company and VC firm. We compute standard errors with two-way clustering following Cameron, Gelbach, and Miller (2011). Standard errors are shown in parentheses. Unless otherwise noted, they are clustered by portfolio company. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Distance-Matched Control Sample

	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.0382***	0.0660***	0.00922**	0.0119*
	(0.0126)	(0.0226)	(0.00455)	(0.00615)
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes
R^2	0.687	0.595	0.542	0.490
Observations	77129	77129	77129	77129

Panel B: Heterogeneous Time Trends

	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.0322***	0.0593***	0.0102**	0.0122**
	(0.0117)	(0.0209)	(0.00437)	(0.00583)
Baseline Characteristics x Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes
R^2	0.668	0.577	0.497	0.457
Observations	130169	130169	130169	130169

Table IAIII
(Continued)

Panel C: Alternative Dependent Variables			
	(1) HJT CPP	(2) HJT WPC	(3) Relative CPP
Treatment	0.0860***	0.107***	0.0295***
	(0.0268)	(0.0325)	(0.00922)
Controls	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes
R^2	0.589	0.640	0.567
Observations	130169	130169	130169

Panel D: Industry-Specific Local Shocks				
	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.0339**	0.0551**	0.00738	0.00900
	(0.0133)	(0.0261)	(0.00484)	(0.00711)
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Industry × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Industry × Year FE	Yes	Yes	Yes	Yes
R^2	0.743	0.653	0.611	0.558
Observations	130169	130169	130169	130169

Panel E: Two-Way Clustering				
	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.0310**	0.0575***	0.0104**	0.0135**
	(0.0127)	(0.0222)	(0.00428)	(0.00583)
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes
R^2	0.668	0.576	0.494	0.453
Observations	130169	130169	130169	130169

Table IAIV
Citations to VC MSA

This table examines whether the treatment leads to an increase in citations made to patents of non VC individuals/organizations located in the VC's MSA. More precisely, for each patent a portfolio company is granted, we calculate the percentage of citations that the patent makes to firms or inventors located in the MSA of the portfolio company's VC. This percentage is the dependent variable in the regressions (observations are at the company-VC-patent level). *Treatment* is defined as in Table IV. Columns (1) to (3) define the MSA of a cited patent based on the location of the firm the patent is initially assigned to. Columns (4) to (6) define the MSA of a cited patent based on the location of the inventor. Standard errors, clustered by portfolio company, are shown in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Percent Assignees Cited from VC MSA			Percent Inventors Cited from VC MSA		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.00306	-0.00346	0.0134	0.000479	-0.000936	0.0120
	(0.00935)	(0.00916)	(0.0147)	(0.00957)	(0.00958)	(0.0137)
Controls	No	Yes	Yes	No	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
MSA(VC) × Year FE	No	No	Yes	No	No	Yes
MSA(Company) × Year FE	No	No	Yes	No	No	Yes
R^2	0.438	0.438	0.475	0.437	0.438	0.483
Observations	51150	51150	51150	51481	51481	51481

Table IAV
Cross-Sectional Heterogeneity

This table repeats the analysis of Table IV, but interacts the treatment indicator with several characteristics. In Panel A, *Early Stage* is an indicator equal to one if the company is classified as "Seed" or "Early Stage." In Panel B, *Other VC Close* is an indicator equal to one if a non lead VC is located in the same MSA as the portfolio company. In Panel C, *Syndicated* is an indicator equal to one if more than one VC invested in the company. Standard errors, clustered by portfolio company, are shown in parentheses. * , **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Early Stage

	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.0156	0.0341	0.00739	0.0122*
	(0.0141)	(0.0255)	(0.00468)	(0.00679)
Treatment × Early Stage	0.0550***	0.0834**	0.0119	0.00630
	(0.0193)	(0.0378)	(0.00825)	(0.0107)
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes
R^2	0.666	0.575	0.493	0.452
Observations	130169	130169	130169	130169

Panel B: Close Non Lead VC

	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.0318***	0.0668***	0.0115***	0.0146**
	(0.0113)	(0.0201)	(0.00444)	(0.00602)
Treatment × Other VC Close	-0.0103	-0.123	-0.0145	-0.0157
	(0.0436)	(0.0806)	(0.0133)	(0.0201)
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes
R^2	0.668	0.576	0.494	0.453
Observations	130169	130169	130169	130169

Table IAV
(Continued)

Panel C: Syndicate Size				
	(1) Patents	(2) Citations/Patent	(3) IPO	(4) Success
Treatment	0.0311**	0.0643***	0.0126**	0.0167**
	(0.0136)	(0.0248)	(0.00538)	(0.00737)
Treatment × Syndicated	-0.000637	-0.0154	-0.00519	-0.00768
	(0.0201)	(0.0422)	(0.00724)	(0.0103)
Controls	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes
R^2	0.668	0.576	0.494	0.453
Observations	130169	130169	130169	130169

Table IAVI
Regional Analysis: Main Regressions

This table shows the main results of the regional analysis. Observations are at the MSA pair by year level. Only MSA pairs that ever have VC flows between them are included in the sample. *Treatment* is an indicator variable equal to one if a direct flight has been introduced between the two MSAs. *Total Investment* is the log of (one plus) the total amount invested by VCs in the source MSA to companies in the target MSA. *Initial Investment* represents investment in new companies. *Follow−Up Investment* represents investment in existing companies. *Number of Deals* is the log of (one plus) the number of rounds of funding closed between VCs in the source MSA and companies in the target MSA. *VC Activity* is an indicator variable equal to one if any VC from the source MSA invested in a company in the target MSA that year. Standard errors, clustered by MSA pair, are shown in parentheses. * , **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Investment

	Total Investment		Initial Investment		Follow-Up Investment	
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.114***	0.0455***	0.0486***	0.0215**	0.0981***	0.0398**
	(0.0215)	(0.0171)	(0.0116)	(0.0103)	(0.0208)	(0.0167)
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No
MSA(VC) × Year FE	No	Yes	No	Yes	No	Yes
MSA(Company) × Year FE	No	Yes	No	Yes	No	Yes
R^2	0.499	0.618	0.378	0.468	0.477	0.602
Observations	182970	182970	182970	182970	182970	182970

Panel B: Deals

	Number of Deals		VC Activity	
	(1)	(2)	(3)	(4)
Treatment	0.0827***	0.0318***	0.0618***	0.0248***
	(0.0134)	(0.0122)	(0.00728)	(0.00742)
Pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
MSA(VC) × Year FE	No	Yes	No	Yes
MSA(Company) × Year FE	No	Yes	No	Yes
R^2	0.612	0.693	0.363	0.463
Observations	182970	182970	182970	182970

Table IAVII

Regional Analysis: Dynamics

This table shows the dynamics of the treatment effects in the regional analysis. All variables are defined as in Table IAVI. The variable $Treatment\,(-1)$ is an indicator variable equal to one if the MSA pair observation is recorded in the year preceding the treatment. $Treatment\,(0)$, $Treatment\,(1)$, and $Treatment\,(2+)$ are defined analogously with respect to the year of the treatment, the first year after the treatment, and two or more years after the treatment, respectively. Standard errors, clustered by MSA pair, are shown in parentheses. * , **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) Total Inv	(2) Initial Inv	(3) Follow-Up Inv	(4) Num Deals	(5) VC Activity
Treatment(-1)	0.00461	0.00535	0.00898	0.00641	-0.00376
	(0.0180)	(0.0115)	(0.0171)	(0.0139)	(0.0106)
Treatment(0)	0.0218	0.0132	0.0246	0.0226	0.0162
	(0.0197)	(0.0125)	(0.0185)	(0.0148)	(0.0116)
Treatment(1)	0.0524***	0.0234*	0.0477**	0.0414***	0.0196*
	(0.0196)	(0.0137)	(0.0187)	(0.0149)	(0.0117)
Treatment(2+)	0.0484**	0.0232*	0.0423**	0.0328**	0.0258***
	(0.0200)	(0.0121)	(0.0195)	(0.0142)	(0.00863)
Pair FE	Yes	Yes	Yes	Yes	Yes
MSA(VC) × Year FE	Yes	Yes	Yes	Yes	Yes
MSA(Company) × Year FE	Yes	Yes	Yes	Yes	Yes
R^2	0.618	0.468	0.602	0.693	0.463
Observations	182970	182970	182970	182970	182970

II. Matching VentureXpert with NBER Patent Data

A. Name Standardization

To match VentureXpert with data from the NBER Patent Project, we begin by standardizing the company names in both, using the name standardization routines developed by the NBER Patent Data Project to create a bridge file to COMPUSTAT[1]. These routines standardize common company prefixes and suffixes building on a list created by Derwent World Patent Index (Thomson-Reuters); they also identify a company's stem name excluding these prefixes and suffixes. Similarly, we standardize the location names from both data sets. This is done to correct for spelling errors as well as other types of errors that commonly occur, particularly in the patent data. For example, in some cases a neighborhood name is used rather than the name of a city. In other cases, country codes are listed as state codes, for example, a patent assignee from Germany (DE) may be coded as being from Delaware (DE). The city name standardization is done by running all location names through the Google Maps API, which automatically corrects close but inaccurate text representations of location names and returns a standardized name broken down into its component parts (city, state, country), along with latitude and longitude information.

B. The Matching Procedure

Using the standardized company and city names, we employ the following matching procedure:

1. Each standardized name associated with a company in VentureXpert is matched with standardized names from the NBER data.[2] If an exact match is found, this is taken to be the same company and hence it is removed from the set of names that needs to be matched.

2. For the remaining companies in VentureXpert, each stem name associated with a company is matched with stem names from the NBER data. If an exact match is found and enough other identifying information matches as well, this is taken to be the same company and it is removed from the set of names that need to be matched. If an exact match is found but

not enough other identifying information matches as well, the match is added to a list of borderline matches to be checked manually.

   (a) For a stem match to be considered definite, the standardized city/state combination also has to match, or the state has to match along with the time period (first patent application was after the company founding year).

3. For the remaining companies in VentureXpert, each stem name associated with a company is matched with up to 10 close stem names from the NBER data using a padded bi-gram comparator. Fuzzy matches with match quality between 1.5 and 2 that also had a city/state match were kept for review, as were fuzzy matches with quality above 2 with only a state match.

4. The borderline matches identified using the above procedure were reviewed manually using other qualitative information from both data sources, including full patent abstracts and paragraph-long company descriptions.

III. Measuring Travel Time

The procedure to compute travel times between VC firms and portfolio companies is the same as in Giroud (2013). The core of the algorithm is done using Visual Basic in the MS Mappoint software. Importantly, the results are not sensitive to the various assumptions listed below. The algorithm proceeds as follows:

1. Using MS Mappoint, we first compute the travel time by car (in minutes) between the two ZIP codes. This travel time is used as a benchmark and is compared to the travel time by air based on the fastest airline route. Whenever traveling by car is faster, air transportation is ruled out by optimality, and the relevant travel time is the driving time by car.

2. To determine the fastest airline route between any two ZIP codes, we use the itinerary information from the T-100 and ER-586 data. The fastest airline route minimizes the total travel time between the VC and the company. The total travel time consists of three components: (1) the travel time by car between the VC and the origin airport; (2) the duration of the flight, including the time spent at airports and, for indirect flights, the layover time; and (3) the travel time by car between the destination airport and the company. The travel time by car to and from airports is obtained from MS Mappoint. Flight duration per segment is obtained from the T-100 and ER-586 data, which include the average ramp-to-ramp time of all flights performed between any two airports in the U.S. The only unobservable quantities are the time spent at airports and the layover time. We assume that one hour is spent at the origin and destination airports combined and that each layover takes one hour.

3. Additional assumptions made are as follows:

   (a) If the distance between the two ZIP codes is less than 100 miles, driving is always optimal.

   (b) A new route dominates a previous one if the time saving is more than 15 minutes one-way (i.e., 30 minutes round-trip).

(c) In the data, we "smooth" the optimal itinerary by keeping the previously optimal route if a new route is introduced but does not dominate the current route (e.g., a new flight from LGA instead of JFK with a time saving of merely five minutes).

IV. Payoffs to the VCs

The results presented in Section IV.A indicate that the treatment has a significant effect on portfolio company outcomes. The magnitudes of our estimates (e.g., a 3% increase in patenting and a 1% increase in IPO probability) are also economically significant. In this appendix, we examine whether these magnitudes are reasonable given our setting. In particular, if the reduction in monitoring costs associated with the introduction of new airline routes leads to large payoffs to VC firms, one may wonder why VCs do not go to further lengths to maintain higher levels of involvement prior to the treatment. In particular, VCs could relax their time constraints by hiring additional partners. It should be noted, however, that prior work suggests that skilled partners are likely a scarce resource. For example, Kaplan and Schoar (2005) find evidence consistent with top-performing funds voluntarily choosing to stay smaller than necessary; one interpretation they offer is that it is difficult to scale up a VC firm by hiring new partners.

To better understand the tradeoff VCs face when deciding how intensively to monitor inconveniently located companies, we conduct a simple back-of-the-envelope calculation to approximate how much value our estimates suggest that VCs capture from the introduction of new airline routes. Our baseline results suggest that the treatment leads to approximately a 1% increase in the probability of an IPO. Thus, we attempt to calculate the average dollar value for a venture firm associated with a 1% increase in IPO probability. The payoff to a VC firm from an IPO is approximated by

$$\textit{VC Payoff} = \textit{Carry Percentage} \times (\textit{Ownership Percentage} \times \textit{IPO Value} - \textit{Cost Basis}).$$

where *IPO Value* is the pre-money value of the company at the offering price, *Ownership Percentage* is the pre-IPO ownership percentage of the VC firm, *Cost Basis* is the amount the VC invested in the company prior to the IPO, and *Carry Percentage* is the percent of profits that the VC firm retains according to its contract with limited partners. The VentureXpert database does not track IPO values, and thus we obtain these from SDC and VentureSource. The average IPO value in our sample is $377 million, consistent with Nanda and Rhodes-Kropf (2013), who report a mean IPO value of $311 million for venture-backed companies from 1985 to 2004. The average cost basis in our sample is $55 million. It is well known that most VCs have a carry percentage of about 20% (see, for example, Metrick and Yasuda (2010)). VentureXpert does not track ownership percentage. We estimate it to be 47% on average based on a sample of 1,105 venture-backed companies with pre-IPO ownership data in VentureSource. This number is also consistent with Kaplan, Sensoy, and Strömberg (2009), who find that VCs own 53.1% at IPO in their sample of 50 companies.

Substituting these numbers into the equation above, VCs on average receive $24 million from a company that goes public. If we assume that failure to go public results in a payoff of zero, a 1% increase in IPO probability corresponds to a $240,000 increase in the expected payoff to the VC firm. One could argue that investing in a company that goes public has not only a direct payoff for a venture firm in the form of carried interest, but also an indirect payoff in the form of management fees on larger subsequent funds. Chung et al. (2012) estimate that the ratio of indirect pay-for-performance to direct pay-for-performance in VC is approximately 0.4. Taking this into account, the expected VC payoff would increase to $336,000.

A caveat of this calculation is that it relies on simplifying assumptions, and hence should be interpreted with caution.[3] Nonetheless, it is helpful in establishing a ballpark—or at least a rough order of magnitude—for the payoffs to VC firms. Based on this calculation, our treatments are associated with a relatively small increase in expected payoffs. Aside from the difficulty of hiring new partners, this would further explain why VC firms may not go to further lengths to maintain higher levels of involvement prior to the treatment.

V. Regional Analysis

A. Methodology

The difference-in-differences specification in equation (1) in the published text can be extended to study whether proximity fosters VC activity at the regional level. To conduct this analysis, we aggregate our data from the VC-portfolio company level to the MSA pair level. We then estimate the following regression:

$$y_{mnt} = \beta \times Treatment_{mnt} + \alpha_{mn} + \alpha_m \times \alpha_t + \alpha_n \times \alpha_t + \epsilon_{mnt}, \tag{IA1}$$

where m indexes MSAs from which VC funding is coming (i.e., MSAs of the VC firms), n indexes MSAs to which VC funding is going (i.e., MSAs of the portfolio companies), and t indexes years; y is the dependent variable of interest (e.g., the total amount of VC funding provided by VCs in MSA m to portfolio companies in MSA n); *Treatment* is the treatment indicator at the MSA pair level; α_{mn} are MSA pair fixed effects; $\alpha_m \times \alpha_t$ and $\alpha_n \times \alpha_t$ are the two sets of MSA by year fixed effects; ϵ is the error term. Standard errors are clustered at the MSA pair level. The identification strategy is analogous to that at the VC-portfolio company pair level ("relationship analysis"). In particular, we are able to include MSA pair fixed effects as well as the two sets of MSA by year fixed effects, thus controlling for local shocks that may be correlated with airlines' decisions to introduce new airline routes.

There are two main differences compared to the relationship analysis. First, "treatments" are coded in a different way. At the relationship level, a treatment is the introduction of a new airline route that reduces the travel time between the VC's ZIP code and the company's ZIP code, taking into account the optimal itinerary and means of transportation. Since an MSA covers several ZIP codes, there is no notion of an "optimal itinerary" at the MSA pair level. Instead, we code as a treatment the first time a direct flight is introduced between any two locations in the two MSAs. Second, there is a large number of MSA pairs between which no VC activity ever occurred during our sample period. For these pairs, any dependent variable would be set to zero in all years, and thus be absorbed by the inclusion of MSA pair fixed effects. In the regressions, we drop these MSA pairs from the sample. This follows common practice in the trade literature in which a similar issue arises when measuring trade flows between country pairs (e.g., Feyrer (2009)).

B. Results

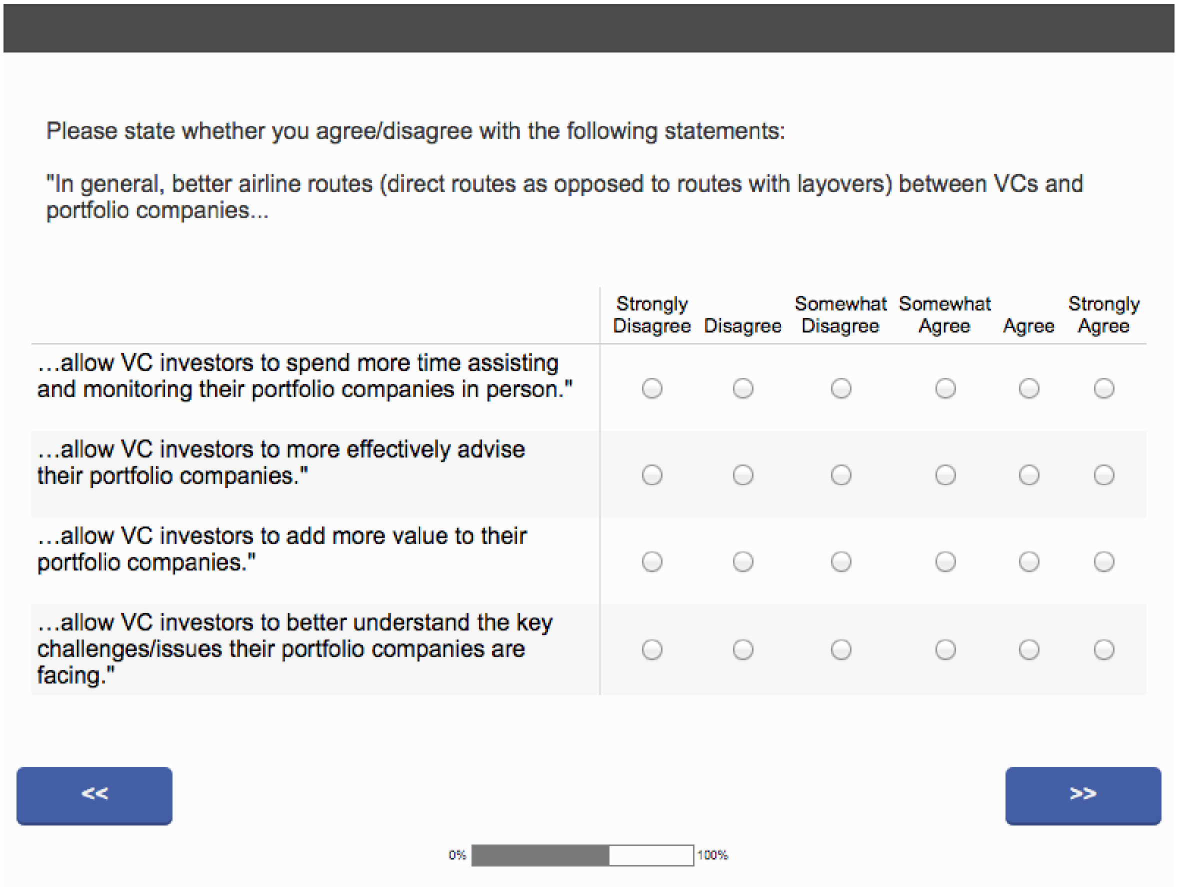
The results of the regional analysis are presented in Internet Appendix Table IAVI. They are obtained by estimating variants of equation (IA1), where observations are at the MSA pair by year level. Column (1) of Panel A shows the effect of the introduction of new airline routes between pairs of MSAs on total VC investment (in logs).[4] The coefficient on *Treatment* is 0.114 and highly statistically significant. This implies that total investment increases by 11.4% following the treatment. In column (2), we account for the possibility of local shocks by including the two sets of MSA by year fixed effects. As can be seen, local shocks are an important determinant of VC investments across MSAs and hence accounting for them leads to a smaller treatment effect: the coefficient is now 0.046, corresponding to a 4.6% increase in total VC investment. Importantly, even after controlling for local shocks, the treatment effect remains highly significant and economically important. This finding indicates that better airline connections foster flows of VC investments between MSAs.

In columns (3) to (6) of Panel A, we decompose total investments into initial investments (extensive margin) and follow-up investments (intensive margin). After controlling for local shocks, the treatment effect is 2.2% and 4.0%, respectively. Both coefficients are significant. Thus, better airline connections lead to higher VC investment along both the extensive and the intensive margins. The increase in investment along the intensive margin suggests that proximity facilitates not only the screening of portfolio companies, but also their monitoring after the initial investment—arguably, VCs are more likely to expand their investment in companies they can monitor more easily. Accordingly, the latter finding complements our analysis of performance outcomes at the relationship level. A reduction in monitoring costs (holding selection fixed) not only leads to increased innovation and a higher likelihood of a successful exit, but also to higher follow-up investments.

In Panel B, we explore alternative dependent variables that capture the intensity of VC activity following the treatment. In columns (1) and (2) the dependent variable is the number of deals (in logs), and in columns (3) and (4) it is an indicator variable equal to one if any VC investment occurs between the two MSAs. After accounting for local shocks, we find that the number of deals increases by 3.2%, and the likelihood of any VC activity increases by 2.5%.

In Internet Appendix Table IAVII, we examine the dynamic effects of the treatment. As in the relationship analysis, we do so by replacing *Treatment* with a set of four indicator variables representing the years around the treatment. We observe a very similar pattern for all dependent variables. The effect is small and insignificant in the year preceding the treatment (year −1), which suggests that there are no pre-existing trends in the data. In the year of the treatment (year 0), we find that the treatment effect is positive, but relatively small and insignificant. It is only in the first year after the treatment (year 1) that the effect becomes large and significant. It remains somewhat stable thereafter (year 2+). This pattern suggests that it takes about one to two years for the new airline routes to translate into higher flows of VC investment between MSAs.

VI. Survey Questions



Please state whether you agree/disagree with the following statements:

"In general, better airline routes (direct routes as opposed to routes with layovers) between VCs and portfolio companies...

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
...allow VC investors to spend more time assisting and monitoring their portfolio companies in person."	○	○	○	○	○	○
...allow VC investors to more effectively advise their portfolio companies."	○	○	○	○	○	○
...allow VC investors to add more value to their portfolio companies."	○	○	○	○	○	○
...allow VC investors to better understand the key challenges/issues their portfolio companies are facing."	○	○	○	○	○	○

For the next set of questions, please consider the hypothetical scenario below.

> Suppose you are a VC based in Seattle, WA and have invested in a portfolio company in Raleigh-Durham, NC. You are an active investor in the company (i.e. not a passive member of an investment syndicate). Currently, the fastest way to travel between Seattle and Raleigh-Durham is an indirect flight with a layover in Chicago. Suppose a major airline is planning to introduce direct flights between Seattle and Raleigh-Durham, which will substantially reduce travel time between the two locations.

Please state whether you agree/disagree with the following statements:

1) The introduction of direct flights from Seattle to Raleigh-Durham will increase the frequency with which you visit the portfolio company.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
○	○	○	○	○	○

2) The introduction of direct flights from Seattle to Raleigh-Durham will increase your flexibility to visit the portfolio company when most useful.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
○	○	○	○	○	○

<< >>

0% 100%

For the next set of questions, please consider the hypothetical scenario below.

> Suppose you are a VC based in Seattle, WA and have invested in a portfolio company in Raleigh-Durham, NC. You are an active investor in the company (i.e. not a passive member of an investment syndicate). Currently, the fastest way to travel between Seattle and Raleigh-Durham is an indirect flight with a layover in Chicago. Suppose a major airline is planning to introduce direct flights between Seattle and Raleigh-Durham, which will substantially reduce travel time between the two locations.

Please state whether you agree/disagree with the following statements:

3) The introduction of direct flights from Seattle to Raleigh-Durham will help you communicate more effectively with the management team of the portfolio company.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
○	○	○	○	○	○

4) The introduction of direct flights from Seattle to Raleigh-Durham will help you establish better relationships with the management team of the portfolio company.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
○	○	○	○	○	○

<< >>

0% 100%

For the next set of questions, please consider the hypothetical scenario below.

> Suppose you are a VC based in Seattle, WA and have invested in a portfolio company in Raleigh-Durham, NC. You are an active investor in the company (i.e. not a passive member of an investment syndicate). Currently, the fastest way to travel between Seattle and Raleigh-Durham is an indirect flight with a layover in Chicago. Suppose a major airline is planning to introduce direct flights between Seattle and Raleigh-Durham, which will substantially reduce travel time between the two locations.

Please state whether you agree/disagree with the following statements:

5) The introduction of direct flights from Seattle to Raleigh-Durham will help you add value to the portfolio company.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
○	○	○	○	○	○

6) The introduction of direct flights from Seattle to Raleigh-Durham will help you better understand the current state of the company's operations and performance.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
○	○	○	○	○	○

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0% 100%

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END NOTES

[1]See https://sites.google.com/site/patentdataproject/

[2]Many companies have multiple names listed in VentureXpert, reflecting the fact that young companies often change their name as they mature.

[3]For example, this calculation abstracts from lockup periods and other nuances of the IPO process. It also assumes a single VC investor.

[4]Total VC investment is obtained by aggregating VC investment (i.e., VC funding) at the VC-portfolio company level to the MSA pair level.