Foreign Venture Capital and the Exodus of Start-ups: Evidence from Headquarters Relocations*

Stefan Weik and Reiner Braun†

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Abstract

Foreign venture capital (VC) investment in technology companies has become a key policy controversy worldwide. In this paper, we examine one main concern with cross-border VC: the exodus of start-ups. We use a novel, large-scale data set of headquarters (HQ) location histories of European start-ups, because we conjecture and provide evidence that HQ relocation in start-ups eventually results in migrating major parts of the company abroad. Our estimates suggest that roughly one in ten early U.S. VC investments leads to a relocation, while the other nine help financing a European start-up without moving it abroad. The foreign VC effect is robust to matching, panel data, instrumental variable methods, and increases as financing conditions become more difficult. Overall, these results indicate that discouraging foreign VC is likely an insensible policy but improving local funding conditions should reduce the exodus.

Keywords: Foreign Direct Investment, Venture Capital, Headquarters, Relocation

JEL: F21, F21, G24, M13

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†Center for Entrepreneurial and Financial Studies, Technical University of Munich (TUM), Arcisstr. 21, 80333 Munich, Germany. Corresponding author: Reiner Braun (reiner.braun@tum.de).

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Abstract

Foreign venture capital (VC) investment in technology companies has become a key policy controversy worldwide. In this paper, we examine one main concern with cross-border VC: the exodus of start-ups. We use a novel, large-scale data set of headquarters (HQ) location histories of European start-ups, because we conjecture and provide evidence that HQ relocation in start-ups eventually results in migrating major parts of the company abroad. Our estimates suggest that roughly one in ten early U.S. VC investments leads to a relocation, while the other nine help financing a European start-up without moving it abroad. The foreign VC effect is robust to matching, panel data, instrumental variable methods, and increases as financing conditions become more difficult. Overall, these results indicate that discouraging foreign VC is likely an insensible policy but improving local funding conditions should reduce the exodus.

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1 Introduction

In recent years, larger, particularly U.S., venture capital (VC) firms have increasingly turned abroad to invest into technology companies around the globe. As a consequence, such foreign VC has become a key policy controversy worldwide, already resulting in regulatory actions (e.g. FIRRMA in the U.S. 2018, 15th AWG amendment in Germany 2020). One of the main concerns is that foreign VCs lead to an exodus of portfolio companies out of host economies. This, however, has so far only been reported in anecdotes. Zendesk, for example, a software company founded in Copenhagen in 2007, considered raising VC in the spring of 2009. Several U.S. VCs were ready to invest, but only on the condition that the three co-founders move to the U.S. Zendesk's CEO described the situation in his own words as follows:

> *"With all the VCs we talked to, the money and the move [to the U.S.] had to go hand-in-hand."*[1]

For Zendesk, moving founders and headquarters (HQ) resulted in moving main parts of the company: when Zendesk went public in 2014, 72% of its workforce (339 of 473 employees) were located in the U.S. (according to its S-1 filing).[2] However, ultimately this is anecdotal evidence only[3] and literature lacks a thorough empirical study on this aspect of foreign VC supply.

In this paper, we advance this debate by analyzing a novel, large-scale dataset on headquarters (HQ) location histories in European start-ups. Beginning with the VentureSource database, we searched national trade registers and web sources for the HQ location histories of 11,074 VC-backed European start-ups first funded between 2000 and 2014. Using this main data asset as a starting point allows us to derive some key findings:

First, we provide a systematic description of HQ mobility (relocation) amongst European start-ups and document that throughout the sample period, 4.1% (457 of 11,074) of all

[1] See https://www.entrepreneur.com/article/220076 (accessed on 24/09/2021).
[2] See Zendesk's April 10, 2014 S-1 filing in the SEC EDGAR system.
[3] Another anecdote is documented by Mäkelä and Maula (2005). In the Finnish start-up studied, relocation was not a condition for investment, but constantly pressured for by a prestigious U.S. VC. As the start-up CEO describes it in his own words: *"[...] there was quite a lot of pressure to move everything to the States. When we decided to continue here, there has still been sporadic pressure [...]".*

European start-ups relocated their HQ across borders at some point in time. 85% of all relocating start-ups moved to the U.S., which is not surprising given the U.S. is widely believed to be the most developed start-up ecosystem in the world. In turn, it came as a surprise that such relocation tends to occur early in a company's life. The median company age at HQ relocation is three years and 78% of all relocations happen within three years after first VC funding.

Second, for all companies in our sample that went public (relocating or not) we searched the IPO documentation for the geographical distribution of the workforce at time of the IPO. This exercise confirmed that HQ relocation is a good proxy for Exodus/drain/migration. For example, by the time of reaching an IPO in the U.S., relocating start-ups have on average 71% of their employees based in the U.S., while this only applies to 26% of similar non-relocating companies. We perceive this to be a substantial imbalance towards the U.S. labor market and think it is fair to say that such firms have largely left their host economies and are likely generating a large share of the economic wealth abroad.

Third, knowing that HQ relocation does happen and that it seems to be a valid measure for migration in the start-up context, we document that foreign VC investments affect the Exodus of European start-ups. 14% of all ventures receiving U.S. VC in their first round relocate their HQ, while only 3% without U.S. VC do so. However, such a rather naïve perspective ignores that matching of foreign VCs and start-ups is endogenous, e.g. through factors such as VC reputation, start-up quality or an underlying propensity to foreign markets irrespective of capital structure. Since the role of foreign VC is our main research question, we apply several empirical strategies to isolate a causal effect of foreign VC funding.

To begin we collect a rich set of observables and apply coarsened exact matching (CEM) to compare the treatment group to a matched counterfactual group that is very similar to the treatment group based on predetermined variables. Reassuringly, we find that the CEM procedure dramatically improves balance of all covariates, including those not used in the matching. These multivariate regressions suggest that a European start-up is 4.9%-points (10.3%-points) more likely to relocate their HQ if a foreign (U.S.) VC invests in the first main funding round. This represents a 120%-increase (251%-increase) over the average probability to migrate. We obtain similar results by estimating an instrumental variable (IV) model,

where the probability to receive foreign VC is instrumented by the local presence of foreign VC among other start-ups in the same country and year. Interestingly, we find that domestic VCs which are particularly well-networked are about as active in relocating companies as foreign VCs. This result suggests that both foreign origin and the international network of a VC are drivers behind the cross-border relocation of start-ups.

Next, we exploit the fact that we have timed data on relocations and VC investments allowing us to do panel data analyses with start-up fixed effects, thereby eliminating unobserved heterogeneity across start-ups. Then, we apply a placebo test to check for reverse causality, i.e. that start-ups relocate to receive foreign VC. Inconsistent with this reverse causality argument, we do not find relocation rates to be higher the lower the presence of foreign VC in a local market. Actually, we find the exact opposite relationship. Finally, the Oster (2019)-bounding method allows us to test to what extent omitted variables are likely to bias our estimates. Based on this method, we find that omitted variables are unlikely to severely affect our estimates.

Fourth, we provide further empirical patterns on the geographical destination of European firms relocating to the U.S. that are in line with the argument that VCs aim to add value by relocating them. To this end, we hand-collect data on the HQ location of the relocating ventures within the U.S. and the seat of the U.S. VC firms who had invested into them before the relocation. We find that start-ups generally move closer to the investing VC rather than to a tax heaven, like, e.g., Delaware. For example, a Californian VC investment is a strong predictor for the start-up to move to California subsequently, but the odds of moving to New York, Massachusetts, or other U.S. states remain unaffected. Similarly, Non-U.S. foreign VC investments affect relocation to Non-U.S. countries, but not to the U.S. If legal and tax reasons were ultimately driving the association, we would expect that VC mainly move start-ups to tax heavens and business law-friendly states; but this is not what we find in our data. Given our finding that value adding is a likely explanation for relocation, the question arises in which way (now local) VC firms hope to help relocating start-ups to succeed?

Hence, and *fifth*, we explore the heterogeneity of start-ups that relocate and find patterns we can reconcile with the explanation that access to capital is the most important mech-

anism. When raising funding, start-ups in our sample exhibit different levels of financing constraints, home market sizes, and information asymmetries. We find that the foreign VC effect is particularly sensitive to financing conditions, suggesting that relocation is a VC strategy to help with fundraising. For example, for start-ups with revenue (an additional source of funding) U.S. VC increases the likelihood to relocate by only 7.7%-points, while the effect is 14.4%-points for start-ups without revenue. Similarly, foreign/U.S. VCs are significantly more likely to relocate their portfolio company when investing in start-ups from less developed VC markets compared to more advanced VC markets (approximating VC market development by total VC investment relative to GDP).

Our findings contribute to recent studies looking at the possibility of negative consequences of cross-border venture capital flows for economies (e.g., Braun et al. (2019); Bradley et al. (2019); Hellmann et al. (2019); Akcigit et al. (2020)). Considering this overarching question (of the overall effects of foreign VC), however, our study only focusses one key effect and should hence not be misinterpreted as a conclusive assessment against foreign VC supply. In our main test (CEM-Weighted Regressions), we do find a statistically and economically significant difference in the probability to relocate HQ if a foreign VC has invested early-on. However, the same test also implies that in absolute terms only one out of ten U.S. VC investments in early financing rounds of European start-ups results in its relocation. In turn, in nine out of ten cases U.S. capital is provided to European start-ups without transferring main parts of the start-up to the U.S. We do find that the relocating firms grow disproportionately after having moved, but our data also suggests that this disparity in post-treatment development is not of an extent, i.e. growth of these firms is not ten times higher, so that we could argue for an overall negative effect of foreign VC supply for European entrepreneurial ecosystems. And even if the total economic value of migrating European firms was higher than the total value of staying European firms that receive foreign VC, this disproportionate growth is likely only happening because these companies are moving to the U.S. (Conti and Guzman (2019)). By virtue of becoming very successful abroad, they may have created more value to economies of origin (by growing their remaining home locations, remittances, spillovers, etc.) than if they had never left. Therefore, instead, we interpret our results as providing an interesting policy tool that would reduce start-up outflow and disproportionally

strengthen local economies: improving financing conditions.

This paper also adds to the literature on location decisions of VC-funded firms. Previous studies looked at location choices and start-up performance (Cumming et al. (2009); Dahl and Sorenson (2012); Conti and Guzman (2019); Guzman (2019)) and entrepreneurs who relocate to obtain financing (De Prijcker et al. (2019)). Neither of these studies, however, examined the role of heterogeneous VCs in relocation.

This work is also related to the literature on cross-border VC and start-up performance that generally finds a positive relationship (e.g.,Dai et al. (2012); Devigne et al. (2013); Humphery-Jenner and Suchard (2013a); Cumming et al. (2016)). But neither of these papers identifies specific actions undertaken by cross-border VCs. We complement these studies by showing that bridging companies into world-leading ecosystems (like the U.S.) is an important mechanism for how cross-border VCs improve performance.

2 Data

The objective of the data collection discussed here and in more detail in the Appendix is to obtain a representative sample of European VC-backed start-ups, their investors, and a timed history of their headquarters locations.

Representative samples of VC-backed start-ups are readily available in commercial data sets. We rely on start-ups, their financing rounds, and their investors from the DowJones VentureSource (VS) data set. VentureSource (previously VentureOne) is one of two databases primarily used in venture capital research and recognized for providing a comprehensive picture of the venture capital market (e.g., Da Rin et al. (2013); Ewens and Rhodes-Kropf (2015)). Although VS was launched in 1987, it is important to note for Europe that VS only started to systemically collect data on European start-ups in 2000. For the period from 2000 onwards, VS' comprehensiveness for the European market has been validated by different methods. For example, Axelson and Martinovic (2013) compare VS with investment data from the European Venture Capital Association (EVCA) and conclude that VS has good coverage since at least 2000. Retterath and Braun (2020) reach the same conclusion comparing VS to a complete list of all investments made by a major European VC between

1999 and 2019.[4] Therefore, we consider all start-ups listed in VentureSource that receive their first round of financing between 2000 and 2014. The upper bound of 2014 assures that we leave a minimum of five years to observe eventual HQ relocations and start-up performances, which is in the same range as previous analyses of venture capital exits.[5] We apply additional filters to restrict our analysis to young, high-growth, and VC-backed companies. We only include financing rounds labeled as 'VC' and exclude buyout, angel, venture debt, and grants from the sample. Furthermore, we require VC-backed companies to be no older than 10 years at the time of their first VC round. Finally, we exclude all financing rounds for which the invested amount is not available.

Data on headquarter movements, however, is not readily available. The problem is that data providers commonly consider the headquarter location as static, while in reality it is not. Static means that the attribute is fixed and does not change after being recorded. This implies that no history on the HQ location is created, which would be needed to identify any changes in the location. The same is true for start-up headquarter locations from VentureSource. Specifically, VentureSource officials informed us that their policy is to treat HQ locations as static and overwrite the location whenever they learn about HQ changes occasionally, but they do not actively seek updates in the attribute. We believe that the same or similar procedures are used by other providers. Therefore, the HQ locations from commercial data providers cannot be used to identify HQ relocations.

2.1 Identifying Headquarter Relocations

Our solution is to hand-collect headquarter relocations as described in the following. The general idea is that we consider all start-ups that received funding from at least one European investor according to VentureSource, irrespective of the HQ location given. In particular, we include all start-ups that received at least one financing from an investor headquartered in

[4] Retterath and Braun (2020) compare the most commonly used commercial VC databases with a complete set of original financing documents from a major European VC based on 339 rounds of financing provided to 108 predominantly European companies between 1999 and 2019. Among the considered databases, VentureSource was the only database with full company coverage.

[5] E.g., Hochberg et al. (2007); Nahata (2008); Nanda et al. (2020) leave 4.5, 4, and 8 years of time between investment and observed exit, respectively.

one of the 51 countries of geographical Europe.[6] Then, we hand-collect timed data on the HQ locations of these start-ups based on commercial databases and the internet. The upside of this strategy is that we narrow the sample down to such size that we are able to hand-collect HQ locations. The downside is that we exclude all European startups that migrated before funding and those that raised exclusively foreign funding. Pre-funding migration should not affect our analyses as we are mainly interested in HQ moves as a consequence of VC funding. This is somewhat different with startups that are exclusively foreign funded. To the extent that the effect of foreign VC is stronger when startups are funded exclusively from abroad, our estimates should therefore be interpreted as a lower bound on the effect of foreign VC on startup relocation.

Applying the above filters leaves us with 14,588 start-ups of which, according to VentureSource, 10,917 are headquartered in Europe and 3,671 out of Europe. For the manual research of headquarter locations over time, we make use of the HQ location indicated by VentureSource. We split the sample into those start-ups that are headquartered in Europe according to VentureSource, and those headquartered out of Europe. For the 'In-Europe' sample, it may be VentureSource did not update the HQ location, so we focus on finding out where the company's HQ is located at the moment of exit, cease of operations, or 2020, whichever is earlier. For the 'Out-of-Europe' sample, it may be that these companies once had a European HQ, so we focus on finding out where the company was headquartered at the moment of first funding. To identify the HQ locations, for each company we search publicly available data sources such as the company's website, LinkedIn, Google, and Crunchbase. If a website was defunct, or if we were interested in the HQ at first funding, we used the Internet Archive Wayback Machine,[7] which regularly stores versions of public websites, to identify timed HQ locations. Since these data are self-reported, we verified identified relocations with official national trade registers. For example, if a company publicly claimed a new HQ in the U.S., we verified this with publicly available U.S. business registration records. U.S. Business registration records require companies to register at least two offices in each state: the office within the state and the principal executive office. Therefore, we only ac-

[6]The United Nations Statistics Division's M49 standard reports 51 countries belonging to the region of Europe as of 2020, see https://unstats.un.org/unsd/methodology/m49/ (accessed on July 22, 2020).
[7]Website: https://archive.org, (last accessed July 22, 2021).

cepted a relocation as such if the web sources and business registration records indicated a move of HQ. Also, we consider only relocations across national borders. In case we detect an HQ relocation, we conduct further research to identify the year of the move. Specifically, we search Lexis/Nexis and the web for specific news articles on the HQ move. If no news articles were found, we inferred the year of the move from the change of the HQ location on the website, based on the website history from the Internet Archive.

Finally, we restrict the sample to all start-ups which were headquartered in one of 17 European countries when they started (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, and the United Kingdom). The financing rounds in these countries account for more than 98% of all VC financing rounds on the European continent in the database.

The data collection process above results in a final sample of 11,074 start-ups being initially headquartered in Europe. Note that we likely fail to designate some start-ups as relocated (i.e., false negatives) due to missing or non-updated public information, but the approach yields a clean sample of HQ relocations (i.e., false positives are unlikely).[8]

2.2 VC Foreignness: Foreign VC and U.S. VC

To examine whether foreign VC facilitates the relocation of start-up companies, we need to identify foreign investments into local start-ups. We use VC headquarters given by VentureSource to determine whether a foreign or U.S. VC invested in a start-up. We consider an investment as foreign if, at the moment of the round, at least one investor is headquartered in another country than the venture. Similarly, we consider a start-up to be backed by U.S. VC if at least one U.S. VC participated in the first round of funding.

While using the raw headquarter of a VC according to a data provider to determine its origin is commonly used in the cross-border VC literature, this approach ignores possible issues (Devigne et al. (2018)). For example, a local subsidiary of a foreign VC firm would be considered local. However, there are empirical and conceptual reasons why the simple

[8]One might worry about false negatives. However, false negatives are only an issue if our objective was demonstrating the absence of an effect, because false negatives will diminish statistical power. Therefore, to the extent that false negatives reduce statistical power, our test should be biased against finding significant results.

approach is valid in our setting. Empirically, VC firms are small organizations typically consisting of a handful of people, which rarely open any branch offices.[9] For example, even the most prominent U.S. VCs, such as Sequoia Capital and Bessemer Venture Partners, only announced plans to open dedicated European offices in 2020, even though they started investing in Europe decades before.[10] Conceptually, if local subsidiaries owned by foreign groups behaved in the same way as local funds, we would not find any differences in our empirical analyses. In other words, our design explicitly tests whether it makes any difference if the ultimate owner of a VC fund is located outside the venture's original country.

3 Stylized Facts on HQ Relocation in Start-ups

Table 1 and Figure 1 summarize HQ relocations in our sample of European start-ups first funded between 2000 and 2014. Overall, 457 start-ups, i.e., 4.1% of the sample, moved their HQ during their VC funding phase. Note that due to our sampling, we miss all start-ups that never received funding from a European VC. As such, the overall migration statistics reported here may only be seen as a lower bound for the overall phenomenon of HQ relocations among European start-ups.

Panel A summarizes the observed HQ relocations according to the source and destination countries. Some countries show more HQ mobility than others. The highest migration rates occur in countries with the fewest start-ups in the sample and hence smallest ecosystems: for instance, in Russia (13.4%), Portugal (7.6%), and Poland (6.9%). In contrast, the three largest ecosystems in our sample, UK, France, and Germany, show below average migration with 3.6%, 3.4%, and 3.1%, respectively. Apart from these differences, all ecosystems have two things in common. First, there is a clear direction: 85% of all migrating start-ups (389 of 457) move their HQ to the U.S. (thereof, 47% to California, 19% to New York, 9% to Massachusetts, and 25% to other states). Second, while some countries have inflows next to

[9] Using a broad VentureXpert sample, Chen et al. (2010) report the average VC firm to have 5.4 employees while Gompers et al. (2020) report 11 employees based on a survey of VCs. Chen et al. (2010) also document that branch office expansions are rare and, somewhat surprisingly, negatively correlated with investment experience.

[10] See https://sifted.eu/articles/us-vcs-europe/ and https://www.businessinsider.com/venture-capital-bessemer-venture-partners-boost-europe-presence-2020-8?r=DE&IR=T (accessed on December 12, 2020).

their outflows, e.g., the UK wins 16 new HQs, all countries show a net outflow of start-ups.

Panel B of Table 1 shows the average timing of the move, compared to the moment of the first VC round. Overall, 78% of all migrants (357 of 457) move their HQ within three years after their first VC round. The median company age at relocation is 3 years and the median age at IPO of relocating start-ups is 11 years. This suggests that HQ migration is generally a strategic move early in the company's life, instead of shortly before an approaching exit. Moreover, the majority of all HQ relocations (53%) happen in the three-year window between one year before and after the first VC round suggesting that VC funding plays an important role in the decision to relocate. Our main objective is to scrutinize the effect of VC funding on HQ relocation decisions. Hence, in the following, we only focus on the first VC round and exclude start-ups relocating later than three years after first VC.[11]

Table 2 compares relocating and staying companies. Panel A reveals that relocating start-ups are not significantly different from stayers in amount raised and company valuation at the moment of first funding. To the extent that amount and valuation at first financing are indicative of future performance, this result suggests relocating companies are not a strict positive selection of companies, at least at first funding. However, there is a significant association in three other dimensions: relocation is much more prevalent among companies backed by foreign VCs and U.S. VCs, companies founded by serial entrepreneurs, and software companies.

Does the relocation of the HQ of start-ups result the migration of most of the company, or does only the legal seat change? To get closer to this question, we take an ex-post look at the geographic footprint of the relocating companies that went public through an U.S. IPO. We focus on start-ups that achieve U.S. IPOs because this sample not only provides data on the geographic distribution of employees, but also represents most of the value created by relocating start-ups for two reasons: First, the vast majority (12 of 14, or 86%) of the relocating startups that achieve an IPO go public in the U.S. Second, VC follows a skewed distribution in which most of the value is created by start-ups that go public (Cumming and MacIntosh (2003); Phalippou and Gottschalg (2009)). Table Table 2, Panel C, shows

[11] The cutoff of three years is admittedly ad hoc. Our results are robust to using different cutoff periods, e.g. using only relocations within one year before and after the first round, or using no cutoff at all.

that 71% of the employees of relocating companies are located in the U.S. at IPO.[12] By comparison, 26% of the employees of companies with HQ in Europe that go public in the U.S. are located in the U.S. Note that start-ups with European HQ filing for U.S. IPO are likely a selected sample of companies that are also U.S.-focused and that this figure is likely much lower for the 416 companies that go public in Europe. Overall, we conclude that for start-ups, relocating the HQ results in moving the main part of the company, not just the legal domicile.

Our data also allows us to see whether some individual VCs are particularly involved in relocating start-ups. Table 3 lists all VCs which were invested in at least six relocating start-ups in our sample. The importance of well-known VC firms from the U.S. and Europe in relocating start-ups becomes apparent. 13 of the 39 VCs most actively involved in relocating start-ups are from the U.S. While the base rate of HQ relocation among all start-ups is 4.1%, the most active players see more than 20% of their portfolio companies migrating across borders. This rate is even above 70% for some U.S. VC firms on the list.

Panel A of Table 4 shows that there is a strong univariate association between foreign VC backing and HQ relocation. 2,826 of the 11,074 start-ups in the sample (26%) receive foreign VC in their first funding, while 1,030 (9%) receive U.S. VC. 9% of all start-ups receiving foreign VC eventually relocate their HQ abroad, while 3% without such funding relocate. Similarly, 14% of the start-ups receiving U.S. VC in their first VC round relocate their HQ, while only 3% without U.S. VC do so. Chi-square tests indicate that these differences are statistically significant at the 1% level.

The following analyses aim to determine whether the apparent association between foreign VCs and relocating start-ups stems from foreign VCs selecting such start-ups (selection) or actively triggering such move (causation).

[12] At U.S. IPO, companies report the geographic distribution of their employees in public S-1 filings, which we collect manually. We retrieve S-1 filings from all 45 companies in the sample that went public in the U.S. from the SEC's EDGAR database (see https://www.sec.gov/edgar/searchedgar/companysearch.html). Of these 45 companies, 22 explicitly state the geographic distribution of their employees. For the 25 remaining companies, we take advantage of the fact that all companies provide the geographic distribution of their main facilities in square foot and geographically distribute employees according to the square footage of the main facilities.

4 Foreign VC and the Relocation of Start-ups

4.1 Empirical Strategy

To determine whether foreign VC participation in start-ups' first funding round affects the likelihood of an HQ relocation, we estimate the following Equation (1):

$$Pr(HQRelocation_i) = f(ForeignVC_i, \Gamma_i, \varepsilon_1 i) \tag{1}$$

Where $HQRelocation_i$ is an indicator variable equal to 1 if start-up i relocated its HQ during the VC fundraising phase, and zero otherwise. The variable $ForeignVC_i$ is the main variable of interest, indicating whether start-up I received funding from at least one foreign/U.S. VC in its first VC funding round or otherwise. The vector Γ_i contains relevant startup and ecosystem characteristics measured at the moment of the first VC round, such as, e.g., amount of funding, start-up development stage, serial entrepreneur, time, industry, and country fixed effects. All variables are defined in the Appendix A1.

However, we cannot draw causal conclusions from estimating Equation (1) because the probability that a start-up receives foreign VC funding is likely endogenous. The problem is that there is sorting in the market leading to more reputable VCs investing in start-ups that are different in unobserved dimensions (Sorensen (2007)). This is a problem precisely because VCs investing across borders tend to be more reputable, i.e., older, larger, more experienced, or more successful (Schertler and Tykvová (2011); Dai et al. (2012)). For example, it could be that HQ relocation is a natural consequence of underlying start-up quality, which would also attract foreign VCs. In this case, failing to control for start-up quality would lead to an upward bias in the effect of foreign VC involvement on HQ relocations. On the contrary, some start-ups may have special characteristics that necessarily require a relocation (e.g., an important resource is not available locally), which comes with considerable costs and risks. If foreign VCs avoid such start-ups, failing to account for such special characteristics would downwardly bias in the effect of foreign VC on HQ relocations.

We use a coarsened exact matching (CEM) algorithm to separate selection from treatment

effects of foreign VC funding on start-up location decisions.[13] Matching generally ensures that treated start-ups are compared to a valid group of counterfactuals, which are similar along predetermined dimensions. To implement CEM, the researcher chooses the variables on which to match, discretizes any continuous variables in the set ("coarsening"), and creates "cells" representing all possible combinations of values of the coarsened variables. Then, every cell which contains both treatment and control observations is assigned a weight and other cells are discarded.[14] By choosing more variables and more cut points within each variable the researcher creates closer matches but also discards more data, implying a trade-off between balance and variance. Finally, a weighted least-squares estimation gives an estimate of the treatment effect for treated start-ups remaining in the matched sample.

Iacus et al. (2012) show that CEM has distinct advantages over propensity score matching and other matching methods. In our setting, the main advantages are: First, CEM is a non-parametric method so that it is not possible that a misspecified matching model, e.g. by choosing the wrong caliper, increases imbalance as is possible with propensity score matching. Second, CEM bounds the model dependence, bias, and estimation error of the causal effect, which is not necessarily the case for other matching methods. Last, CEM not only establishes balance among mean values but also all other distribution moments, which is particularly an advantage dealing with the highly skewed distributions in venture capital.

To implement the CEM algorithm, we match each treated observation with control observations based on data available in the first round of VC funding. We not only match on start-up location, industry, and year in the moment of first funding,[15] but also on discrete buckets of the following variables: The first is the amount of funding a start-up received in its first round. We create seven buckets using cutoff values at the 25th, 50th, 75th, 90th, 95th, and 99th percentile of the funding amount distribution within each industry.[16] The large

[13] Our approach is based on Conti and Graham (2020), who investigate the effect of prominent VCs on CEO replacement.

[14] Assuming that T_c and C_c are the number of treated and control observations in each cell c, respectively, each treated observation receives a weight of 1 and of each control observation has the weight T_c/C_c.

[15] Locations are the 17 countries in our sample. Industries are the five clusters "Information technology", "Business support services", "Biotech/Healthcare", "Consumer/Retail", and "Others". The three year clusters according to the year in which a start-up received its first funding are: 2000-2004, 2005-2009, 2010-2013.

[16] Conti and Graham (2020) use similar buckets.

number of buckets is aimed at finding close matches in terms of funding amounts, because all else equal, greater funding should reflect better start-up quality. The close grid, however, comes at the cost of dimensionality if we use a similarly tight grid with other continuous variables. Thus, for the total number of investors participating in the first round ("syndicate size"), and for the age of the start-up, we match on a coarser grid and create six and three buckets per variable, respectively.[17] Finally, we match on further binary indicators of start-up quality, namely one for each development stage[18] and an indicator for whether the start-up is founded by at least one serial entrepreneur (Gompers et al. (2010)).[19]

Table 4 illustrates how the CEM procedure dramatically improves the balance in the distributions of covariates across treated and control samples. The procedure yields a matched sample of 2,027 start-ups treated with foreign VC in their first round and 5,487 controls, i.e., for 72% of the 2,826 treated start-ups a match could be identified. Each row in the table reports means for start-ups with and without foreign VC backing and the test statistic of a t-test (weighted t-test, in Panel B) for the difference of means. Panel A compares all start-ups in the sample. We find that start-ups backed by foreign VC are different along several dimensions. They are more likely to relocate their headquarters, but also raise more funding, attract more investors, are higher valued, more often include serial entrepreneurs, and show a much higher likelihood to eventually reach a successful exit (i.e., IPO or acquisition at a valuation of more than 1.5 times funding raised). These differences are all statistically significant at the 1% level.

Panel B of Table 4 compares the CEM-weighted means of the matched sample of treated and controls start-ups. Matching works very well in the sense that no significant differences in the means between treated and control samples in terms of the variables used in matching remain.[20] Some observable variables, namely, the pre-money valuation, revenue, and the number of employees in the moment of first funding, were not used in the matching procedure, which we use as a falsification test: if the treatment remains correlated with observable

[17] The cutoff points for syndicate size are at the 25th, 50th, 75th , 90th, and 95th percentiles and for start-up age are at the 25th and 75th percentile of their distributions within each industry.

[18] Development stages are "Seed/Startup", "Product development/clinical trial", and "Generating revenue".

[19] Following Gompers et al. (2016), we identify serial entrepreneurs by tracking the careers of founders and CEOs in the VentureSource database and identify those who were previously founders in another start-up as serial entrepreneurs.

[20] Medians are also well balanced and show no significant differences (untabulated).

variables not used in the matching, we should be skeptical about our assumption that the treatment is uncorrelated with unobserved start-up characteristics. Reassuringly, the results of this falsification test show that there are no statistically significant differences between treated and control samples also in observables not used in the matching procedure. Overall, results in Table 4 show that CEM matching removed all significant differences in means of observable variables, suggesting that we have removed much of the potential bias in the data.

Based on the CEM-matched sample, we estimate the effect of foreign VC involvement on HQ relocation. First, we estimate Equation (1) using a linear probability model on the full sample to generate 'naïve' baseline results. Second, we apply CEM-weights in linear models of Equation (1) to estimate treatment effects. All models include the observables used in matching to control for any remaining imbalances within coarsened buckets.

4.2 Main Effect

4.2.1 Baseline Results

We begin our empirical analysis by estimating Equation (1) to estimate the conditional correlation between foreign VC and start-up HQ relocations. The baseline specification is an unweighted linear probability model that relates the incidence of foreign VCs in the first VC round to the likelihood of migrating HQ within the first three years after the round. We control for a set of observables measured in the first VC round (summarized in Table 4). In particular, we include the following proxies of start-up quality, which are all expected to be indicative of future performance: the first is the amount of funding invested in the first round. The second is a dummy variable indicating whether at least one serial entrepreneur was in the management team of the start-up. The third is the number of VCs participating in the round. The fourth is the age of the start-up and the fifth is an indicator variable of whether the start-up already generated revenues. Also, we add time, country, and industry fixed effects because there may be ecosystems, industries, and times driving start-ups away stronger than others. Standard errors are clustered at the country level to take into account possible clustering at the country level in HQ relocations.[21]

[21] Results are robust to clustering at the year and industry level.

Table 5 reports a significant and positive relationship between foreign VC backing and HQ relocation of the start-up. The magnitude is such that start-ups are 5.1%-points more likely to relocate when foreign VCs participate in the funding, implying a 124% increase in the likelihood over the mean of 4.1% (the base rate of HQ relocations). Similarly, when U.S. VCs participate in the funding, the likelihood increases by 9.8%-points, corresponding to a 239% increase over the base rate (Column (2)).

The coefficients on the control variables offer several insights. First, funding amount and syndicate size tend to be positively correlated with HQ relocations. Since funding amount (Nahata (2008)) and syndicate size (Jääskeläinen (2012)) tend to be positively correlated with favorable start-up outcomes, this suggests more promising start-ups relocate. However, the funding amount is not significant in all specifications so that this interpretation is to be treated with caution. Second, serial entrepreneurs are disproportionately engaged in relocating start-ups. This is consistent with Gompers et al. (2010) who show that serial entrepreneurs are persistent in selecting the right industry and time to start new ventures. It seems that in addition to industry and time, serial entrepreneurs more actively select the location in which their venture is based compared to first-time founders.

Table 6 shows that also when using a closely matched control group with the CEM procedure, foreign VC increases the likelihood of HQ relocations. We estimate the same models as described in Table 5, with the only difference that we apply the CEM weights that follow from our CEM procedure. For brevity, we omit the coefficients on the control variables. We find that foreign VC and U.S. VC increase the likelihood of HQ relocation within the first three years after investing by 4.9 and 10.3 percentage points, respectively, which implies an increase of 120% and 251% over the mean. Both coefficients are significant at the 1% level. The finding that the CEM-weighted effects are very close to the simple mean differences and OLS estimates suggests that relocation is relatively unaffected by selection problems. This mirrors the statistics from Table 2 suggesting that, at the moment of first funding, relocating start-ups do not necessarily represent a positive selection of start-ups in terms of company value.

4.2.2 Time Dynamics

Despite the mentioned advantages, like any other matching method, CEM assumes selection on observables so that omitted variable bias may still affect our estimates. Being aware of this concern, we exploit the fact that we have timed data on VC investments and HQ relocations to perform additional panel data analyses. Based on panel data, we are able to include start-up fixed effects, meaning that we control for any unobservable time-invariant start-up quality factors. To create the panel data set, each start-up enters the sample in the year of its first VC round and drops from the sample if it exits (IPO or acquisition), does not receive funding in five consecutive years, or 2020, whichever is earlier. Then, the following specification captures the within start-up relationship between foreign VC funding and HQ relocations:

$$HQRelocation_{it} = \alpha_2 + \beta_2 ForeignVC_{it} + \gamma_2 F_{it} + \delta_i + \theta_t + \varepsilon_{2i} \tag{2}$$

The unit of observation is the start-up-year combination. $HQRelocation_{it}$ is an indicator variable equal to 1 if start-up i relocated its HQ in year t, and zero otherwise. The variable $ForeignVC_{it}$ is the main variable of interest, indicating whether start-up i received funding from at least one foreign VC in year t, or otherwise. F_{it} are time-varying start-up characteristics, δ_i is the start-up fixed effect, and θ_t are year fixed effects. In the main specification, F_{it} is a dummy variable indicating whether start-up i received a funding round in year t. Thus, the coefficient estimates of β_2 capture within-firm changes in the likelihood of an HQ relocation related to foreign VC investment compared to domestic VC funding rounds. The model includes all start-ups in the sample, resulting in 142,077 start-up-year observations.

Table 7 presents the results of estimating Equation (2). We find that the coefficient of Foreign VC one and two years before the treatment with foreign VC is small and insignificant, suggesting there are not pre-existing trends in the data. The effect jumps to a large and significant peak in the treatment year. Finally, the effect persists in the longer run (at least 3 years after the treatment). The same pattern is observed for treatment with U.S. VC, with the only difference that an effect is already marginally significant in the year before the treatment. In sum, the dynamic pattern suggests that foreign/U.S. VC affects HQ

relocations immediately in the investment year and persists for at least three years after investment.

4.2.3 Robustness to Reverse Causality and Omitted Variables

We provide two additional robustness tests for our finding that foreign VC funding increases the likelihood that start-ups relocate their HQ abroad. In particular, we analyze to what extent 1) reverse causality and 2) omitted variables are likely to bias our estimates.

Before delving into additional analyses, note that the results from the panel data analysis are hardly conceivable with a reverse causality argument. If reverse causality, that is, start-ups relocate to get foreign VC, would drive the association, we would expect significant effects in the years before the foreign VC investment and no effects after the investment year—which is the opposite of what we find. However, tests so far do not explicitly rule out the possibility that start-ups migrate to acquire foreign VC. For example, if the time gap between moving and receiving foreign VC is very short, i.e., less than a year, this could at least partially explain the findings so far. This theory implies that start-ups migrate to increase the likelihood to get foreign/U.S. VC funding. If true, we would expect the less foreign/U.S. VC is available locally, the higher the incentive to migrate. This hypothesis is directly testable. To do so, we calculate the market share of foreign/U.S. VC at the local market level and use it as a regressor in Equation (1) instead of the foreign VC dummy. We define the local market share of foreign/U.S. VCs as the number of rounds that featured at least one foreign/U.S. VC in the same country-year combination as in the year of first funding of the focal start-up (excluding the focal start-up), divided by all rounds in this market. Column (1) of Table 8 shows the results. We find a positive and statistically significant association between the local presence of foreign/U.S. VCs and the relocation of start-up companies (Panel A and Panel B). If reverse causality was at play, we should have found the exact opposite: The higher the local availability of foreign VC, the lower the likelihood to relocate, because foreign VC is readily available in the current location.

The local availability of a certain investor type is also commonly used as an instrumental variable (IV) to correct for endogenous treatment by that investor (see, e.g., Bottazzi et al. (2008); Hellmann et al. (2008); Humphery-Jenner and Suchard (2013a); Brander et al.

(2015)). The intuition is that, while the actual selection of investors may be endogenous, the local availability of a certain VC type, in our case foreign VCs, is exogenous to the individual venture. Then, once the matching took place, the local availability of foreign VC should not affect the HQ relocation decision of a start-up. To implement such an IV model, we re-estimate Equation (1), but we instrument our foreign/U.S. VC variable with the market share of foreign/U.S. VC among other start-ups.[22] Before showing the results of the IV in Table 8, we test whether, conditional on observables, our instruments predict start-up performance, namely, whether a start-up reaches an IPO as of March 2020 (Column 2), or the total amount of VC that a start-up raises (Column 3). Reassuringly, neither instrument is correlated with either measure of start-up performance. If anything, there is a marginally negative correlation between the intensity of foreign VC and IPO outcomes. This makes sense, as peaks in foreign VC activity coincide with hot VC markets (Aizenman and Kendall (2012)), and hot markets typically predict higher failure rates (Nanda and Rhodes-Kropf (2013)).

Columns (5) and (6) of Table 8 show the first and second stage results of our IV model. Column (5) shows that the instrument is a strong predictor of the likelihood that at least one foreign (Panel A) or U.S. VC (Panel B) participates in a start-up's first round. Consistent with the earlier findings, the second stage estimates in Column (6) suggest a statistically significant effect of foreign VC on HQ relocation. With 7.2 and 21.9 percentage points for foreign VC and U.S. VC, respectively, the point estimates for U.S. VC are higher than in the naïve and matching-based models. A likely reason for the higher effects is that some observable variables we use in matching models capture part of the effect that is attributable to U.S. VCs. For example, in models when we use both the funding amount and the U.S. VC dummy, the coefficient on U.S. VC only captures the effect of the non-financial capital of U.S. VC. If, however, U.S. VCs also provide more financial capital than domestic VCs, the funding amount coefficient captures part of the effect that is in reality attributable to U.S. VC and the effect of U.S. VC is downward biased.

As another robustness check, we apply the bounding method of Oster (2019) to assess the

[22] We do not include the start-up level control variables in the IV models because they may be endogenously affected by the instrument. If they are affected, start-up controls might pick up effects that are actually attributable to the treatment.

extent to which our estimates my be affected by omitted variable bias. Assuming that the relationship between treatment and unobservables is proportional to the relationship between treatment and obervables, Oster (2019) provides a simple method to assess robustness to omitted variable bias. The method requires only the changes in the treatment coefficient and R-squared when observable controls are added to the regression. The results in Appendix A2 show that the influence of unobservables (expressed as δ^*) must be more than three times larger compared to observables to achieve a treatment effect of zero on HQ relocations. Given that Oster (2019) considers a δ^* of one to be a reasonable bound, or, in other words, assuming that unobservables have roughly the same impact on the treatment coefficient as observables, this result suggests that unobserved confounders are unlikely to severely bias our estimates.

4.2.4 Adding Other VC Attributes

More reputable VC firms, that is, more experienced, more successful, and better connected VCs, tend to invest across greater geographic distances, including foreign markets (Sorenson and Stuart (2001); Cumming and Dai (2010)). To better isolate the effect that foreign VC origin has on HQ relocation, we re-estimate Equation (1) and add indicators of VC reputation based on experience, success, and network position in the VC syndicate. First, we add a dummy variable *Experienced VC* that indicates whether at least one participating VC is in the 90th percentile for the number of investments made among all VCs in our sample in the three years before the start-up's first round. This variable is one in 28% of observations and has a correlation of 0.21 and 0.20 with foreign VC and U.S. VC, respectively. Second, we define *Successful VC* if a start-up receives funding from at least one "successful VC" in its first funding. A VC is considered successful if it is in the 90th percentile of the success rate based on all investments made in the three years before investing in the start-up. This success rate is calculated annually for each VC in our sample that made at least 10 investments in the three years preceding the year in question and is defined as the share of investments that resulted in either IPO or acquisition. The share of start-ups treated with successful VC in the first round is 5% and the correlation with foreign VC and U.S. VC is 0.20 and 0.26, respectively. Third, we introduce a dummy variable *Central VC* indicating whether at least

one participating VC is in the 90th percentile of the distribution of centrality in the VC syndication network in the year of first funding. To calculate the centrality for each VC in each year, we annually plot a VC syndication network based on all investments by all VCs in VentureSource (not only our sample) during a three-year window before the first VC year of the start-up.[23] Finally, 15% of the start-ups in our sample receive funding from a Central VC in their first VC round and the correlation with both foreign VC and U.S. VC is 0.40.

By including *Experienced VC*, *Successful VC*, and *Central VC* we are controlling for VC firms' reputation earned by executing deals, being successful, and having a central position in the VC syndication network. Therefore, any residual effect on *Foreign VC* and *U.S. VC* should more closely reflect the effect coming from originating from a foreign market. However, because we cannot apply CEM weights in these regressions, the results are to be interpreted with caution.

Table 9 shows the results from estimating Equation (1) when adding other VC attributes. Columns (1) to (3) show the correlation of the three VC reputation measures with HQ relocations. All VC reputation measures show a highly significant correlation with HQ relocations. Columns (4) and (5) show the effects of foreign and U.S. VC, respectively, when adding all three VC reputation measures to the model. The coefficients on foreign VC and U.S. VC remain statistically significant at the 1% level but lose somewhat in economic magnitude compared to naïve regressions in Table 5. While Experienced VC and Successful VC gradually lose their significance, Central VC remains statistically significant at the 1% level. This result suggests that, in addition to foreignness, a VC's network is another independent driver influencing the relocation of portfolio companies across borders. To understand whether the coefficient on Central VC is driven by well-networked domestic or foreign VCs, we separate VCs into *Foreign & Central*, *Foreign & Non-Central* and *Domestic & Central VCs* as well as *Domestic & Non-Networked VCs* (being the base category) in Columns (6) and (7). We find a significantly positive effect for all foreign VC types (well-networked and otherwise) and also for Domestic & Central VCs. This indicates that not only foreign VCs but also

[23]To calculate centrality, we use the eigenvector centrality introduced by Bonacich (1987) which, in our setting, expresses the extent to which a VC firm is connected to other well-connected VC firms. Eigenvector centrality has become a standard measure of centrality in VC research (Sorenson and Stuart (2001); Hochberg et al. (2007); Conti and Graham (2020); Nanda et al. (2020)).

domestic VCs with central positions in the international VC network are disproportionately engaged in start-up relocations. Overall, these results suggest that both the foreign origin and the international network of a VC are determinants for the cross-border relocation of start-ups.

4.3 Where Do Foreign VCs Relocate Start-ups?

Having shown that VCs relocate portfolio companies when investing across borders, the question remains why they do so. To get closer to those intentions, we next analyze where start-ups are relocated to. After all, the choice of destination can tell us something about the intentions behind. We hypothesize two basic intentions: 1) relocation is to improve the *legal or tax regime* of the investment, or 2) relocation is to *add value* to the portfolio company. Under the legal and tax regime hypothesis, we would expect headquarters to be relocated either to tax havens or countries with business-friendly laws. Under the value-add hypothesis, VCs may plan to either add value themselves or by introducing start-ups to critical resources (e.g., financiers, clients, employees, or information) in their own or another ecosystem. Therefore, if the plan is to add value, we should expect that VCs mainly relocate start-ups closer to themselves or another attractive start-up ecosystem. If, instead, relocation is driven by the legal and tax regime motive, we should observe that most start-ups are relocated to a common destination (a corporate law or tax heaven).

To test whether any of the two hypotheses prevail, we examine the association of VC origin and start-up destination at a more granular level. We re-estimate the model from Table 5 and separate the variable of interest, foreign VCs, into Non-U.S. foreign VCs and U.S. VCs and test whether these VCs mainly influence relocation to Non-U.S. foreign countries or the U.S., respectively. Because we cannot use the CEM procedure described above, these results are correlations, not causal effects. The results reported in Table 10, Panel A, show that there is no common direction, but that start-ups move towards their VCs. Investment by non-U.S. foreign VCs only correlates with the likelihood of relocation to non-U.S. foreign countries (and not to the U.S) and U.S. VC investment increases the likelihood of relocation to the U.S. Both associations are statistically significant at the 1% level.

We conduct a similar analysis within U.S. VCs. If U.S. VCs relocate companies to the

U.S. mainly for legal and tax reasons, we should expect that start-ups mainly move to law and tax-friendly states, such as Delaware.[24] To test this proposition, we separate the U.S. VCs into Californian (CA), New York (NY), Massachusetts (MA), and all "Other" U.S. VCs, depending on their HQ given by VentureSource. Similarly, we separate HQ relocations into relocation to CA, NY, MA, and "U.S. (Other)". Table 10, Panel B, shows that U.S. VC investment from a particular state is mainly associated with relocation to that state. For example, an investment from a Californian VC predicts a jump in the likelihood of relocation to California by substantial 19.9 %-points. But apart from California, Californian VC investments are not correlated to relocations to New York or Massachusetts, and show only a marginally significant effect of 2.1%-points to "Other" U.S. states. Similarly, investments from New York and "Other" U.S. VCs are only significantly related to relocations to New York and "Other" U.S. states, respectively, and no other destinations. The only exception is the effect of Massachusetts VCs on relocations to Massachusetts is not significant, but we consider this a matter of statistical power since only 8% of all relocations are to Massachusetts.

Overall, we find that when start-ups relocate, they mainly move to the country or state of the investing foreign VC. While we cannot determine whether VCs' motivation behind this pattern is to move start-ups closer to themselves or a better ecosystem, the pattern is inconsistent with the legal and tax regime hypothesis and suggests that relocations are aimed at adding value to portfolio companies.

4.4 Why Do Foreign VCs Relocate Start-ups?

Having shown that foreign VCs mainly move their portfolio companies to where they are located themselves, the question remains why they do so. We distinguish two main hypotheses, improve control over or add value to the portfolio company. If the motivation is to improve control, the relocation effect should be heterogeneous across different levels of information

[24]The state of Delaware is the legal home to more than 66% of the Fortune 500 companies because of, according to the state administration's own words "complete package of corporation services" (https://corp.delaware.gov/aboutagency/, accessed on 28/7/2021). This "complete package of corporation services" appears to have consequences as Delaware law has been shown to increase firm value (Daines (2001)) and helps corporations to save taxes (Dyreng et al. (2013)).

asymmetry. If value creation is the motive, the relocation effect should differ depending on the different resource constraints of start-ups (e.g., lack of finance, customers, knowledge). In the following, we provide suggestive evidence that relocation mainly serves to add value by helping with fundraising.

4.4.1 Financial Capital

In their seminal paper, Gorman and Sahlman (1989) document that VCs' most frequently reported service for portfolio companies is to help raise additional funds. If relocation is a VC strategy to help with fundraising, the effect should be heterogeneous across start-ups with different fundraising constraints. For example, the effect should differ depending on whether start-ups 1) have alternative sources of funding (e.g., revenues), and 2) originate from more or less developed VC markets. We examine both hypotheses in turn.

Panel A of Table 11, we re-estimate CEM-weighted baseline model of Table 6 but interact the foreign VC dummy with a dummy variable indicating whether a start-up generated revenue as of the funding or not. Consistent with relocation as a fundraising support strategy, the interaction is statistically significant. The most rigorous model (Column (4)) implies that U.S. VCs increase the likelihood of relocation by only 7.6%-points in start-ups with revenue (14.4-6.8%), but by 14.4%-points in start-ups without revenue. This result is qualitatively similar for foreign VC in general.

Panel B of Table 11 examines whether the foreign VC effect is heterogeneous for start-ups from differently developed VC markets. Similar to Rajan and Zingales (1998), we measure VC market development[25] as the ratio of total VC investment over the GDP in a start-up's country and first year of funding.[26] The interaction between the foreign/U.S. VC dummy and VC market development is statistically significant at the 1% level. The magnitude of

[25]Traditionally, the financial development of a country is measured as the ratio of stock market capitalization plus credit market over GDP (Rajan and Zingales (1998)). Analogously, we measure the development of a country's VC market as ratio of VC investment to GDP. The VC investment to GDP measure also reflects how practitioners and policy-makers to compare the development of VC markets (see, e.g. https://ec.europa.eu/programmes/horizon2020/en/news/assessing-potential-eu-investment-venture-capital-and-other-risk-capital-fund-funds, accessed on 28/7/2021).

[26]Total VC investment is calculated as the sum of all deal amounts in a country and year based on all deals reported by VentureSource. GDP data are from Refinitv Datastream.

the effect is such that a one standard deviation increase in VC market development (being 1.1‰ of GDP, which is comparable with a change in development from, say, Ireland (0.7‰, or 4th of the 17 countries in 2013) to UK (1.8‰, or 1st of the 17 countries)) decreases the probability of relocation after U.S. VC investment by 3.4%-points.

4.4.2 Home Market Size

Foreign VCs may relocate European start-ups to introduce them to larger product markets (like the U.S.). If market size considerations matter, the foreign VC effect should be stronger for start-ups from smaller markets.

Panel C of Table 11 investigates the foreign VC effect at different sizes of the home market of the start-up. We proxy the size of the home market by the gross domestic product (GDP) in a start-up's country and year of first funding. The interaction between the foreign/U.S. VC dummy and GDP of the home market is not statistically significant, suggesting that product market considerations matter not much for the decision to relocate. However, though insignificant, the coefficient of the interaction is negative across all models which is potentially consistent with the market size motive. Moreover, proxying the local market size for all start-ups with GDP is coarse. For example, start-up specific market sizes may provide a cleaner test, but are unavailable. Therefore, we explicitly do not rule out that relocation is to access larger product markets, but conclude that the fundraising motive is clearly more evident.

4.4.3 Information Asymmetry

Lastly, we have seen in the previous section that relocation usually reduces the geographic distance between foreign VC and start-up. Therefore, it could be that relocation simply serves to reduce information asymmetry to allow for better control over the portfolio company. If reducing information asymmetry is important, the presence of a domestic VC in the syndicate should lead to a heterogeneous relocation effect. The reason is that a domestic VC should reduce the information asymmetry between foreign VC and start-up due to its geographical and cultural proximity (Dai et al. (2012)), making relocation a less effective value creation lever.

In Panel A of Table 11, we re-estimate CEM-weighted baseline model of Table 6 but

interact the foreign VC dummy of with a dummy variable indicating whether or not a domestic VC participates in the financing syndicate. The interaction term is not significantly different from zero, implying that the effect does not differ if a domestic VC is involved or not. This result indicates that it is unlikely that relocation is to reduce information asymmetry between foreign VC and start-up.

Overall, the findings in this subsection are consistent with the hypothesis that relocation is a VC strategy to add value to start-ups, in particular by helping with fundraising, but is not to monitor start-ups more closely.

4.5 Foreign VC Effect Over Time

Our hypothesis that VCs mainly relocate startups to help with fundraising provides interesting predictions for ecosystems as a whole. From a European ecosystem perspective, this means that relocations out of Europe would decline as financing conditions improve. To test whether there was such a shift during our study period, we split the start-ups in our sample into those receiving first funding during 2000-2005, 2006-2010, and 2011-2014 and estimate the basic effect from Table 6 for each sample.

Figure 2 presents the results (see also Appendix A3). We do not find material changes over time, as the confidence intervals of the effect in all three periods are highly overlapping. The only indication of a downward trend is that the point estimate of the U.S. VC effect in the last period is lower at 11.7%-points than in the previous period at 13.0%-points. This, however, is due to a "crisis effect" rather than a declining trend, as estimating the effect for start-ups first funded during the financial crisis, i.e., 2009-2010 (untabulated), yields an even higher effect of 14.7%-points. Note that the peaking effect during the financial crisis is again consistent with the fundraising hypothesis.

4.6 Is Foreign VC Bad for Local Economies?

We last discuss whether based on our findings, policymakers should consider raising the cost of foreign financing, whether through regulatory barriers or taxes. For this exercise, we take a European perspective instead of a national one. Since all relocations out of Europe take

place to the U.S., we can simplify the problem as a Europe vs. U.S. one. Our coefficient for U.S. VC (as main part of Non-European VC) of roughly 0.1 suggests that on average one in ten U.S. VC investments leads to the relocation of a start-up. Therefore, in nine out of ten cases U.S. capital helps financing a company without transferring main parts of the start-up to the U.S. The overall relocation statistics provide a similar conclusion: According to Invest Europe (2020), 14% of all capital invested in European start-ups comes from Non-European VCs. Based on our sample, 3.5% of start-ups move out of Europe, and a maximum of 2% do so because of receiving Non-European VC (=3.5%*(1-43%), because 43% of the relocating start-ups never raise any Non-European VC, they cannot be driven away by it). Assuming that foreign capital is additional, and does not crowd out local funding,[27] gaining 14% from Non-European VC while losing 2% again makes a strong case against raising barriers for foreign VC.

The above cost-benefit illustrations assume that relocating companies are lost to their home economies. This is justified by the documented fact that at IPO, main parts of relocating companies are abroad. However, note that while relocating companies represent 4.1% of all start-ups, in terms of company value at exit, they represent 14.6% of all company value created (51*785.1 USDm / (51*785.1 USDm + 1,138*205.6 USDm)), see Table 2, Panel B). Since relocating and staying start-ups are of similar company value at first funding, this disproportionate growth happens after relocation and it is not unlikely that it happens only because these companies are moving abroad (Conti and Guzman (2019)). By virtue of becoming disproportionately successful abroad, they may have created more value to host economies (by growing their remaining home locations (typically product and R&D), remittances, spillovers, etc.) than if they never left.

Overall, the above back-of-the-envelope calculations show that it is unlikely sensible to introduce investment barriers for foreign VCs if one fears an exodus of start-ups.

[27] The strong positive correlation between foreign VC activity and overall start-up activity (e.g., Aizenman and Kendall (2012); Akcigit et al. (2020)), suggests that foreign VCs do not merely crowd out local VC investors without increasing start-up activity. However, to what extent foreign VC is additional to or crowds out local VC is an open question.

5 Conclusion

This paper provides empirical evidence for the long-standing policy debate of whether foreign VC hampers or benefits the local economy. We examine on one potential concern that is commonly reported in anecdotes: the relocation of start-ups as a consequence of foreign VC funding. We assemble a unique data set that systematically tracks the HQ location histories of European start-ups. We provide a novel set of facts which have not been previously reported, including that cross-border HQ relocations in start-ups: 1) are relatively rare events (4.1% of all start-ups relocate), 2) happen at an early stage, and 3) result in migrating main parts of the company instead of the legal domicile only.

Consistent with the anecdotal evidence, we find that foreign VC and U.S. VC increase the likelihood of HQ relocation by 4.9%- and 10.3%-points, respectively. This effect is robust to matching methods, panel data, and instrumental variables. Though the effect is large, it implies that U.S. VC funding leads to no relocation in 9 out of 10 start-up investments. Given the importance of foreign and U.S. capital in non-relocating start-ups in Europe, we conclude that the concern of a start-up exodus hardly justifies raising barriers to foreign VC. Instead, our finding that the foreign VC effect is stronger the more difficult financing conditions are provides an interesting policy alternative to reduce the start-up exodus: improving local funding conditions.

Our results suggest that it is unlikely sensible to introduce investment barriers for foreign VCs if one fears that an exodus of start-ups. However, this may be different when other effects and contexts are considered. For example, foreign VC also facilitates foreign IPOs (Humphery-Jenner and Suchard (2013b)), takeovers by foreign investors, outflow of important talent (Braun et al. (2019)), and knowledge transfer abroad, which, in critical technologies, can lead to costly threats to national security (Akcigit et al. (2020)). Perhaps considering these effects in combination and in the appropriate context will lead to different conclusions, but we leave this question to future research.

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Figure 1: HQ Relocations over Time

This shows headquarter (HQ) relocations among European start-ups over time. The sample consists of 11,074 start-ups from 17 European countries that received venture capital financing from a European VC between 2000 and 2014 according to VentureSource. Start-ups' HQ relocations were hand-collected from several sources as described in the text. Start-ups were categorized as 'relocating' ('relocating to U.S.') if they moved their HQ location to another country (the U.S.) during the VC fundraising period and 'staying' if otherwise.

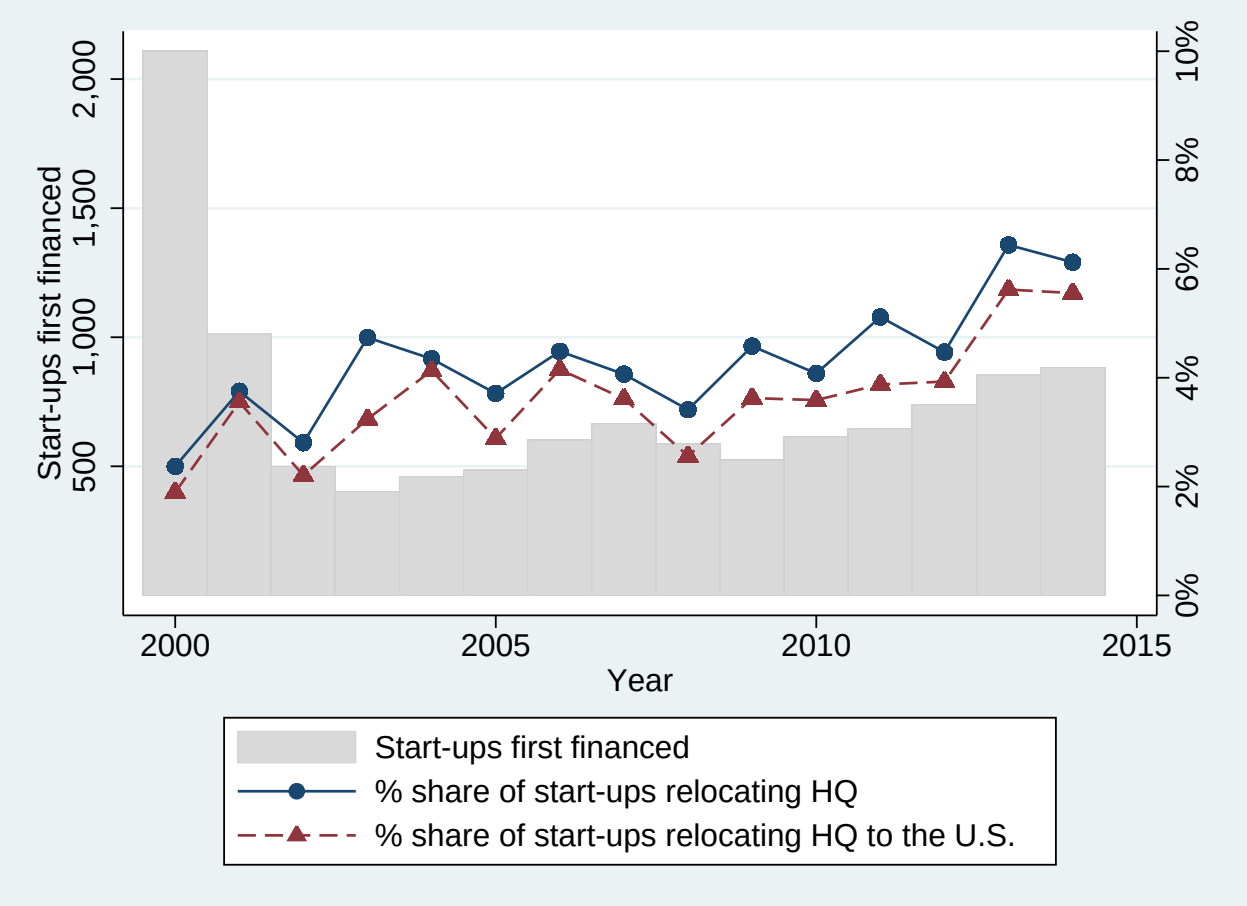

Figure 2: Foreign VC Effect over Time

The figure shows CEM-weighted effects and 95% confidence intervals as per Table 6 in different subsamples. Start-ups are split into subsamples according to their year of first funding, i.e. 2000-2005 (N=4,941), 2006-2010 (N=2,965), and 2011-2014 (N=3,101).

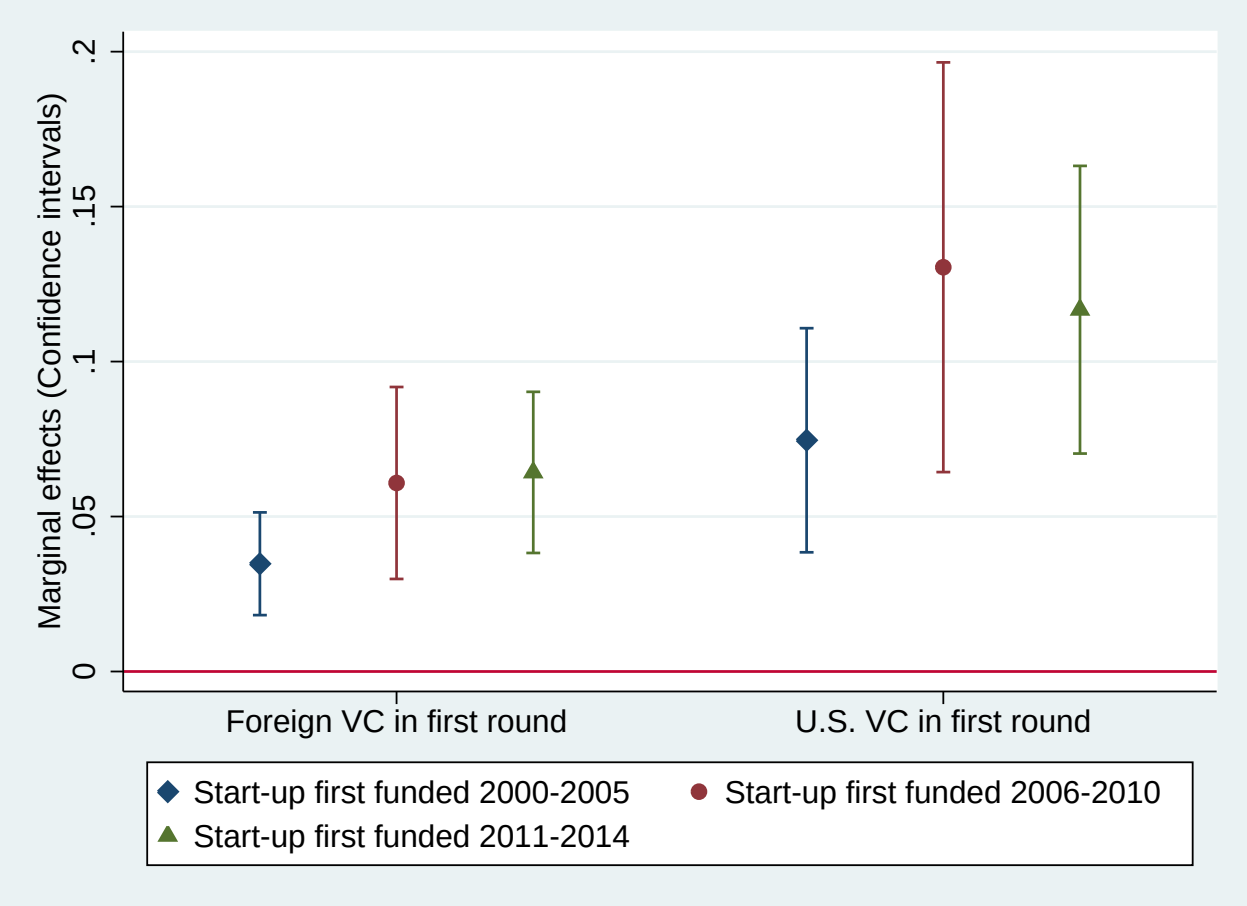

Table 1: Start-up Headquarter Relocation Patterns

This table presents country and timing patterns of headquarter (HQ) relocations among European start-ups. The sample consists of 11,074 start-ups from 17 European countries that received venture capital financing from a European VC between 2000 and 2014 according to VentureSource. Start-ups' HQ relocations were hand-collected from several sources as described in the text. Start-ups were categorized as 'Relocating' if they moved their HQ location to another country during the VC funding period, and 'Staying' if otherwise. In Panel A, each column represents the HQ location at the time of first VC investment, while each row represents the HQ location at exit, cease of operations, or 2020, whichever is earlier. Panel B splits the 457 relocating start-ups according to the timing of their HQ move compared to their first VC year.

Panel A: Distribution of start-ups by country

	Start-up HQ location at start																	
	AT	BE	CH	DE	DK	ES	FI	FR	GB	IE	IT	NL	NO	PL	PT	RU	SE	Total
Final start-up HQ location																		
AT	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	121
BE	0	228	0	2	0	0	0	0	1	0	0	1	0	0	0	0	0	232
CH	0	0	284	1	0	0	0	1	2	0	1	0	0	0	0	0	0	289
DE	0	0	1	1,325	0	1	1	1	0	0	0	0	1	0	0	0	0	1,330
DK	0	0	1	0	339	0	0	0	0	0	0	0	0	0	0	0	0	340
ES	0	0	0	0	0	584	0	1	1	0	0	0	0	0	0	0	0	586
FI	0	0	0	0	0	0	379	0	0	0	0	0	1	0	0	0	1	381
FR	0	0	0	0	0	0	0	2,104	0	0	0	0	0	0	0	0	0	2,104
GB	1	1	2	0	2	1	1	2	3,111	2	0	0	0	0	0	1	3	3,127
IE	0	0	0	1	0	0	0	1	0	307	0	0	0	0	0	0	0	309
IT	0	0	0	0	0	0	0	0	0	0	279	0	0	0	0	0	0	279
NL	0	0	0	0	0	1	0	0	1	0	0	337	1	0	0	1	0	341
NO	0	0	0	0	0	0	0	0	0	0	0	0	208	0	0	0	2	210
Other	0	2	2	3	1	0	4	2	5	0	2	1	0	0	0	1	0	23
PL	0	0	0	0	0	0	0	0	0	0	0	0	0	62	0	0	0	62
PT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0	69
RU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185	0	185
SE	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	695	697
US	5	4	9	39	19	19	14	65	102	23	9	16	8	5	6	26	20	389
Total	127	235	299	1,372	361	606	399	2,177	3,223	332	291	355	220	67	75	214	721	11,074
Relocating (%)	4.7	3.0	5.0	3.4	6.1	3.6	5.0	3.4	3.5	7.5	4.1	5.1	5.5	7.5	8.0	13.6	3.6	4.1
Reloc. to US (%)	3.9	1.7	3.0	2.8	5.3	3.1	3.5	3.0	3.2	6.9	3.1	4.5	3.6	7.5	8.0	12.1	2.8	3.5

Panel B: Distribution of HQ relocations relative to first VC year

HQ relocation t years after first VC year	t=								
	<3	-3	-2	-1	0	1	2	3	>3
# Relocating start-ups	5	9	15	55	116	73	47	37	100
%	1.1%	2.0%	3.3%	12.0%	25.4%	16.0%	10.3%	8.1%	21.9%
Cum.	5	14	29	84	200	273	320	357	457
Cum. %	1.1%	3.1%	6.3%	18.4%	43.8%	59.7%	70.0%	78.1%	100.0%

Table 2: Summary Statistics: Relocating HQ vs. Staying Start-ups

This table reports the means of each variable, distinguishing between start-ups relocating their HQ during the sample period and staying start-ups. Start-ups are categorized "Relocating HQ" if they moved their HQ across borders during the VC funding period, and "Staying" otherwise. Panel A reports means of start-up characteristics measured at first funding for the full sample of 11,074 start-ups. Panel B reports start-up outcomes as of 3/2020. Panel C reports employment statistics for the subsample of start-ups that exit via U.S. IPO. All variables are defined in the Appendix. The last column reports t-statistics of two-sample t-tests for equality of means. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Relocating HQ start-ups		Staying start-ups		Test for diff.
	Obs.	Mean	Obs.	Mean	(t-stat)
Panel A: Start-up characteristics at first funding					
First round: Amount raised (USDm)	457	5.59	10617	5.76	−0.14
First round: Pre-money valuation (USDm)	99	10.90	3259	15.62	−0.51
First round: Revenue (USDm)	46	3.66	1464	14.07	−0.71
First round: Employees	154	27.32	3511	50.09	−1.13
First round: Foreign VC involved	457	0.53	10617	0.24	13.86***
First round: U.S. VC involved	457	0.31	10617	0.08	16.74***
First round: Number of VCs investing	456	2.38	10552	1.97	6.77***
First round: Serial entrepreneur	457	0.11	10617	0.05	6.14***
First round: Start-up age	457	2.40	10617	2.60	−1.63
Industry: Software	457	0.36	10617	0.22	7.19***
Industry: Healthcare	457	0.13	10617	0.18	−2.77 ***
Panel B: Start-up outcomes					
Total VC rounds	457	3.01	10617	2.04	15.06***
Total VC raised (USDm)	457	29.51	10617	13.67	6.64***
IPO	457	0.03	10617	0.04	−1.14
Successful exit (IPO or acq>1.5VC raised)	457	0.11	10617	0.11	0.19
Valuation at IPO (USDm)	15	1449.00	449	348.60	2.50**
Valuation at successful exit (USDm)	51	785.10	1138	205.60	3.69***
Age at HQ relocation	457	3.92	0	.	.
Age at IPO	15	11.13	466	8.28	2.57**
Panel C: Subsample of start-ups exiting via U.S. IPO					
# Start-ups with U.S. IPO	12		33		
Total employees at U.S. IPO	12	438.00	33	478.88	0.16
Share employees in U.S. at U.S. IPO	12	0.71	33	0.26	4.02***

Table 3: Venture Capitalists Involved in Relocating Start-ups

This table reports the venture capitalists (VCs) which are most frequently involved in start-ups relocating across borders. The sample consists of 11,074 start-ups from 17 European countries that received venture capital financing from a European fund between 2000 and 2014 according to VentureSource. The table lists all VCs that invested in at least six start-ups relocating HQ across borders in the sample as well as the total start-ups they backed.

VC investor	Country	Relocating start-ups backed	Total start-ups backed	Relocating start-ups as share of Total [in %]
Index Ventures	Switzerland	32	142	22.5
Intel Capital	United States	20	84	23.8
Accel Partners	United States	16	79	20.3
Enterprise Ireland	Ireland	16	202	7.9
Balderton Capital Management LLP	United Kingdom	15	73	20.5
Wellington Partners	Germany	13	88	14.8
Idinvest Partners	France	11	119	9.2
Kima Ventures	France	11	58	19.0
Amadeus Capital Partners Ltd.	United Kingdom	10	58	17.2
Draper Esprit LLP	United Kingdom	10	58	17.2
Oseo	France	10	129	7.8
Sunstone Capital A/S	Denmark	10	73	13.7
Y Combinator	United States	10	14	71.4
Atlas Venture	United States	9	72	12.5
Bpifrance Investissement SAS	France	9	201	4.5
Draper Fisher Jurvetson	United States	9	23	39.1
Kreos Capital	United Kingdom	9	60	15.0
Benchmark Capital	United States	8	41	19.5
Earlybird Venture Capital GmbH	Germany	8	49	16.3
Venture Capital Investment Man.	United Kingdom	8	33	24.2
3i Group PLC	United Kingdom	7	321	2.2
Andreessen Horowitz	United States	7	8	87.5
Bessemer Venture Partners	United States	7	22	31.8
Dawn Capital LLP	United Kingdom	7	24	29.2
High-Tech Gruenderfonds GmbH	Germany	7	218	3.2
Northzone Ventures AS	Norway	7	78	9.0
Octopus Ventures	United Kingdom	7	76	9.2
Runa Capital	United States	7	30	23.3
AIB Seed Capital Fund	Ireland	6	48	12.5
Alven Capital SA	France	6	64	9.4
Business Finland	Finland	6	64	9.4
Cisco Systems	United States	6	21	28.6
Creandum	Sweden	6	41	14.6
Deutsche Telekom Strategic Inv.	Germany	6	51	11.8
Greylock Management Corporation	United States	6	19	31.6
Omnes Capital	France	6	134	4.5
SV Angel	United States	6	8	75.0
Sofinnova Partners SAS	France	6	84	7.1
Tuesday Capital LLC	United States	6	8	75.0

Table 4: Foreign VC Involvement: Covariate Balance in Full and Matched Samples

This table compares the characteristics of start-ups receiving (treatment) and not receiving (control) foreign VC or U.S. VC backing in their first VC round. A start-up is classified as *Foreign/U.S. VC*-backed if at least one VC headquartered in a foreign country/the U.S. participated in the first VC funding. Panel A reports means for the full sample of 11,074 start-ups. Panel B reports CEM-weighted means for the matched sample. All variables are defined in the Appendix. The last column reports t-statistics of two-sample t-tests for equality of means. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Foreign VC in first round?					U.S. VC in first round?				
	Start-ups with foreign VC		Start-ups without foreign VC		Test for diff. (t-stat)	Start-ups with U.S. VC		Start-ups without U.S. VC		Test for diff. (t-stat)
	Obs.	Mean	Obs.	Mean		Obs.	Mean	Obs.	Mean	
Panel A: Full Sample										
Variables used in the CEM procedure										
First round: Amount raised (USD m)	2,826	12.82	8,248	3.34	16.63***	1,030	21.16	10,044	4.18	19.95***
First round: Number of VCs investing	2,826	2.53	8,182	1.80	26.98***	1,030	2.88	9,978	1.89	24.31***
First round: Serial entrepreneur	2,826	0.07	8,248	0.04	6.58***	1,030	0.10	10,044	0.04	7.87***
First round: Start-up age	2,826	2.48	8,248	2.63	-2.72***	1,030	2.33	10,044	2.62	-3.48***
First round: Generating revenue	2,826	0.59	8,248	0.62	-3.19***	1,030	0.57	10,044	0.62	-3.16***
Industry: Software	2,826	0.23	8,248	0.22	0.35	1,030	0.22	10,044	0.22	-0.16
Industry: Healthcare	2,826	0.17	8,248	0.17	-0.17	1,030	0.16	10,044	0.17	-1.02
Variables not used in the CEM procedure										
First round: Pre-money valuation (USD m)	828	29.58	2,530	10.86	5.14***	255	48.55	3,103	12.76	6.04***
First round: Revenue (USD m)	343	24.19	1,167	10.69	2.25**	113	29.34	1,397	12.50	1.76*
First round: Employees	955	71.57	2,710	41.23	3.29***	341	75.18	3,324	46.47	2.06**
Start-up outcomes										
Headquarter relocation	2,826	0.09	8,248	0.03	13.86***	1,030	0.14	10,044	0.03	16.74***
Panel B: Matched Sample										
Variables used in the CEM procedure										
First round: Amount raised (USD m)	2,027	7.12	5,487	7.61	-0.48	716	11.13	3,700	10.76	0.21
First round: Number of VCs investing	2,027	2.03	5,483	2.02	0.39	716	2.35	3,697	2.34	0.24
First round: Serial entrepreneur	2,027	0.03	5,487	0.03	0.00	716	0.04	3,700	0.04	0.00
First round: Start-up age	2,027	2.47	5,487	2.55	-1.26	716	2.27	3,700	2.39	-1.16
First round: Generating revenue	2,027	0.62	5,487	0.62	0.00	716	0.61	3,700	0.61	0.00
Industry: Software	2,027	0.22	5,487	0.22	0.00	716	0.21	3,700	0.21	0.00
Industry: Healthcare	2,027	0.16	5,487	0.16	0.00	716	0.16	3,700	0.16	0.00
Variables not used in the CEM procedure										
First round: Pre-money valuation (USD m)	615	22.72	1,716	27.47	-0.64	182	37.35	1,077	35.73	0.11
First round: Revenue (USD m)	234	14.30	773	12.91	0.29	73	17.55	489	25.62	-0.51
First round: Employees	701	56.78	1,826	82.85	-1.46	234	59.94	1,356	91.6	-1.13
Start-up outcomes										
Headquarter relocation	2,027	0.08	5,487	0.03	9.89***	716	0.13	3,700	0.04	11.19***

Table 5: Foreign VC and Headquarter Relocation: Naïve Regression

This table presents unweighted linear regression results. *Headquarter relocation* is an indicator of whether the start-up relocated its headquarters (HQ) within three years after the first VC funding. *Foreign/U.S. VC in first round* is an indicator variable that takes the value of one if a start-up received funding from at least one Foreign/U.S. VC in its first VC funding and zero otherwise. All other variables are defined in the Appendix. LN denotes the natural logarithm of a variable incremented by one. Fixed effects include the initial home country, the industry, and the year of the first VC investment of the start-up. Constants are included in all regressions. Robust standard errors clustered at the country level are shown in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Headquarter relocation	
	(1)	(2)
Foreign VC in first round	0.051***	
	(0.006)	
U.S. VC in first round		0.098***
		(0.018)
LN Amount raised (USD m) in first round	0.003**	0.003*
	(0.001)	(0.001)
Serial entrepreneur	0.039***	0.036***
	(0.010)	(0.009)
LN Number of VC investors in first round	0.019***	0.017**
	(0.006)	(0.006)
LN Start-up age in first round	-0.006**	-0.005*
	(0.002)	(0.002)
Generating revenue in first round	-0.001	-0.001
	(0.004)	(0.004)
Observations	11,008	11,008
R-squared	0.036	0.043
Funding year FE	Yes	Yes
Industry FE	Yes	Yes
Country FE	Yes	Yes

Table 6: Foreign VC and Headquarter Relocation: CEM-Weighted Regression

This table presents CEM-weighted linear regression results. *Headquarter relocation* is an indicator of whether the start-up relocated its headquarters (HQ) within three years after the first VC funding. *Foreign/U.S. VC in first round* is an indicator variable that takes the value of one if a start-up received funding from at least one Foreign/U.S. VC in its first VC funding and zero otherwise. Controls include the same start-up characteristics as those listed in Table 5. Fixed effects include the initial home country, the industry, and the year of the first VC investment of the start-up. Constants are included in all regressions. Robust standard errors clustered at the country level are shown in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Headquarter relocation	
	(1)	(2)
Foreign VC in first round	0.049***	
	(0.004)	
U.S. VC in first round		0.103***
		(0.018)
Observations	7,510	4,400
R-squared	0.036	0.059
Controls	Yes	Yes
Funding year FE	Yes	Yes
Industry FE	Yes	Yes
Country FE	Yes	Yes

Table 7: Foreign VC and Headquarter Relocation: Panel Data Analysis

This table shows the results of panel data regressions with start-up fixed effects. The observation level is the start-up-year. Each start-up enters the sample in the year of its first VC round and drops from the sample if it exits (IPO or acq.), does not receive funding in five consecutive years, or 2020, whichever is earlier. The dependent variable is an indicator of whether a start-up relocated HQ in that year. The variables of interest are indicator variables that take the value of one if a start-up received funding from at least one *Foreign/U.S. VC*, in a year and zero otherwise. Controls include a dummy variable indicating whether the start-up received a financing round in a year. Fixed effects for the start-up and the year of the first VC investment of the start-up are included. Constants are included in all regressions. Robust standard errors clustered at the start-up level are shown in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Headquarter relocation this year?	
Treatment:	Foreign VC	U.S. VC
	(1)	(2)
Treatment in 2 years	-0.002	-0.002
	(0.001)	(0.003)
Treatment in 1 year	0.002	0.006**
	(0.001)	(0.002)
Treatment this year	0.010***	0.022***
	(0.002)	(0.003)
Treatment 1 year prior	0.005***	0.010***
	(0.001)	(0.002)
Treatment 2 years prior	0.006***	0.006***
	(0.001)	(0.002)
Treatment 3 years prior	0.004***	0.005***
	(0.001)	(0.002)
Financing round in 2 years	0.002***	-0.001
	(0.001)	(0.001)
Financing round in 1 year	0.002***	0.002***
	(0.000)	(0.001)
Financing round this year	0.004***	0.004***
	(0.000)	(0.001)
Financing round 1 year prior	0.004***	0.004***
	(0.000)	(0.001)
Financing round 2 years prior	0.002***	0.003***
	(0.000)	(0.001)
Financing round 3 years prior	0.002***	0.002***
	(0.000)	(0.000)
Observations	142,074	142,074
R-squared	0.268	0.269
Firm FE	Yes	Yes
Year FE	Yes	Yes

Table 8: Foreign VC and Headquarter Relocation: Instrumental Variable

This table presents a placebo test and instrumental variable regression results. Headquarter relocation is an indicator of whether the start-up relocated its headquarters (HQ) within three years after the first VC funding. *Foreign/U.S. VC in first round* is an indicator variable that takes the value of one if a start-up received funding from at least one Foreign/U.S. VC in its first VC funding and zero otherwise. Foreign/U.S. VC in first round are instrumented by the market share of foreign/U.S. VCs, defined as the number of deals with at least one foreign/U.S. VC divided by all deals in the same country-year combination in which the start-up was first funded (except the focal start-up). Columns (1), (5), and (6) present the reduced form, first stage, and second stage results, respectively. Columns (2) and (3) regress Total VC funding (USDm) and IPO on the instruments. Fixed effects include the initial home country, the industry, and the year of the first VC investment of the start-up. Constants are included in all regressions. Robust standard errors clustered at the country level are shown in parentheses. 'IV F-Stat' refers to the F-statistic on excluded instruments. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Foreign VC					
	HQ relocation	LN Total VC funding ($m)	IPO	HQ relocation	Foreign VC in first round	HQ relocation
	(OLS)	(OLS)	(OLS)	(OLS)	(IV: 1st)	(IV: 2SLS)
Market share of foreign VCs in other start-ups funded in same country-year	0.067**	0.332	-0.067**		0.927***	
	(0.030)	(0.655)	(0.028)		(0.093)	
Foreign VC in first round		1.175***	0.025***	0.059***		0.072**
		(0.082)	(0.005)	(0.006)		(0.031)
Observations	11,074	11,074	11,074	11,074	11,074	11,074
R-squared	0.012	0.137	0.026	0.032	0.051	0.027
IV F-stat					98.396	
Controls	No	No	No	No	No	No
Funding Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
	Panel B: U.S. VC					
	HQ relocation	LN Total VC funding ($m)	IPO	HQ relocation	Foreign VC in first round	HQ relocation
	(OLS)	(OLS)	(OLS)	(OLS)	(IV: 1st)	(IV: 2SLS)
Market share of U.S. VCs in other start-ups funded in same country-year	0.139**	0.254	-0.063		0.634***	
	(0.060)	(0.792)	(0.046)		(0.085)	
U.S. VC in first round		1.431***	0.028***	0.109***		0.219**
		(0.070)	(0.008)	(0.018)		(0.091)
Observations	11,074	11,074	11,074	11,074	11,074	11,074
R-squared	0.013	0.105	0.025	0.041	0.028	0.011
IV F-stat					55.498	
Controls	No	No	No	No	No	No
Funding Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Foreign VC and Headquarter Relocation: Adding VC Reputation

This table repeats unweighted linear regression of Table 5 when adding measures of VC reputation. *Experienced VC* is an indicator of whether at least one first round VC is in the 90th percentile for the number of investments made among all VCs in our sample in the three years before the start-up's first round. *Successful VC* is an indicator of whether at least one "successful VC" participated in a start-up's first funding. A VC is "successful" if it is in the 90th percentile of the success rate (i.e., share of investments that exited via IPO or acquisition) based on all investments in the three years before investing in the start-up. *Central VC* is an indicator of whether at least one first round VC is in the 90th percentile of the distribution of eigenvector centrality in the global VC syndication network in the year of first funding. Controls include the same start-up characteristics as those listed in Table 5. Fixed effects include the initial home country, the industry, and the year of the first VC investment of the start-up. Constants are included in all regressions. Robust standard errors clustered at the country level are shown in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Headquarter relocation						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Experienced VC in first round	0.019***			-0.009	-0.007	-0.009	-0.007
	(0.005)			(0.005)	(0.005)	(0.005)	(0.005)
Successful VC in first round		0.068***		0.043**	0.034*	0.042**	0.031
		(0.020)		(0.018)	(0.018)	(0.018)	(0.018)
Central VC in first round			0.061***	0.047***	0.041***		
			(0.014)	(0.012)	(0.011)		
Foreign VC in first round				0.036***			
				(0.007)			
U.S. VC in first round					0.079***		
					(0.015)		
Foreign x Central VC in first round						0.086***	
						(0.017)	
Foreign x Non-Central VC in first round						0.034***	
						(0.007)	
Domestic x Central VC in first round						0.040***	
						(0.013)	
U.S. x Central VC in first round							0.131***
							(0.020)
U.S. x Non-Central VC in first round							0.060***
							(0.017)
Non-U.S. x Central VC in first round							0.033***
							(0.011)
Observations	11,008	11,008	11,008	11,008	11,008	11,008	11,008
R-squared	0.027	0.030	0.036	0.043	0.049	0.043	0.049
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: Foreign VC and Headquarter Relocation: Decomposing Destinations

This table presents unweighted linear regressions when decomposing HQ relocations and foreign/U.S. VCs in more detailed geographies. Panel A regresses relocations to *Non-U.S. foreign countries/U.S.* on the incidence of *Non-U.S. foreign/U.S. VCs* in the first funding round. Panel B regresses relocations to different U.S. states (i.e., California (CA), New York (NY), Massachusetts (MA), and others) on the incidence VCs from different U.S. states in the first funding round. Controls include the same variables as in Table 5. Fixed effects include the initial home country, the industry, and the year of the first VC investment of the start-up. Constants are included in all regressions. Robust standard errors clustered at the country level are shown in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Non-U.S. vs. U.S.

	Headquarter relocated to:			
	Non-U.S. foreign country		U.S.	
	(1)	(2)	(3)	(4)
Non-U.S. foreign VC in first round	0.012***		-0.007*	
	(0.004)		(0.004)	
U.S. VC in first round		0.001		0.097***
		(0.003)		(0.017)
Observations	11,008	11,008	11,008	11,008
R-squared	0.009	0.006	0.026	0.046
Controls	Yes	Yes	Yes	Yes
Funding year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Panel B: Within U.S.

	Headquarter relocated to:			
	U.S. (CA)	U.S. (NY)	U.S. (MA)	U.S. (Other)
	(1)	(2)	(3)	(4)
U.S. (CA) VC in first round	0.199***	0.003	-0.003	0.017*
	(0.025)	(0.008)	(0.004)	(0.010)
U.S. (NY) VC in first round	0.009	0.086***	0.007	0.006
	(0.018)	(0.024)	(0.009)	(0.012)
U.S. (MA) VC in first round	0.032	-0.015***	0.040*	0.021
	(0.025)	(0.005)	(0.022)	(0.019)
U.S. (Other) VC in first round	0.010	-0.001	0.005	0.019***
	(0.007)	(0.003)	(0.004)	(0.007)
Observations	11,008	11,008	11,008	11,008
R-squared	0.074	0.025	0.010	0.012
Controls	Yes	Yes	Yes	Yes
Funding year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Table 11: Heterogeneity of the Foreign VC Effect

This table presents results of the baseline CEM-weighted estimates as per Table 6 when interacting the Foreign/U.S. VC treatment with different variables. Panel A interacts the treatment with an indicator of whether the start-up generated revenues as of the financing. Panel B interacts the treatment with a proxy for VC market development. VC market development is proxied by the ratio of total VC investment (according to VentureSource) to GDP (according to Datastream) in the country and year of first financing. Panel C interacts the treatment with a proxy for home market size (i.e. GDP). Panel D interacts the treatment with an indicator of whether a domestic VC participated in the funding. Robust standard errors clustered at the country level are shown in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Headquarter relocation			
Treatment:	Foreign VC		U.S. VC	
	(1)	(2)	(3)	(4)
Panel A: Generating revenue				
Treatment	0.064***	0.064***	0.139***	0.144***
	(0.010)	(0.011)	(0.034)	(0.035)
Treatment x Generating revenue	-0.022**	-0.024**	-0.064*	-0.068*
	(0.009)	(0.010)	(0.035)	(0.035)
Generating revenue	0.005	0.013*	-0.002	0.005
	(0.006)	(0.007)	(0.009)	(0.009)
Panel B: VC market development (VC investment / GDP)				
Treatment	0.061***	0.060***	0.144***	0.146***
	(0.007)	(0.008)	(0.017)	(0.015)
Treatment x (VC investment / GDP)	-8.276***	-8.619***	-30.906***	-31.120***
	(2.304)	(2.384)	(6.305)	(5.157)
VC investment / GDP	0.349	2.810	-1.371	13.180*
	(3.792)	(3.102)	(9.295)	(7.161)
Panel C: Home market size (GDP)				
Treatment	0.061***	0.062***	0.138***	0.132**
	(0.016)	(0.017)	(0.043)	(0.045)
Treatment x GDP	-0.007	-0.007	-0.019	-0.015
	(0.008)	(0.008)	(0.018)	(0.019)
GDP	-0.006*	-0.065	-0.007	-0.042
	(0.003)	(0.039)	(0.004)	(0.046)
Panel D: Domestic VC involved				
Treatment	0.049***	0.050***	0.097***	0.104***
	(0.010)	(0.011)	(0.024)	(0.025)
Treatment x Domestic VC	0.004	-0.002	0.009	-0.002
	(0.013)	(0.015)	(0.028)	(0.029)
Observations	7,514	7,510	4,416	4,413
Controls	Yes	Yes	Yes	Yes
Funding year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

A Appendix

A.1 Geographical footprint of companies that went public via U.S. IPO

To determine the extent to which startups that relocate their headquarters also relocate overall, we take advantage of the fact that all companies that file for listing on a stock exchange in the U.S. provide information on their geographic footprint. Companies filing for an initial public offering (IPO) in the U.S. must file an S-1 public filing with the U.S. Securities and Exchange Commission (SEC). All such filings are publicly available online on the SEC's EDGAR file system for all filings since 1996. We retrieved the filings for all companies in our sample that went public in the U.S. from https://www.sec.gov/edgar/searchedgar/companysearch.html (last accessed on 23/08/2021). Of the 47 companies in our sample going public in the U.S., 22 explicitly state the geographic distribution of their employees. For the 25 remaining companies, we take advantage of the fact that all companies provide the space of their main facilities (in square feet in section 'Facilities') and calculate the distribution of employees according to the distribution of their main facilities.

Table A1: Variable Definitions

The table reports descriptions of variables used in the regression analysis.

Variable	Description
First round variables	
Foreign VC in first round	At least one foreign VC participated in the financing
U.S. VC in first round	At least one U.S. VC participated in the financing
First round: Amount raised (USD m)	Amount raised in the financing in 2012 U.S. dollars
First round: Pre-money valuation (USD m)	Pre-money valuation at the financing in 2012 U.S. dollars
First round: Revenue (USD m)	Revenue reported by start-up at financing in 2012 U.S. dollars
First round: Employees	Number of employees at start-up at financing
First round: Number of VCs investing	The number of investors involved in the financing
First round: Serial entrepreneur	At least one serial entrepreneur is involved in the start-up
First round: Start-up age	Age of the start-up at financing
First round: Generating revenue	Start-up reported revenues at financing
Industry: Software	Start-up industry is software
Industry: Healthcare	Start-up industry is health care or biotechnology
Market share of foreign VCs among other start-ups funded in same country-year	Ratio of deals with at least one foreign VC to all deals (excl. the focal start-up), in the same country and year as of the start-up's first funding
Market share of U.S. VCs among other start-ups funded in same country-year	Ratio of deals with at least one U.S. VC to all deals (excl. the focal start-up), in the same country and year as of the start-up's first funding
Central VC in first round	At least one VC participated that is in the 90th percentile of the distribution of eigenvector centrality in the VC syndication network based on all investments in the three years before the financing
Experienced VC in first round	At least one VC participated that is in the 90th percentile for the number of investments made among all VCs in our sample in the three years before the financing.
Successful VC in first round	At least one VC that is in the 90th percentile of the success rate (i.e., share of investments that exited via IPO or acquisition) based on all investments in the three years before the financing
VC investment / GDP	The ratio of total VC investment (according to VentureSource) to GDP (according to Datastream) in the country and year of the start-up's first funding
Start-up outcomes	
Headquarter relocation	Start-up relocated ist headquarters (HQ) during the VC fundraising period, i.e., after start and before exit, or 2020 if no exit occured.
Total VC rounds	The number of financing rounds raised by the start-up
Total VC raised (USD m)	The total VC amount raised by the start-up across all rounds in 2012 U.S. dollars
IPO	Start-up exited via IPO
Successful exit (IPO or acq.¿1.5 VC raised)	Start-up exited via IPO or acquisition with deal value higher than 1.5 times total VC raised
Valuation at IPO (USD m)	Start-up valuation at IPO, i.e. first day closing price times shares outstanding, in 2012 U.S. dollars
Valuation at successful exit (USD m)	If start-up exited via IPO, first day closing price times shares outstanding; if start-up exited via "successful acquisition", i.e. deal value higher than 1.5 times total VC raised, deal value [in 2012 U.S. dollars]
Fixed effects	
Funding year FE	First VC financing year fixed effects
Industry FE	Start-up industry fixed effects: "Software", "Hardware", "Healthcare/Biotech", "Consumer/Retail", "Other"
Country FE	Country fixed effects for the initial HQ-country of the start-up

Table A2: Oster (2019)-Test for Size of Unobservables to Set Effect to Zero

This table shows the results of the bounding method according to Oster (2019). Under the assumption that 1) the relationship between treatment and observables is proportional to the relationship between treatment and unobservables, and 2) the upper bound of the variation R^2_{max} is $1.3R^2$, which Oster empirically derives from comparing experimental vs. observational studies, then it is possible to provide the required size of unobservables to make the effect be of a certain value, e.g., zero.

	Foreign VC	U.S. VC
Baseline regressions		
Baseline effect, (Std. err.), [R^2]	0.059 (0.006) [0.017]	0.107 (0.020) [0.025]
Controlled effect, (Std. err.), [R^2]	0.051 (0.006) [0.036]	0.098 (0.018) [0.043]
Oster (2019)-bounds		
Bias-adjusted β	0.044	0.089
Degree of selection on unobservables relative to observables to set effect to zero (i.e., δ^*)	2.841	3.141
Max R^2 to set effect to zero	0.085	0.123

Table A3: Foreign VC Effect over Time

The table reports CEM-weighted effects as per Table 6 in different subsamples. Start-ups are split into subsamples according to their year of first funding, i.e. 2000-2005, 2006-2010, and 2011-2014.

	Headquarter relocation					
	Start-up first funded			Start-up first funded		
	2000-2005	2006-2010	2011-2014	2000-2005	2006-2010	2011-2014
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign VC in first round	0.035***	0.061***	0.064***			
	(0.008)	(0.016)	(0.013)			
U.S. VC in first round				0.075***	0.130***	0.117***
				(0.018)	(0.034)	(0.024)
Observations	3,427	1,835	2,248	1,725	1,094	1,594
R-squared	0.030	0.067	0.050	0.043	0.112	0.071
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Funding year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes