A Work Project, presented as part of the requirements for the Award of a Master's

degree in Management from the Nova School of Business and Economics.

ARE THE NEW STARTUP ECOSYSTEMS ABLE TO OVERCOME THE GEOGRAPHIC CONCENTRATION ON VENTURE CAPITAL INVESTMENTS?

Pedro Filipe Esteves Mota

26132

Work project carried out under the supervision of:

Francisco Queiró

03-01-2020

ARE THE NEW STARTUP ECOSYSTEMS ABLE TO OVERCOME THE GEOGRAPHIC CONCENTRATION ON VENTURE CAPITAL INVESTMENTS?

Abstract

This study assesses the geographic concentration of venture capital (VC) investments. Using Crunchbase's data from 1998 to 2019, the research finds that top-VCs investments lead to more local successful exits and at higher valuations. Successful entrepreneurs' investments do not necessarily increase local exits, but they lead to higher exit valuations. It is not possible to infer that successful US exits will persistently signal top and non-top VCs to invest in local hubs, but the effects seem to be significant in the year of the exit. Investments from successful entrepreneurs are not relevant drivers for the increase of VC deals.

Section 1 - Introduction

Young and promising companies face uncertain prospects, with long periods of negative cash flows, and hold mainly intangible assets, which increases asymmetric information. Thus, venture capitalists (VCs) are oftentimes their only possible source of financing (Gompers & Lerner, 1998). VCs also add value to their portfolio firms by improving their strategy, getting access to clients and suppliers, recruit talent, among other vital monitoring activities to a successful exit (Metrick & Yasuda, 2011).

Venture Capital is praised by local governments and civil society because it spurs innovation. For example, it accounted for 8% to 14% of the U.S. innovative activity between 1992 to 1998 (Kortum & Lerner, 2000). Consequently, VC activity is also associated with stronger economic growth (Kolmakov et al., 2015). Furthermore, successful companies, like Amazon, Microsoft, Google, and Facebook were VC-backed in earlier stages (AngelList, 2019). Hence, cities worldwide want to stimulate entrepreneurship and VC activity to create their own Silicon Valley.

The US was the pioneer of Venture Capital. The first modern VC firm, American Research and Development Corporation, was founded in 1946 in Boston. This early adoption of VC and the vigorous high-tech sector in Silicon Valley concentrated the VC sector in the US (Lerner, 2009), especially in three hubs: San Francisco Bay Area, New York, and Boston (Chen et al., 2010). In fact, until the mid-1990s, almost the entire global VC investments were focused in the US. However, entrepreneurial hubs are proliferating worldwide, particularly in Asia (ex. Beijing, Shanghai, Bangalore, Delhi, Singapore) and Europe (ex. Paris, London, Berlin, Stockholm). Still, the US concentrated half of the global VC market in 2017 (Florida & Hathaway, 2018).

Although many global entrepreneurial hubs are growing fast, some of their best-performing ventures are relocating abroad, mainly to the US. Those firms seek to attract later-stage financing, exit through IPO, secure superior resources, reach a larger customer base, access to learning opportunities or to operate in a more corporate-friendly legal environment (Cumming et al., 2009). For instance, 14% of fast-growing European high-tech startups have moved their headquarters abroad. Most of those firms (83%) relocated to the US, especially to Silicon Valley and New York (Onetti & Glazer, 2017).

Hence, it is important to understand if these emerging hubs can achieve and sustain enough scale to overcome the concentration of the three leading US hubs. Will they be able to avoid the relocation of their most promising ventures? Can they fund larger late-stage rounds and secure larger exit valuations?

The thesis will focus on answering these questions. The rest of the research is organized in the following way. Section 2 discusses the relevant literature about venture capitalists' decision process, the geographic concentration of VC investments and venture relocation. In section 3 is discussed the hypotheses. Section 4 describes the data and methodology. Section 5 examines the empirical findings. Whereas, in section 6 is presented the conclusion, main implications and potential limitations of this study.

Section 2 - Literature review

There is already extensive literature about the geographic concentration of venture capital and the decision-making process of venture capitalists and entrepreneurs. However, there are not many studies regarding young ventures' relocation and the development of local entrepreneurial ecosystems. Thus, it is important to complement the existing literature to better understand the reasons for ventures' relocation and local entrepreneurial hubs development.

Performance Persistence

Kerr et al. (2014) state that VC is an industry-driven by hits: 55% of VC-backed firms terminate at a loss, while 6% of them represent 50% of the industry's gross returns. Due to this uncertainty, VCs implement an experimentation process to assess a project's commercial feasibility without investing the full amount at once. After VCs identify hit companies, they invest larger amounts to scale them up.

Chen et al. (2010) note there is a larger availability of funding in Silicon Valley, Boston, and New York due to performance persistence. On one hand, VCs want to be in areas that offer the highest concentration of profitable investments. Hence, they locate in regions that have been historically performing better. On the other hand, founders choose to locate their businesses closer to funding sources, talented human resources, and research centers. Consequently, more entrepreneurs move to the leading hubs, which brings more good opportunities for VCs that invest more in those hubs. Therefore, both VCs and VC-backed firms based on the three leading US hubs outperform their peers.

Geographic Concentration

Venture Capitalists tend to demonstrate a "strong local bias in their investment decisions" (Cumming & Dai, 2010). Thus, the further a potential target is from a VC, the lower the odds of securing funding (Sorenson & Stuart, 2001). Prijcker et al. (2019) concluded that ventures that relocate to California or Massachusetts have a greater probability of attracting initial VC investment than firms that stay in their home state.

Typically, VCs concentrate their investments in a specific hub to monitor better their portfolio companies in a cost-efficient way, as they can visit on-site several firms with reduced transportation and monitoring costs (Chen et al., 2010). Moreover, if

portfolio companies were geographically dispersed, VCs would have less time available for each of them (Knill, 2009).

Furthermore, investing abroad translates into more information asymmetries due to cultural and legal differences between the VC's and target's countries (Kolympiris et al., 2018). Consequently, VCs tend to demand higher standards for their overseas targets, in terms of business experience or patent applications (Kolympiris et al., 2018). Hence, around 50% of VC firms just focus in a specific region (Gompers et al., 2018), and most international VCs invest in countries institutionally similar to their own (Vedula & Matusik, 2017). Nevertheless, once VCs invested in a venture of a specific country, there is a higher chance they will fund other firms of that hub (Sorenson & Stuart, 2001).

However, VCs tend to follow their peers regarding international investments (Sorenson & Stuart, 2001; Vedula & Matusik, 2017). If a syndicate partner invests in an overseas venture, VCs are more likely to co-invest because they trust their peers' judgment. Therefore, VC firms tend to use their syndicate partners to "identify, screen, and monitor potential investments in distant locations" (Sorenson & Stuart, 2001). Nevertheless, if there are more good investment opportunities in their local markets, VCs tend to seize those deals, instead of investing abroad (Vedula & Matusik, 2017).

Medcalfe and Thompson (2017), and Ballinger et al. (2016) argue that the concentration of VC investments in the US follows a long-run upward trend. Hence, efforts to attract VC investments for other hubs may just result in temporary gains, as any shock is only transitory. Tough these findings could be accurate for the United States, they are not necessarily valid globally. Recent data indicates that other overseas hubs are gaining ground. For example, Beijing was responsible for 20% of global VC investment growth between 2015-2017, whereas San Francisco was responsible for 16% (Florida & Hathaway, 2018).

Experienced top-VCs

Successful VCs (measured by the number of IPOs) and with more active funds make more international investments (Vedula & Matusik, 2017). Lerner (2009) argues that global investors are vital to a dynamic entrepreneurial hub because they bring more capital, sophistication, experience, and scale. Therefore, they provide superior value-added monitoring and networking ties for their portfolio firms. As a result, their investee firms tend to raise more funding and have more successful exits than startups that only receive local VC funding (Espenlaub et al., 2015; Kong et al., 2016). Besides, if a hub has predominantly local VCs with small funds, there will be constraints to finance firms in later stages. Consequently, ventures relocate to other hubs with larger availability of capital (Gompers & Lerner, 1998; Cumming et al., 2009; Kong et al., 2016).

Nevertheless, Devigne et al. (2013) claim that the most successful VC-backed firms in terms of growth are the ones that are initially funded by a syndicate of domestic and cross-border VCs. On one side, domestic VCs have greater local knowledge, which enables them to overcome information asymmetries and provide early-stage support. On the other side, cross-border VCs have a better understanding of external markets and add legitimacy to the venture.

Social Capital and Native Entrepreneurs

Entrepreneurs tend to locate in regions where they have lived longer because of their "home-field advantage" and greater social capital (Figueiredo et al., 2002; Dahl & Sorenson, 2012). However, these studies focused only on Portuguese and Danish firms from all sectors. Hence, their findings might neither apply to other regions, neither to fast-growing sectors that are the main receivers of VC funding.

Feldman (2014) advocates that social capital is the driver for the success of Silicon Valley. In her view, it is the cornerstone for the establishment of new technologies and hubs' development. Therefore, ecosystems' success is propelled by regional champions – individuals with social responsibility who, even though they are seeking for profit, want to improve their communities. Moreover, one of the appointed factors for the success of Silicon Valley was the role of local wealthy angel investors in financing infant ventures (Lerner, 2009).

Furthermore, the development of local entrepreneurial ecosystems is being accelerated by highly skilled expatriates that work in high-technology firms and VC industries worldwide. Those individuals are acting as angel investors, mentors, and partners in their native countries (Lerner, 2009; Saxenian, 2002). For instance, 22% of Indian-born entrepreneurs working in Silicon Valley invested in Indian Startups (Saxenian, 2002).

Section 3 - Theoretical Conclusions and Hypotheses

Emerging hubs that have been the home of successful startups, due to performance persistence, get more attention from VCs, entrepreneurs, and talented human resources. VC firms start considering that these hubs have a large concentration of profitable opportunities. Moreover, as the management team is considered by VCs as the decisive factor for a venture's success (Gompers et al., 2018), they tend to invest where there are entrepreneurs with a good reputation. Therefore, the following hypotheses are drawn:

H1a: Hubs that were the original location of successful ventures will draw more VC investment

H1b: Hubs that were the original location of successful ventures will draw more investment from top-VCs

Top-VCs provide better value-added monitoring support to their portfolio companies and have more successful exits. Therefore, if they invest directly in ventures' home hubs, they do not need to relocate in late stages due to capital constraints. As such, this hypothesis is presented:

H2: VC investments from top-VCs enhances local exits

Successful entrepreneurs with "social capital" use their experience as founders to help other fellow countrymen in their start-ups, while also profiting from it. Furthermore, they will use their "home-field advantage" to overcome information asymmetries, that other VC would not be able to. Thus, the following hypotheses are presented:

H3a: Investments led by native successful entrepreneurs will signal VC firms to invest in their home hubs

H3b: Investments led by native successful entrepreneurs will signal top-VC firms to invest in their home hubs

Successful entrepreneurs have greater knowledge in founding and managing a start-up from inception until exit. This experience could increase the odds of the success of their portfolio ventures. Hence, this hypothesis is drawn:

H4: VC Investments from native successful entrepreneurs enhances local exits

Section 4 – Data and Methodology

The data used in this study was extracted from Crunchbase's *research access* database. In terms of ventures analyzed, the following sampling criteria were applied: it was only considered firms that received VC investment from 1946 onwards; firms missing information about their location, founding date or funding size were excluded;

and ventures that failed (did not exit and closed) were also excluded. After these adjustments, the dataset englobed 93,287 ventures from 157 countries.

For the exits' analysis, it was only considered **successful exits** – exits through IPO or M&A higher than $50 million, adjusted for the 2018 US Consumer Price Index (source: Bureau of Labor Statistics). The resulting sub-sample consists of 3,679 VC-backed firms whose exit occurred between 1980 and 2018. Non-US ventures whose IPO was in a US stock exchange or that were acquired by American corporations were labeled as **US-exits**. Ventures whose IPO occurred in their country or were acquired by native companies were categorized as **local exits**. All other ventures were classified as **foreign-exits**. To guarantee robust results, it was only studied countries that had more than 8 US-Exits between 1998 and 2018. Thus, 12 countries were evaluated: Australia, Canada, China, France, Germany, India, Ireland, Israel, Netherlands, Sweden, Switzerland, and the UK.

Regarding VC deals analysis, it was considered **local VC deals** and local **top-VCs deals**. Top-VCs were defined as VCs with at least 10 successful exits. Following this criterion, there are 66 top-VCs (Sequoia Capital, Benchmark, Accel, Bessemer, etc.) out of 1,661 VC firms. In aggregate, the sampled ventures had 190,910 funding rounds, of which 6,115 had top-VCs as lead investors.

There are 62 **successful entrepreneurs-investors:** co-founders or c-level executives of ventures with successful exits that are also VC investors. Overall, they participated in 782 VC-funding rounds. In the database used, France, Netherlands, Sweden, and Switzerland had not successful entrepreneurs investing locally. Hence, it was not possible to analyze these countries for hypotheses 3a, 3b, and 4.

In table 1 is presented the summary of the main descriptive statistics of the 12 assessed countries and their respective totals.

Table 1 - Descriptive Statistics

	AUS	CAN	CHE	CHN	DEU	FRA	GBR	IND	IRL	ISR	NLD	SWE	Total
Number of Ventures	1,406	3,168	905	4,256	1,859	2,873	7,525	3,310	742	1,655	969	1,109	29,777
Local VC deals	2,518	6,412	1,938	7,734	3,620	5,079	15,460	5,894	1,428	3,360	1,755	2,397	57,595
Average number of Local VC deals per year	89.9	229.0	69.2	276.2	129.3	181.4	552.1	210.5	51.0	120.0	62.7	85.6	2,057
Median number of Local VC deals per year	17	94	20	81	55	90	186	35	20	61	10	25	711
Average VC deal size ($M)	10.8	11.5	13.1	68.1	22.2	9.1	10.2	21.4	17.2	8.6	10.2	8.3	20.1
Average rounds of financing	1.8	2.0	2.1	1.8	1.9	1.8	2.1	1.8	1.9	2.0	1.8	2.2	1.9
Top-VC deals	26	110	24	385	87	61	206	299	9	131	23	29	1,390
Average number of Top-VC deals per year	1.04	4.4	0.96	15.4	3.48	2.44	8.24	11.96	0.36	5.24	0.92	1.16	55.6
Median number of Top-VC deals per year	0	2	1	3	2	2	6	7	0	5	1	0	31
Average Top-VC deal size ($M)	81.4	32.6	68.0	139.9	44.9	46.6	40.1	59.2	11.1	16.6	41.3	36.8	70.7
Successful entrepreneurs	6	5	0	13	4	0	23	17	1	6	0	0	75
Average number of Investments per year	0.3	0.25	0	0.65	0.2	0	1.15	0.85	0.05	0.3	0	0	3.75
Median number of Investments per year	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Average Investment deal size ($M)	2.4	21.9	0	253.5	7.6	0	15.3	4.3	5.5	8.4	0	0	52.4
Number of Successful US-exits	17	40	17	107	22	20	84	8	17	66	15	12	425
Average number of US-exits per year	0.8	1.9	0.8	5.1	1.0	1.0	4.0	0.4	0.8	3.1	0.7	0.6	20.2
Median number of US-exits per year	0	1	0	3	0	1	3	0	1	2	0	0	15
Average US-exit size ($M)	847	337	2,120	4,335	306	356	621	2,310	2,327	887	2,225	4,846	1,887
Median US-exit size ($M)	259	307	255	819	284	156	321	274	769	440	1,307	2,751	761
Number of Sucessful Local-exits	13	21	6	47	18	24	77	29	4	17	6	5	267
Average number of Local-exits per year	0.6	1.0	0.3	2.2	0.9	1.1	3.7	1.4	0.2	0.8	0.3	0.2	12.7
Median number of Local-exits per year	0	0	0	1	0	1	2	0	0	0	0	0	5
Average Local-exit size ($M)	748	407	506	4,635	1,877	341	434	703	1,184	449	924	336	1,328
Median Local-exit size ($M)	224	247	209	945	444	187	339	468	1,165	372	424	245	580

To test the hypotheses, there were performed two event studies for each of them, with the aggregate values of the twelve assessed countries, to have a more precise and global understanding of the results. The first event study reflects a thinner time period (quarter by quarter) to evaluate if a certain variable has a direct and immediate effect on another one. Whereas, similar to other recent researches (Smith et al., 2019), the second event study analyses a longer time period (year by year).

In this way, it is possible to appraise if there is a significant relationship between the variables and if it is relevant. In other words, this analysis aims to infer if there is a significant change in the dependent variable's trend after the event (exit or VC deal), or if it keeps the same trend as before. Moreover, it allows testing the effects' persistence by looking at the results in the subsequent years of the event. To compute the event studies the following equation was followed:

$$Y_t = \alpha_k + \beta_k * x_{t+k} + \varepsilon$$

$$k \in \{-3, -2, -1, 0, 1, 2, 3\}$$

with t representing the year/quarter of the event and ε the error, which was assumed to follow a normal distribution

Table 2 identifies the independent and dependent variables considered for the analysis of each hypothesis.

Table 2 - Variables

Hypothesis	Dependent Variables	Independent Variables
H1a	Local VC Deals	Successful US-Exits
H1b	Top-VC Deals	Successful US-Exits
H2	Local Successful Exits	Top-VC Deals
H3a	Local VC Deals	Successful entrpreneurs-investors
H3b	Top-VC Deals	Successful entrpreneurs-investors
H4	Local Successful Exits	Successful entrpreneurs-investors

Section 5 – Empirical results

In this section are presented the research's findings that allow to validate or reject the hypotheses drawn. Appendixes A, B, C, and D have a summary of the results (regression coefficients, P-Values, and R-squared) of the tests executed to analyzed hypotheses H1 (a and b), H2, H3 (a and b), and H4, respectively.

US-exits and VC deals

As discussed in hypotheses 1a and 1b, in aggregate terms, hubs that were the original location of ventures with successful US-exits draw more VC investments from top and non-top VCs in the following years. Although the results are statistically significant (for a 95% confidence level) for both event studies, it is not possible to infer that the exits are the driver of hubs' growth, since the increasing trend is also observed in the periods before the exit moment (Graphs 1 to 4).

Nevertheless, for hypothesis 1a is observed that successful US exits might have a positive impact on local VC deals in the exit year. In the two years before, the aggregate VC sector was presenting an annual growth rate between 18.2% and 18.7%. Whereas in the year of the exit, local VC deals grow on average 21.5%. Thus, this 3% differential seems to be related by the positive signal effect that successful US exits have over VCs. Moreover, the exit year presents the most significant relationship between the two variables as it generated an R-squared (R^2) of 0.80, the largest of the seven periods

assessed (Appendix A – Table 4). This means that 80% of the variation in the number of local VC deals are explained by changes in the number of successful US-exits in that year. Hence, these results suggest that VCs infer that the original hub of a successful venture might have other good investing opportunities. Consequently, they increase their investments in that market, as it is proposed in the performance persistence theory (Chen et al., 2010).

These results could also suggest that VCs make late-stage investments some months before an exit. However, the thinner event study reveals that there are more VC deals in the subsequent quarters of an exit than in the previous ones. Therefore, this theory appears not to be valid.

Graph 1 - US exits and VC deals

Graph 2- US exits and VC deals
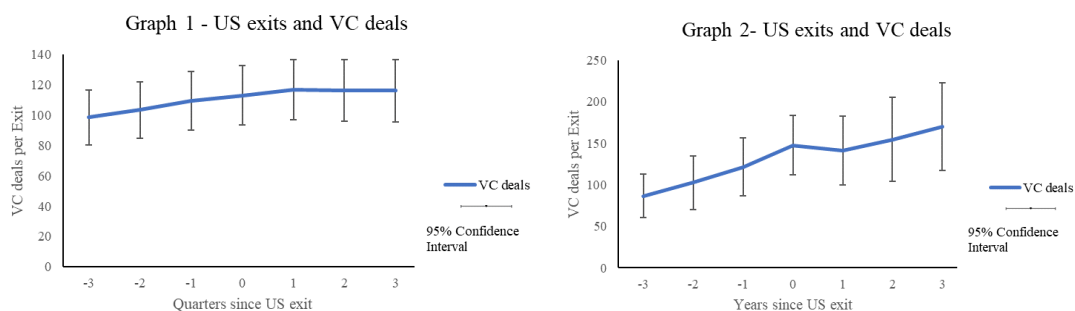
For hypothesis 1b is also observed that, in aggregate terms, hubs with successful US exits draw more investments from top-VCs, in the exit year. In the previous year, VC deals' annual growth rate is 22.9%, whereas in the next year it is 28.7%. Even though these results are not persistent for the 2 next years (coefficients equal to 3.2 and 3.16, respectively), they seem to be relevant again for 3 years after the exit, as top-VCs spur their investments (coefficient equal to 3.64). This might occur because top-VCs let their syndicate partners invest in early-stage rounds. Therefore, they face the experimentation period on their behalf, and top-VCs only invest in later-stages rounds, as defended by Sorenson & Stuart (2001) and Devigne et al., (2013).

Graph 3- US exits and Top-VC deals

Graph 4 - US exits and Top VCs
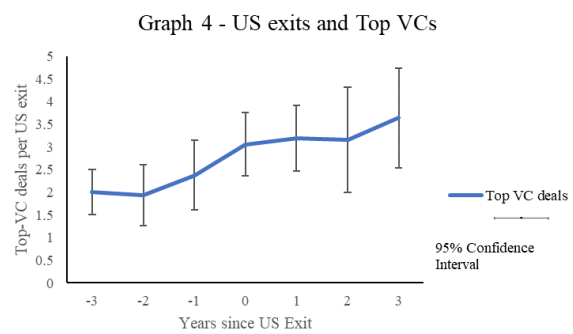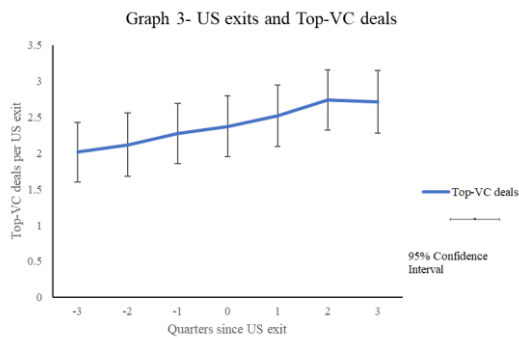
Hence, the results seem to partly reinforce the performance persistence theory proposed by Chen et al. (2010), as hubs with successful US exits tend to draw more VC investments in the exit year. Furthermore, in aggregate terms, the twelve VC sectors analyzed have consistently presented a growing trend. Therefore, as referred before, the results of Medcalfe and Thompson (2017), and Ballinger et al. (2016), defending that the concentration of VC investments in the US follows a long-run upward trend, seem not to be valid for the global VC market.

However, as previously stated, the growing trend on VC deals seems to be related to other factors besides successful US-exits. Hence, the results are not strong enough to comfortably accept hypotheses 1a and 1b.

Top-VC deals and Local successful exits

As defended in hypothesis 2, investments from top-VCs enhance local exits. The event study for a narrower time period reveals a positive relationship between the number of investments from top-VCs and the number of successful local exits (Appendix B – Table 7). The results are statistically significant for a 95% confidence level, but the number of exits does not change meaningfully between the quarters before and after the exit (graph 5). However, these findings are not surprising as most exits occur in a longer period than three quarters after the investment. Even so, it is possible to verify an increase in local exits three quarters after the investment. The coefficient for that period is equal

to 0.26, which means that for every 100 top-VC deals, there would be, on average, 26 local successful exits after three quarters. This might reveal that some top-VCs invest in "hit companies" in the late-stage round, where typically ventures have larger funding needs that only top-VCs can provide (Lerner, 2009).

Graph 5 -Top VCs and Local Exits
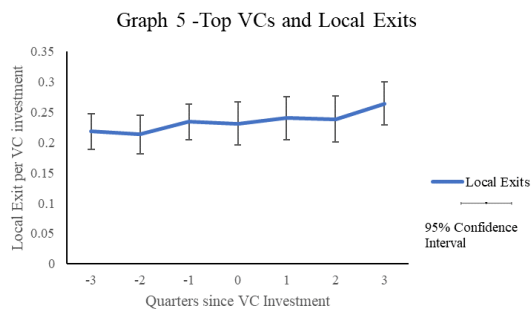
It is also observed a positive and significant relationship between the number of investments from top-VCs and the number of successful local exits, for a lengthier time period (Appendix B – Table 8). Although the growing trend is also noted before the exit moment, top-VCs seem to have a significant role in the number of local exits (graph 6). Before the investment and in the subsequent year, the annual growth rate varies around 2.6% to 3.9%, whereas two and three years after the investment, the annual growth rate is 6.7% and 6.3%, respectively. Additionally, the results are equally relevant for the different time periods, since R^2 is equal to 0.90, 0.95, 0.87, and 0.90 for the year of the investment until three years after, respectively.

The findings also reveal that top-VCs investments lead to higher exit valuations. They are significant for a 95% confidence level, and the effects persist and grow over time. Prior to the top-VCs' investments, per each aggregate dollar invested there would be an average gross return of $1.17, while the average return is $4.68, $8.27, $10.09, and $13.64, in the investment year and the following years, respectively (Graph 7). However, the effects lose some significance in the subsequent periods of the investment, as R^2 is

equal to 0.88, 0.86, 0.52, and 0.72 for the investment year until three years after, respectively (Appendix B – Table 9).

Hence, these results reinforce the literature (Lerner, 2009; Espenlaub et al., 2015; Kong et al., 2016): top-VCs are vital to a dynamic entrepreneurial hub, as their portfolio companies tend to have more exits and at a higher valuation. They are consistent with the findings of Kolympiris et al. (2018), as well. Top-VCs seem to demand higher standards for their foreign targets to mitigate information asymmetries, as their returns grow much faster than the number of investments. Therefore, they are more selective in their overseas investments and only fund ventures that have better prospects of being "hit companies". Lastly, since ventures tend to relocate to hubs with larger availability of capital (Gompers & Lerner, 1998; Cumming et al., 2009; Kong et al., 2016), the higher number of local successful exits and at higher valuations might reduce the need to ventures to relocate to the US.

Therefore, it is not possible to reject hypothesis 2. Top-VCs seem to be important players to enhance local VC markets, as their investments lead to more exits and at higher valuations. Moreover, they also have an important role in retaining successful firms.

Graph 6 - Top VC and Local Exits

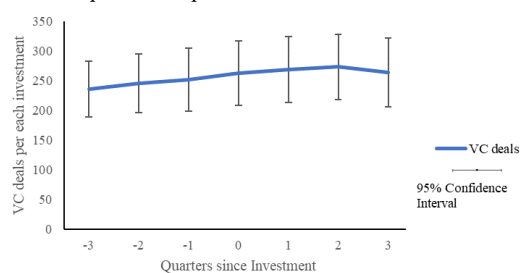Graph 7 - Top VC and Size of Local Exits
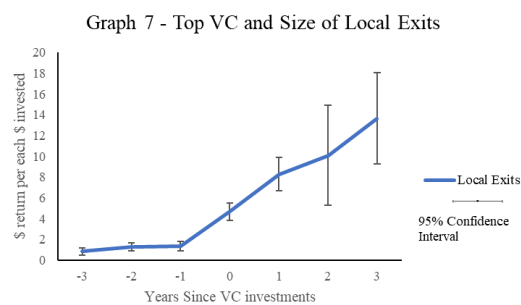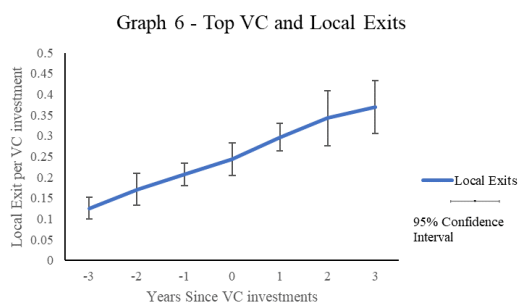
Successful entrepreneurs and VC deals

There is a positive and significant relationship (for a 95% confidence level) between the number of investments led by native successful entrepreneurs and the number

of VC deals, both from top and non-top VC firms. However, it is not possible to conclude that they will have a relevant signal effect over VC firms to invest in their countries, as it was expected in hypothesis 3a. Both for the thinner and lengthier event studies, it possible to infer that during the periods after the investment led by a successful entrepreneur, the number of VC deals does not change significantly compared to the moments before that investment (graphs 8 and 9).

Nevertheless, the effects in the following years to the investments are less significant than in the preceding periods (Appendix C – Table 11). R2 is equal to 0.91, 0.94, 0.97, 0.96, 0.79, 073, and 0.56 for the three years before the investment until three years after, respectively. This might occur because few successful entrepreneurs invested in startups in the analyzed hubs during the assessed period. Besides, their investments only started to be more consistent after 2010. Although currently hypothesis 3a must be rejected, when more reliable data is available, it might be possible to conduct more significant analysis.

Graph 8 - Entrepreneurs-investors and VC deals

Graph 9 - Entrepreneurs-investors and VC deals
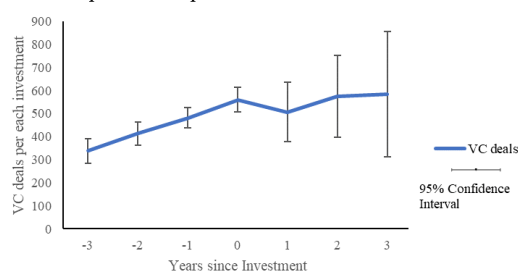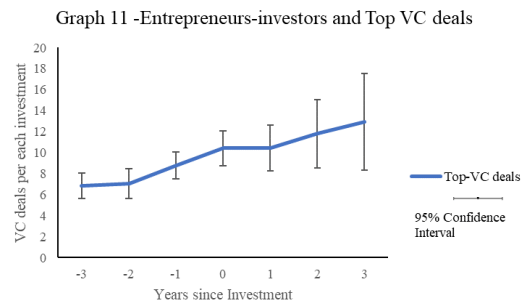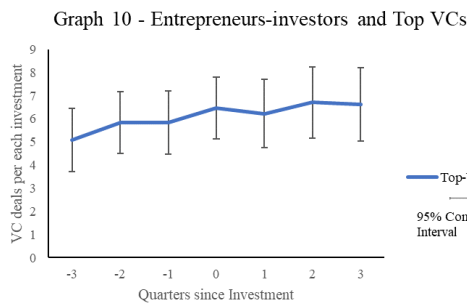
It is not also possible to confirm hypothesis 3b, even though there is a positive and significant relationship between the number of investments led by successful entrepreneurs and the number of top-VC deals. It is inferred that top-VC deals increase in the preceding and subsequent periods of the investment led by successful entrepreneurs, for both event studies (graphs 10 and 11).

Nevertheless, in the same quarter of the exit is observed a substantial increase in top-VC deals (6.46 deals per each investment) comparing to the previous quarter (5.84 deals). This might reveal, as it is proposed by Sorenson & Stuart (2001) and Vedula & Matusik (2017), that VCs trust their peers' judgment regarding international investments, and they co-invest with them. Hence, they believe that successful entrepreneurs have enough business experience and local market knowledge to help other entrepreneurs to achieve a successful exit. Consequently, top-VCs consider that these target firms will comply with the high standards they demand (Kolympiris et al., 2018), which reduces information asymmetries.

Graph 10 - Entrepreneurs-investors and Top VCs

Graph 11 - Entrepreneurs-investors and Top VC deals

Successful entrepreneurs and Local Successful exits

Similar to hypothesis 2, it is observed a positive and significant (for a 95% confidence level) relationship between the number of investments led by successful native entrepreneurs and the number of local exits in the thinner event study. Nonetheless, the number of exits does not change significantly between the preceding and subsequent periods of the investment (graph 12).

However, it is noticeable that in the quarter before the investments there are a larger number of local exits (coefficient equal to 1.42). Thus, in the short run, it seems that local exits signal native successful entrepreneurs to invest in local ventures due to the performance persistence effect defended by Chen, et al. (2010). Nevertheless, the effects

lose some significance comparing to the results of the quarter prior to the investments, whose R^2 is equal to 0.49 (Appendix D – Table 14).

Graph 12- Entrepreneur-investors and Local Exits
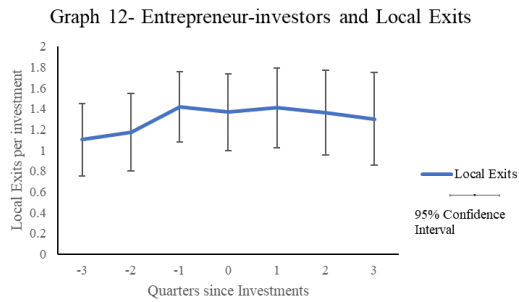

Regarding the lengthier time period, it also verified a positive and significant relationship between the number of investments led by successful entrepreneurs and the number of local exits. Nevertheless, it is visible that the number of local exits presents an increasing trend both before and after the period of the investment (graph 13). Therefore, it is not possible to conclude that native successful entrepreneurs are the main reason for the increase in the number of local exits.

On the other hand, the findings suggest, for a 95% confidence level, that investments led by successful entrepreneurs result in larger exit valuations (graph 14). Without successful entrepreneurs' investment and value-added monitoring, per each potential aggregate dollar invested there would be an average gross return within $14.26 and $29.18 range. Whereas, in between the investment year and the three following years, per each dollar invested by a successful entrepreneur the entire local VC market would have a gross return between $60.42 and $100.32. Therefore, this is a sign that firms that receive funding from successful entrepreneurs tend to present bigger exit valuations, as it is defended in hypothesis 4.

These results are consistent with the literature. As Devigne et al. (2013) suggest the most successful VC-backed firms are the ones that are initially funded by domestic

VCs, in this case, domestic angel investors. Native investors have greater local knowledge and can properly overcome information asymmetries. Furthermore, these findings appear to support Saxenian's (2002) views: successful expatriated entrepreneurs are improving their native entrepreneurial hubs by acting as angel investors, mentors, and partners. Therefore, as Lerner (2009) advocates, local angel investors that finance young ventures are one key driver to the success of local entrepreneurial ecosystems as they have the "social capital" defended by Feldman (2014): they want to improve their communities, but also profiting from it.

Although investments from successful entrepreneurs do not necessarily lead to more exits, they lead to higher exit valuations. Thus, we cannot reject hypothesis 4, it seems that investments from successful entrepreneurs enhance local exits. Nevertheless, the results might present some multicollinearity issues, as there is a positive correlation between the number of investments led by successful entrepreneurs and the number of top-VC deals, which in turn are positively correlated with local exits' valuation.

Graph 13 - Entrepreneurs-Investors and Local exits

Graph 14 - Entrepreneurs-Investors and Local exits size
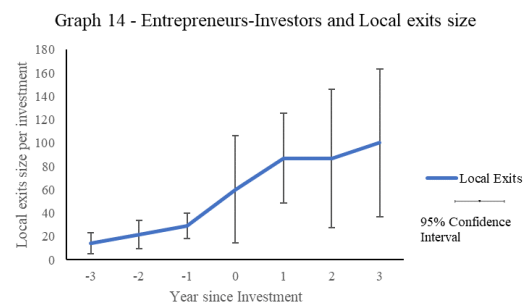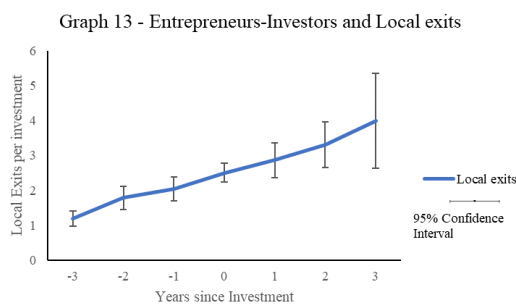
Section 6 – Conclusions and Limitations

Although the results indicate a positive correlation, for a 95% confidence level, between the number of successful US-exits and the number of top and non-top VC deals, for both event studies, it is not possible to infer that those exits are the driver for the VC sector development. The event studies demonstrate that VC deals were already increasing

independently of the number of US exits. Literature suggests other factors for VC sector growth: hubs' market size (Cumming et al., 2009; Florida & King, 2016; Weterings & Knoben, 2013), existence of high-quality research facilities (Lerner, 2009), quality of legal systems (Gompers & Lerner, 1998; Espenlaub et al., 2015), among others. Hence, further research could focus on complementing those studies and assess if those factors can indeed decrease venture relocations.

However, the findings are consistent with the performance persistence theory (Chen et al., 2010). In the year of a successful exit, there is a boost in investments from top and non-top VCs. Moreover, top-VCs tend to increase their investments three years after a successful US-exit, which might reveal that they let their syndicate partners face the experimentation period on their behalf and only invest in later-stages rounds, as defended by Sorenson and Stuart (2001) and Devigne et al. (2013).

The results also suggest that top-VCs are vital to the development of local VC markets. Their investments lead to more local successful exits and at a higher valuation. Thus, the existence of larger funding capacity and the ability to exit successfully in local hubs can partly avoid young venture relocation. Consequently, it could be a sign that VC hubs can overcome the dominance of the three main US hubs.

It was not possible to infer that investments from successful entrepreneurs signal top and non-top VCs to invest in their native hubs, even though these variables presented a positive and significant (for a 95% confidence level) correlation. Neither it was possible to conclude that investments from successful entrepreneurs lead to more local successful exits. Nevertheless, their portfolio firms tend to exit locally at higher valuations. Therefore, it seems that investments from successful entrepreneurs enhance local exits.

Thus, the main implication of this research is that top-VCs are key players for local hubs to gain relevance over the US, as they tend to assure more successful exits at higher valuations. As such, future studies could focus on other factors that attract top-VCs to a specific hub.

This master thesis has some limitations. Firstly, some entries on Crunchbase's database were incomplete. Therefore, they had to be excluded, even though they could potentially have been useful observations. Secondly, there is only data for US-exits from 1998 onwards. Besides, for most years, many hubs had zero US-exits. Thus, only after 2008, there is enough data to achieve robust results. Thirdly, there are great annual variations regarding VC deals and exits. Hence, this could compromise the results' robustness, as the variables could not present a linear relationship between them, and the errors could not be normally distributed. Fourthly, the definitions of successful exit and top-VC are assumptions made by the author. Thus, other definitions of these variables could lead to completely different results. Lastly, the analyses were conducted over the aggregate values of the twelve assessed countries. Therefore, the conclusions of this study might not apply for some, or even all, the hubs considered. However, this method mitigates some of the other identified limitations, like the lack of data in some years regarding individual countries, which led to more robust results than individual analyses.

Appendices

Appendix A

Table 3 - Thinner Event study: US exits and VC deals

	-3Q	-2Q	-1Q	0Q	1Q	2Q	3Q
Coefficient	98.4	103.2	109.2	112.9	116.7	116.1	115.9
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.59	0.60	0.61	0.61	0.63	0.61	0.61

n=84

Table 4 - Lengthier Event study: US exits and VC deals

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	86.5	102.7	121.4	147.4	141.1	154.5	169.9
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.72	0.70	0.74	0.80	0.73	0.70	0.73

n=21

Table 5 - Thinner Event study: US exits and Top-VC deals

	-3Q	-2Q	-1Q	0Q	1Q	2Q	3Q
Coefficient	2.01	2.12	2.27	2.37	2.52	2.74	2.71
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.54	0.53	0.59	0.61	0.63	0.68	0.65

n=84

Table 6 - Lengthier Event study: US exits and Top-VC deals

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	2.00	1.93	2.38	3.06	3.20	3.16	3.64
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.79	0.66	0.69	0.81	0.82	0.65	0.74

n=21

Appendix B

Table 7 - Thinner Event study: Top VCs and Local Exits

	-3Q	-2Q	-1Q	0Q	1Q	2Q	3Q
Coefficient	0.22	0.21	0.23	0.23	0.24	0.24	0.26
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.75	0.70	0.77	0.69	0.70	0.67	0.74

n=78

Table 8 - Lengthier Event study: Top VCs and Local Exits

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	0.13	0.17	0.21	0.24	0.30	0.34	0.37
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.87	0.84	0.93	0.90	0.95	0.87	0.90

n=21

Table 9 - Lengthier Event study: Top VCs and Size of Local Exits

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	0.84	1.28	1.38	4.68	8.27	10.09	13.64
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.62	0.75	0.69	0.88	0.86	0.52	0.72

n=21

Appendix C

Table 10 - Thinner Event study: Entrepreneurs-investors and VC Deals

	-3Q	-2Q	-1Q	0Q	1Q	2Q	3Q
Coefficient	235	246	252	263	269	273	264
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.57	0.57	0.54	0.55	0.56	0.57	0.53

n=76

Table 11 - Lengthier Event study: Entrepreneurs-investors and VC Deals

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	337	413	481	560	507	574	583
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.91	0.94	0.97	0.96	0.79	0.73	0.56

n=20

Table 12 - Thinner Event study: Entrepreneurs-investors and Top-VC Deals

	-3Q	-2Q	-1Q	0Q	1Q	2Q	3Q
Coefficient	5.07	5.84	5.84	6.46	6.22	6.71	6.63
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.43	0.51	0.49	0.56	0.49	0.51	0.49

n=76

Table 13 - Lengthier Event study: Entrepreneurs-investors and Top VC Deals

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	6.82	7.07	8.80	10.42	10.44	11.81	12.92
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.89	0.86	0.92	0.96	0.85	0.78	0.69

n=20

Appendix D

Table 14 - Thinner Event study: Entrepreneurs-investors and Local Exits

	-3Q	-2Q	-1Q	0Q	1Q	2Q	3Q
Coefficient	1.10	1.17	1.42	1.37	1.41	1.36	1.30
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.36	0.36	0.49	0.43	0.43	0.38	0.32

n=73

Table 15 - Lengthier Event study: Entrepreneurs-investors and Local Exits

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	1.19	1.79	2.05	2.50	2.86	3.31	3.99
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-Squared	0.89	0.88	0.90	0.95	0.89	0.88	0.72

n=20

Table 16 - Lengthier Event study: Entrepreneurs-investors and Local Exits Size

	-3Y	-2Y	-1Y	0Y	1Y	2Y	3Y
Coefficient	14.26	21.78	29.18	60.42	87.05	86.84	100.32
P-Value	0.00	0.00	0.00	0.01	0.00	0.01	0.00
R-Squared	0.40	0.46	0.65	0.30	0.57	0.38	0.43

n=20

References

Ballinger, T. Parker, Wendy Habegger, Clifton T. Jones, and Mark A. Thompson. 2016. "Convergence in Venture Capital Investments: Evidence from a Panel of 18 US Regions." *The Journal of Regional Analysis & Policy* 132-137.

Chen, Henry, Paul Gompers, Anna Kovner, and Josh Lerner. 2010. "Buy local? The geography of venture capital." *Journal of Urban Economics* 90-102.

Cumming, Douglas, and Na Dai. 2010. "Local bias in venture capital investments." *Journal of Empirical Finance* 362-380.

Cumming, Douglas, Grant Fleming, and Armin Schwienbacher. 2009. "Corporate Relocation in Venture Capital Finance." *Entrepreneurship: Theory & Practice* 33: 1042-2587.

Dahl, Michael S., and Olav Sorenson. 2012. "Home Sweet Home: Entrepreneurs' Location Choices and the Performance of Their Ventures." *Management Science* 1059-1071.

Devigne, David, Tom Vanacker, Sophie Manigart, and Ine Paeleman. 2013. "The role of domestic and cross-border venture capital investors in the growth of portfolio companies." *Small Business Economics* 553-573.

Espenlaub, Susanne, Arif Khurshed, and Abdulkadir Mohamed. 2015. "VC investments and global exits." *The European Journal of Finance* 608-628.

Espenlaub, Susanne, Arif Khurshed, and Abdulkadir Mohamed. 2015. "Venture capital exits in domestic and cross-border investments." *Journal of Banking & Finance* 215-232.

Feldman, Maryann P. 2014. "The character of innovative places: entrepreneurial strategy, economic development, and prosperity." *Small Business Economics* 9-20.

Figueiredo, Octávio, Paulo Guimarães, and Douglas Woodward. 2002. "Home-field advantage: location decisions of Portuguese entrepreneurs." *Journal of Urban Economics* 341-361.

Florida, Richard, and Ian Hathaway. 2018. *Rise of the Global Startup City.* Washington D.C.: Center for American Entrepreneurship .

Florida, Richard, and Karen M. King. 2016. *Spiky Venture Capital - The Geography of Venture Capital Investment by Metro and Zip Code.* Toronto: Martin Prosperity Institute.

Gompers, Paul A, and Josh Lerner. 1998. "What Drives Venture Capital Fundraising?" *Brookings Papers on Economic Activity Microeconomics* 149-204.

Gompers, Paul A., Will Gornall, Steven N. Kaplan, and Ilya A. Strebulaev. 2018. "How do venture capitalists make decisions?" *Journal of Financial Economics.*

Kerr, William R., Ramana Nanda, and Matthew Rhodes-Kropf. 2014. "Entrepreneurship as Experimentation." *Journal of Economic Perspectives* 25-48.

Knill, April. 2009. "Should Venture Capitalists Put All Their Eggs in One Basket? Diversification versus Pure-Play Strategies in Venture Capital." *Financial Management* 441-486.

Kolmakov, Vladimir, Aleksandra Polyakova, and Vasily Shalaev. 2015. "An Analysis of the impact of Venture Capital Investment on Economic Growth and Innovation: Evidence from the USA and Russia." *Economic Annals* 7-37.

Kolympiris, Christos, Sebastien Hoenen, and Nicholas Kalaitzandonakes. 2018. "Geographic distance between venture capitalists and target firms and the value of quality signals." *Industrial and Corporate Change* 189-220.

Kong, Shuangshuang, Miwako Nitani, and Allan Riding. 2016. "Cross-border VC investment in Canadian firms: implications for exit patterns." *Venture Capital* 63-93.

Kortum, Samuel, and Josh Lerner. 2000. "Assessing the Contribution of Venture Capital to Innovation." *Rand Journal of Economics* 31: 674-692.

Lerner, Josh. 2009. *Boulevard of Broken Dreams.* Princeton: Princeton University Press.

Medcalfe, Simon K., and Mark A. Thompson. 2017. "Further evidence on the geographical concentration of venture capital investments." *Letters in Spatial and Resource Sciences* 229-235.

Metrick, Andrew, and Ayako Yasuda. 2011. *Venture Capital & the Finance of Innovation.* 2nd. New York: John Wiley & Sons, Inc.

Onetti, Alberto, and Daniel Glazer. 2017. *European Dual Companies - Scaleup Migration?* London: Mind the Bridge.

Prijcker, Sofie de, Sophie Manigart, Veroniek Colleaert, and Tom Vanacker. 2019. "Relocation to Get Venture Capital: A Resource Dependence Perspective." *Entrepreneurship: Theory & Practice* 43: 697-724.

Saxenian, Annalee. 2002. *Local and Global Networks of Immigrant Professionals in Silicon Valley.* San Francisco: Public Policy Institute of California, 1-37.

Smith, Matthew, Danny Yagan, Owen Zidar, and Eric Zwick. 2019. "Capitalists in the Twenty-First Century." *The Quarterly Journal of Economics* 1675-1745.

Sorenson, Olav, and Toby E. Stuart. 2001. "Syndication Networks and the Spatial Distribution of Venture Capital Investments." *American Journal of Sociology* 1546-1588.

Vedula, Siddharth, and Sharon F. Matusik. 2017. "Geographic, Network, and Competitor Social Cues: Evidence from U.S. Venture Capitalists Internationalization Decisions." *Strategic Entrepreneurship Journal* 393-421.

Weterings, Anet, and Joris Knoben. 2013. "Footloose: An analysis of the drivers of firm relocations over different distances." *Papers in Regional Science* 791-809.

https://angel.co/venture-capital; Access: 14/09/2019