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Cross-border Venture Capital investments: the role of domestic market saturation

MSc. DISSERTATON, MANAGEMENT ENGINEERING – INGEGNERIA GESTIONALE

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Venture Capital landscape

Venture Capital (VC) refers to the professional asset management activity that raises financial resources from institutional investors and wealthy individuals, and invest them on young and risky entrepreneurial ventures with high potential to grow (Sahlman, 1990). Among all the possible financing means the young and risky startups can recur to, the literature considers VC as the most appropriate funding mechanism, to fill both the *funding* and *knowledge gap.* Indeed, besides capital, they provide ventures with advice and strategic support, through coaching and monitoring. Helping young innovative ventures to scale and develop their business, VCs play a key role in the whole economic system of a nation in terms of job creation and GDP growth.

VC funds differentiate based on their ownership structure in two main categories, namely *independent VCs* (IVCs) and *captive VCs*. IVCs are usually organized as limited partnerships, where the firm's executives (General Partners, GPs) collect money from financers (Limited Partners, LPs). GPs arrange such capital in funds and manage it in order to guarantee the LPs high financial returns, investing in promising startups' equity stakes and exiting the investments before the end of the fund life. Captive VCs are instead backed by a parent organization; the three types are distinguished based on the nature of the parent entity: *corporate VCs* (CVCs), *government-affiliated VCs* (GVCs) and *bank-affiliated VCs* (BVCs).

The different ownership structures translate into different funds' missions and objectives structure, thus reflecting also on the investment scope. CVC programs are a way to promote an entrepreneurial attitude within established firms, and represent an external source of innovation complementary to the internal R&D activities. Hence, differently from IVCs that exclusively seek for high financial returns, CVCs primarily pursue strategic objectives in order to benefit from synergies through the combination of existing corporate resources and venture capabilities. GVC programs belong to the category of direct policy interventions that governments can enact to support the national entrepreneurial ecosystem. GVCs aim at filling the equity gap for those ventures that would have the potential to grow but are not able to raise funds from private VCs due to market failures. Thus, as CVCs, their main objectives do not have a financial nature: public VC funds are mainly interested to yield social returns and develop local economies. GVCs' activity is also successful in signalling startups and attracting private VCs financings in the future (i.e *crowding-in effect*). Even the last category of captive VCs, BVC, is not merely driven by financial objectives. When it comes to ventures whose business is close to the bank's one, BVC can leverage on complementary assets and competences the startups may offer; moreover, investing in young companies increases the likelihood of future loan provisions in the debt capital market. BVCs, thus, prefer to invest on ventures belonging to high debt level industries, and on lower risk deals.

Internationalization of VC industry

VC business has traditionally been considered a local business, as value adding services are easier to be provided when the investee is located nearby the VC. Indeed, most investment decisions have been guided by the so-called *20-minute drive rule*.

Despite the importance of geographical proximity, in recent years international VC activity gained momentum, with positive trends of growth in cross-border capital flows worldwide. The internationalization trend is observable both on the inflow (funds raised from foreign LPs) and on the outflow (investments towards foreign ventures) sides; this work focuses the attention on the second side only. In Europe, between 1998 and 2014, 29.5% of the performed deals were cross-border (Bertoni et al., 2019); in 2020, the percentage reached the value of around 34% (InvestEurope, 2020). Investing abroad requires to adopt a careful strategic approach and to take some key decisions (such as entry mode and organizational structure of the fund), since VCs may have to relate with institutionally and culturally distant environments. Additionally, geographical distance amplifies the information asymmetries posing real challenges for the VC investors. These distances, together, give rise to the *liability of foreignness*, defined to as the additional costs (such as learning and coordination costs) a firm operating in a foreign market needs to face with respect to a local firm. However, VC investors have the chance to mitigate distances in several ways. One of the most adopted solutions is to syndicate (i.e. to invest together with other VC firms) with investors established in the country of the investee, enabling risk sharing and exploiting the local VC's enhanced knowledge of the environment.

Several studies observed a positive impact of foreign VCs' backing on ventures' likelihood of successful exit via IPO and M&A, whereas there is mixed evidence about the effect of increased distances on exit probability. Li and colleagues (2014) found institutional and cultural distances to negatively affect the exit likelihood; on the contrary, according to Nahata and colleagues (2014) higher distances incentivize VCs to carry out more severe ex-ante screening processes, that lead to an enhanced success probability. However, the magnitude of the financial returns generated by foreign investments are on average lower compared to those obtainable from equivalent domestic investments (Buchner et al., 2018).

From startups' point of view, being backed by an international investor brings several benefits: besides the higher exit probability, they experience enhanced growth in sales, assets and employment, and gain access to broad international networks building contacts with suppliers and consumers established abroad.

Previous research tried to study the determinants of the process leading a VC fund to invest in an entrepreneurial firm established abroad. The internationalization decision can be guided either by the attractiveness of a specific foreign country conditions (*country-level determinants*), or by the policy and goals of the VC (*firm-level determinants*). Past research on the country-level determinants mainly assumed two different perspectives: the *host institutions perspective*, focused on the attractive features of foreign countries as drivers of cross-border decisions, and the *home-host institutions perspective*, focused on the interplays and differential conditions between pairs of countries as drivers of international capital flows. Concerning the first perspective, VCs exhibit larger propensity to invest towards more institutionally developed countries able to provide stability and investors' protection, to foster innovation and to guarantee fair appropriation of returns (Guler & Guillén, 2010). Additional determinants of a host country's attractiveness, from an economic and financial point of view, are the expected GDP growth and the activeness and liquidity of the stock market (Aizenman & Kendall, 2012), that were proved to increase foreign VCs' likelihood to invest. From a home-host institutions perspective, empirical evidence showed VCs to be more willing to invest in countries with greater market capitalisation and expected GDP growth with respect to their domestic country (Tykvová & Schertler, 2011).

Country level determinants should impact transversely all the investors belonging to the same nation; however, VC firms behave differently one from each other. VC international investments are in fact influenced by specific firm level factors, that must be taken into account when analysing the decision-making process. The identified VC firm-level determinants of cross-border activity are first of all connected to the investment focus (especially in terms of venture's lifecycle stage) and to the ownership type. Additionally, large, reputable and experienced VC firms show to be less locally biased in their investment decisions, as they have stronger capabilities in mitigating information asymmetries (Cumming & Dai, 2010). The experience of the VC firm's human capital matters as well, in fact executives with international prior experience are more likely to invest abroad (Schertler & Tykvová, 2011). Besides human capital, the VC firm's social capital is relevant too, as the network of syndicate partners may affect cross-border investment likelihood (Jääskeläinen & Maula, 2014).

Theoretical framework

This work is part of the research stream on the country-level determinants of cross-border VC investment activity. Apart from the attractive features of the foreign markets and the differential conditions between the home and host countries, the decision to invest overseas may be guided by the unfavourable conditions of the domestic country per se. This perspective (i.e. *home institutions perspective*; Mingo et al., 2018) of study was almost neglected by the literature. It is reasonable to think that a country's weak attractiveness not only reduces the chances of collecting investments from abroad (based on a host institutions perspective), but also may encourage local VCs to undertake cross-border deals (based on a home institutions perspective). This work focuses the attention on a single economic driver belonging to the home perspective. The *saturation of the domestic VC market* emerged as a suitable potential determinant for the thesis, as it is a structural industry condition that might force VCs to seek alternative courses of action. According to Buchner and colleagues' (2018) definition, a saturated VC market is characterized by an excess of funds and a shortage of investment opportunities, leading to a condition

of disequilibrium between the available and the actually demanded capital. The topic was mentioned in some previous literature, but the relation between saturation and willingness to invest abroad has never been empirically studied. Since the VC phenomenon is heterogenous and different types of VCs show different investment patterns, it is appropriate to decline the impact of market saturation along the ownership dimension. The necessity to include this dimension is reinforced by the observed different internationalization behaviour assumed by independent and captive VCs (Bertoni et al., 2019). This work, thus, wants to answer the following research question: *How does the saturation of the domestic VC market affect the cross-border investment decisions of different VC types?*

When domestic saturation increases, and thus VC firms face more competition in investing locally, they can actually choose to invest abroad, or not to employ the available capital, waiting for more favourable conditions in the next future. Nevertheless, given the nature of IVCs' objectives (i.e. to remunerate limited partners in 8-10 years), the second alternative is not popular among investors because of the opportunity costs that keeping part of the funds in house would imply. Besides generating difficulties in finding potential deals at home (given the excess of capital supply), that may force local VCs to seek for alternative investment opportunities, VC market saturation is likely to increase the average deal valuation and, consequently, the price to be paid to purchase domestic ventures' equity stakes. An increase in price reduces the expected investments' returns, and so IVCs may be more willing to internationalize searching for less expensive opportunities, since their activity is driven by financial objectives. These rationales, together with the suggestions provided by the literature, lead to the formulation of Hypothesis 1: *As the level of domestic VC market saturation increases, the likelihood of IVCs' cross-border tie formation increases*.

CVCs mainly pursue strategic objectives (absorbing new technologies and competences, accessing new markets, etc.), while financial returns are usually secondary. The strategic orientation leads them to be disposed to pay also a premium price to secure deal closing when they find an investee fitting their business (Hellmann, 2002). This suggests that, differently from IVCs, CVCs cross-border activity might be less affected by the eventual domestic average deal valuation increase provoked by saturation, given their weaker elasticity to prices. Moreover, CVCs have a stronger inclination to operate internationally, since they are usually backed by multinational enterprises interested in employing resources and effort in international activity. For this reason, CVCs are hard to be framed in the country in which they are headquartered, since their investment scope is, by nature, less geographically constrained. The resulting Hypothesis 2 is: *As the level of domestic VC market saturation increases, the likelihood of CVCs' cross-border tie formation increases, but to a lower extent compared to IVCs' one.*

GVC programs are oriented to nurture the home economic-financial ecosystem, however statistical data (Bertoni et al., 2019) disclose the presence of GVC cross-border investments as well, even if to a smaller extent than the other VC types. Reasonably, the few international investments performed by GVCs may be interpreted as occasional interventions driven by political and strategical reasons (e.g. scouting foreign technologies that may bring benefits to the national economy), more than by the home market saturation. The third and last Hypothesis is: *As the level of domestic VC market saturation increases, the likelihood of GVCs' cross-border tie formation increases, but to a lower extent compared to IVCs' one.*

Sample definition

The work's empirical analysis makes use of a subset of the latest version of the VICO dataset, that contains information about the investments received by young entrepreneurial firms operating in 27 European countries, plus UK and Israel, between 1998 and 2018. VICO includes 103,744 observations, made by 12,747 investors on 38,673 ventures. The dataset was reduced first of all keeping only the investments performed by IVC, CVC and GVC investors established in a European country. Subsequently, the time span was reduced to the period 2007-2018, since the external information to be integrated with the dataset were available from 2007 onwards only. The shortened time frame still allows to capture both phases of economic crisis (Great Recession and Debt Crisis) and economic recovery. Finally, in analysing the saturation as determinant of cross-border investments, only the first investment of a VC in a specific venture (so the entry of the investor in the investee's ownership structure) should be taken

into account, since the *follow-on rounds* are usually driven by contractual specifications and not by the home conditions. The follow-on observations were thus dropped. The above-described process led to the definition of a sample of 16,869 VC investments.

The descriptive statistics of the sample shows an almost steady trend of growth of the cross-border investments, differently from the domestic ones that are more cyclical (**Figure 1**).

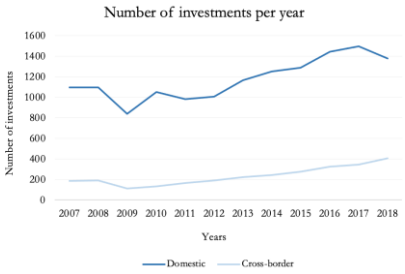

Figure 1: number of domestic and cross-border investments

As to the ownership structure, IVC investments account for 75% of sample investments (12,638 out of 16,869). The share of CVC and GVC investments is 10% (1,683 investments) and 15% (2,548 investments), respectively. CVCs have a higher propensity to invest abroad, with almost 25% of cross-border over total investments, while the same ratio equals to 18% in the case of IVCs. On the contrary, GVCs, as expected, are almost totally focused on domestic activity field.

Econometric model design

The study adopts a *matching model*, consisting in the creation of a set of potential ties (*dyads*) between VCs and ventures, to be integrated with the sample of realized ties. In this way, it is possible to observe the tie realization probability as conditions change, that is indeed not possible looking at realized investments only. The set of potential ties has been created crossing the investors who performed at least one investment during a year, with the ventures who received financings during that year. The final dataset of potential ties reached the size of around 2 million of rows.

The dependent variable of the model *RealizedTie* is a dummy that equals 0 for unrealized ties and 1 for realized ties. The main explanatory variables are *CrossBorderYesNo*, *d_Ownership*, and *Saturation*. *CrossBorderYesNo* is a dummy assuming the value of 1 when the VC-venture dyad is cross-border, 0 otherwise. The vector of two dummies *d_Ownership* indicates whether the investor is independent, corporate or government backed. *Saturation*, instead, is a continuous variable computed as the ratio between the total funds raised by VCs in a given year and country, and the equity capital collected by startups in the same year and country. To each *dyad* is associated the value of saturation corresponding to the investor's country of origin in the year of the tie. Differently from Buchner and colleagues (2018), who operationalized saturation through the available supply of VC funds only, this work provides a measure of saturation that takes into account both the demand and supply side of the domestic VC market. Data on yearly funds raised were gathered from Pitchbook; the report provided figures organised per international regions (Central & Eastern Europe, Dach, France & Benelux, Nordic countries, UK & Ireland, Israel), that were then split on the single countries belonging to the region, using as driver the number of active funds in each year. Demand for capital was approximated cumulating the investments received by ventures in every country for each year. It was assumed that a company being financed in a given year, was actually searching for fundings in that period, thus representing a real source of demand for equity capital. The demand proxy was computed using the whole VICO and not the restricted sample, since, being the demand a market variable, including all the deals in the measure was deemed the most appropriate approach. Considering only the ventures included in VICO, the demand measure is not accounting for the startups that have never obtained funds; however, excluding them is reasonably not an issue, if it is assumed that the actual demand perceived by VCs is that coming from quality ventures only.

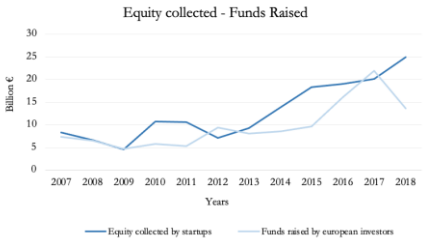

Figure 2: equity collected and funds raised in Europe, in each year

Figure 2 shows the trends of funds raised by European VCs and equity collected by European startups. equity collected sometimes overtakes

funds raised, highlighting the relevance of capital coming from the other continents.

Several control variables were introduced in the model. First of all, some variables identified by the literature as determinants of the international investing decisions have been included (i.e. *host country level control variables*, *home-host country level control variables*, *VC level control variables*). Moreover, some control variables relevant in the whole VC investment patterns discussion have been introduced (i.e. *general control variables*).

A general econometric specification including the explanatory variables, their interaction terms and the control variables has been defined to test the three Hypotheses. The model adopted in the analysis is the logit regression, since the dependent variable *RealizedTie* is binary. Being the logit a non-linear model, the interpretation of the regression coefficients is not straightforward. The coefficients of the non-interactive terms give information on the direction of the relation only (positive or negative), but not on the effect size. The interactive terms' coefficients are even more difficult to be interpreted, and additional analyses are needed to assess their impacts. In fact, the sign of the interaction coefficient may not indicate the real direction of the effect, and the significance level of the coefficient may not indicate the real significance level of the effect (Hoetker, 2007). Given these issues, to look at the overall reactivity to the domestic VC market saturation level for IVCs, CVCs and GVCs - and consequently test the Hypotheses - an average marginal effect (AME) analysis per each case was carried out. The analyses allow to determine the average marginal impact of *Saturation* on the likelihood of tie realization under the conditions of interest (i.e. ownership type and cross-border investment).

Empirical results and discussion

Table 1 shows the results of the AME analyses for all the cross-border cases.

The AME analysis to test Hypothesis 1 reports a positive and statistically significant impact of a unitary increase of *Saturation* on the probability of cross-border tie realization (+0.04%, with a 95% significance level). The magnitude of the effect, though the coefficient may seem small, is relevant if compared with the percentage of IVC realized international investments on potential ones present in the final dataset (0.31%). The results of the AME analyses run to test Hypothesis 2 and Hypothesis 3 are not statistically significant, that means there is not sufficient evidence to affirm the presence of a positive cross-border investment pattern when domestic saturation increases.

	dy/dx
IVC cross-border case	0.0004(**)
CVC cross-border case	0.0002(-)
GVC cross-border case	0.0002(-)

*** p<.05, - non-significant*

Table 1: Results of the AME analyses for all the cross-border cases

Hypothesis 1 is verified, since as expected, when saturation increases IVCs confirm to be more likely to realize ties with foreign startups. Given the financial nature of their main objectives, IVCs show to be affected by an economic condition such as market saturation, that reflects both on the ease to find local investees and on the average domestic deals' price. These issues represent a cost for the investors; greater costs or prices to be paid to purchase equity stakes can undermine IVCs' capability to generate substantial capital gains, and in the long term this could damage IVC reputation and the possibility to guarantee itself a significant funds' inflow from the future fundraisings. It is interesting to look also at how the domestic investment patterns change when the saturation level increases. This check allows to investigate whether *Saturation* impacts on IVC probability to invest in general, or the statistically observed impact is typical of the cross-border activity only. The AME analysis of the IVC domestic case gives in output a negative and statistically significant coefficient (-0.1%). This result reinforces the previous arguments and findings: the probability to realize ties within national borders decreases because of the home unfavourable conditions to the maximization of the financial returns, whereas the willingness to invest abroad increases.

Hypothesis 2 instead, is not verified: the absence of statistical significance in the results obtained does not allow to compare the reactivity of CVCs and IVCs cross-border cases. The CVCs' lower elasticity to prices and greater international vocation, rather than provoking a weaker marginal effect of *Saturation* compared to IVCs, makes CVCs' cross-border behaviour apparently not influenced by this home market condition. Additionally, the comparison with the domestic case allows to understand whether the observed results are limited to the cross-border activity or

characterise the overall CVC activity. Even in this case, the results of the AME analysis are not statistically significant, affirming that the increase of home market saturation does not affect the degree of domestic activity. Hence, *Saturation* seems not to be a relevant determinant in the CVC investment decision process overall; this finding underlines the deeply different nature of corporate and independent funds in reacting against economic market conditions.

Hypothesis 3 is not verified as well: similarly to the CVC case, the non-significant results of the AME analysis do not allow to compare the GVCs' reactivity to *Saturation* with the IVCs' one, and suggest that the rare investments performed outside national borders are likely guided by occasional political and strategic objectives rather than such home market condition. Interestingly, looking at the domestic patterns, it can be noticed that, contextually to an increase in *Saturation*, GVCs' likelihood to fund ventures rises. The first possible interpretation is that GVCs' intervention itself provokes an increase in the saturation level of the home VC market, rising the capital supply; however, it is unlikely, as their impact on the whole supply side is marginal. The most convincing interpretation, instead, is based on the countercyclical nature of the GVC business, that means GVC activity becomes more relevant and massive when domestic conditions are not friendly for investors. GVCs' intervention to contrast the increasing domestic saturation may be thus an attempt to increase the high-quality demand perceived by IVCs, lowering the information asymmetries some startups may suffer from. This behaviour may help in keeping the IVCs focused on the domestic market and avoid the case of a shift of interest towards foreign countries.

The robustness of all the statistical results discussed so far, was verified substituting the logit with the probit model, and using an alternative operationalisation of *Saturation*.

Conclusions

This work sheds lights on the impact of the domestic VC market saturation on the cross-border activity of different VC types. Overall, it is possible to conclude that *Saturation* implies for IVCs a shift of propensity from local to foreign investments, seeking for more favourable economic market conditions to optimize financial returns. On the opposite, CVCs do not consider *Saturation* a relevant variable in their decision-making process for both domestic and cross-border investments. The dominant strategic focus often leads them to invest regardless of the economic market conditions, when the target venture fits their business; as a consequence *Saturation* is not observed to modify CVC patterns. Finally, GVC cross-border activity is driven by determinants other than *Saturation*. Interestingly, results show that *Saturation* affects their domestic behaviour; the increased propensity to invest might be interpreted as an attempt to maintain the domestic environment attractive and contrast the possible migration of IVC capital towards foreign countries.

This work presents some limitations and has room for improvements. First of all, more precise and punctual data on funds raised by VCs and equity collected by startups may be gathered. Second, it was not possible to include geographical distance as control variable in the analysis, although it is quite relevant in the internationalization topic. Third, as VC funds are typically specialized in investments on few industries, it might have sense to look at the domestic saturation of the specific industry on which each VC focuses its activities, rather than at the saturation of the domestic VC market as a whole.

The work also paves the way for interesting future research. The new home institutions perspective might be explored; the impact of domestic VC market saturation may be investigated using monetary figures, or studied under a home-host institutions perspective to understand whether investment flows go from more saturated to less saturated countries; finally, the insightful findings obtained about *captive* VCs' behaviour could be deepened by specific future works.

The contributions of the thesis are relevant for practitioners, academicians and policy makers. The findings are informative for VCs about the common patterns of the industry they belong to, and for startups, that might seek for financings from VC firms established in saturated foreign countries. The domestic saturation topic and the home institutions perspective in general may be deepened and represent an opportunity for academicians. The findings give significant information to policy makers as well, whose interest is to preserve the attractiveness of their home market and avoid a decrease of the investment activity within national borders.

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MASTER OF SCIENCE IN MANAGEMENT ENGINEERING

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DISSERTATION

Cross-border Venture Capital investments: the role of domestic market saturation

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“…ché non fa scïenza,
sanza lo ritenere, avere inteso.”

Dante (Paradiso, V, 41-42)

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ABSTRACT (ENGLISH)

Venture Capital (VC) was born as a local business. Compared to the alternative financing options young ventures can recur to, VCs contribute to startups' growth through value-adding services such as coaching and monitoring, that require frequent contacts and thus benefit from geographical proximity. Nevertheless, in the last decades positive trends of VC industry internationalization were observed worldwide. Literature gained interest towards the topic and tried to investigate the determinants of VC firms' decisions to invest cross-border.

This work provides novel contribution to the research stream on the determinants of cross-border VC activity, by analysing the effect of the domestic VC market saturation. VC market saturation depends on the interplay between the supply and demand for capital; its level increases contextually to an excess of supply, or a shortage of demand. Our central argument is that the increased difficulty to find domestic investment opportunities, and the likely increase in the average price to be paid to secure a deal in the home market, may force VC firms to seek for more attractive investment opportunities abroad. Given the heterogenous nature of their objectives and scopes, independent VCs (IVCs), corporate VCs (CVCs) and government VCs (GVCs) may react differently to changes in the level of domestic VC market saturation.

This work examines the impact of domestic VC market saturation on the likelihood to undertake cross-border investments of the different investor types (IVC, CVC, GVC) using a dataset of realized and unrealized European VC-venture ties between 2007 and 2018, derived from the VICO database.

Results highlight that domestic VC market saturation can be considered a determinant of IVC cross-border activity: as domestic saturation increases, the probability to invest abroad becomes larger to the expense of a decrease in the willingness to invest domestically. The same relation does not hold for CVCs and GVCs, whose cross-border decisions seem not to be influenced by saturation. Quite interestingly, whereas domestic CVC investments are not driven by domestic saturation as well, GVCs' likelihood to fund ventures within national borders is positively affected by an increase of domestic VC market saturation, probably due to the countercyclical nature of their activities.

Keywords: Venture Capital; internationalization; determinant; saturation; ownership.

ABSTRACT (ITALIANO)

Il Venture Capital (VC) è un business tradizionalmente locale. Rispetto alle opzioni di finanziamento alternative a cui le giovani imprese possono ricorrere, i VC contribuiscono alla crescita delle startup attraverso servizi a valore aggiunto come *coaching* e *monitoring*, che richiedono contatti frequenti e quindi beneficiano della vicinanza geografica. Tuttavia, nelle ultime decadi sono state osservate in tutto il mondo tendenze positive di internazionalizzazione del settore VC. La letteratura ha maturato interesse verso l'argomento e ha indagato le determinanti delle decisioni di investire oltre confine.

Questo lavoro fornisce un nuovo contributo al filone di ricerca sulle determinanti di investimento oltre confine, analizzando l'effetto della saturazione del mercato VC domestico. La saturazione del mercato VC dipende dall'interazione tra domanda e offerta di capitale; il suo livello aumenta contestualmente a un eccesso di offerta o a una carenza di domanda. L'argomentazione centrale di questa tesi è che la maggiore difficoltà a trovare opportunità di investimento locali e il probabile aumento del prezzo medio da pagare per assicurarsi un *deal* nel mercato interno possono costringere gli operatori VC a cercare opportunità di investimento più attrattive all'estero. Data la natura eterogenea dei loro obiettivi e ambiti di investimento, i VC indipendenti (IVC), corporate (CVC) e governativi (GVC) possono reagire diversamente a variazioni del livello di saturazione domestica.

Questo lavoro esamina l'impatto della saturazione del mercato VC nazionale sulla probabilità di intraprendere investimenti oltre confine dei diversi investitori (IVC, CVC, GVC) analizzando un dataset di investimenti potenziali (realizzati e non) in Europa tra il 2007 ed il 2018, derivanti dal database VICO. I risultati evidenziano che la saturazione del mercato VC domestico può essere considerata una determinante dell'attività internazionale degli IVC: all'aumentare della saturazione, la probabilità di investire all'estero diventa maggiore a scapito di una diminuzione della volontà di investire a livello nazionale. La stessa relazione non vale per i CVC e i GVC, le cui decisioni di investire all'estero non sembrano essere influenzate dalla saturazione. Mentre per i CVC anche gli investimenti domestici non sono guidati dalla saturazione, è interessante notare che la probabilità dei GVC di finanziare imprese all'interno dei confini nazionali è influenzata positivamente da un aumento del livello domestico di saturazione, probabilmente a causa della natura anticiclica delle loro attività.

Parole chiave: Venture Capital; internazionalizzazione; determinante; saturazione; tipologia.

1. INTRODUCTION

The Venture Capital business plays a critical role in the financial and economic systems worldwide, supporting the growth of several young and risky ventures. The latters have a positive impact on countries' economies creating jobs, promoting innovation and stimulating established players to become more dynamic and improve their productivity to avoid being displaced (Bosma et al., 2011; Drover et al., 2017). Many times, ventures are not able to survive the first years, if not backed by appropriate financial intermediaries such as VC firms, because of the information asymmetry issues that impede them to collect sufficient resources to set up the business. Besides financial resources, needed to fill the *funding gap*, VCs also transfer knowledge and competences to the startups helping them to limit the *knowledge gap*. For this reason, VCs' one represents a complete and comprehensive form of backing, and it is considered as the most appropriate financing mechanism for the young ventures (Bottazzi & Da Rin, 2002; Bertoni et al., 2016). The VC business was born in the USA and subsequently took off all around the world. VCs can be independent (IVCs), or backed by a parent organization, that is the case of corporate VCs (CVCs), government VCs (GVCs) and bank VCs (BVCs); each investor type category has its own specific goals and investment patterns. VCs contributed to the growth of many former promising startups, that nowadays became large and established corporations; some examples are Google, Facebook, WhatsApp, Twitter, Airbnb, SpaceX, Spotify, Alibaba Group, Yoox.

Along the years, the VC phenomenon have drawn the attention of the policy makers and of the scholars. Research concentrated on many different aspects of the VC business such as the steps of the investment process, the effects of the VC firms' *treatment*, the determinants of the investment decisions. Concerning the steps of the investment process, there is broad literature on the ex-ante screening activities, on the more detailed evaluation the proposals that overcome the screening stage are subjected to, and on the way contracts are designed. The effects of the *treatment* investigated mainly refer to the growth experienced by VC-backed ventures, and to their likelihood to successful exit via IPO or M&A. Research on the determinants of the investments aimed at understanding VCs' decisions criteria in selecting which entrepreneurial firms to finance.

More recently, literature funnelled efforts also into the internationalization of the VC industry topic, incentivized by the positive foreign investment trends detected worldwide. In the past, VC firms' activity was mainly geographically concentrated, with investment flows directed towards ventures located nearby, because of the difficulty to provide constant support to startups established in far locations, and of the challenges to be faced when operating in a foreign country.

This thesis contributes to the literature on VC internationalization, in particular to the research stream investigating the determinants of the decisions to invest cross-border. The determinants studied so far can be classified in two categories, namely the *country-level determinants* and the *VC firm-level determinants*. The first category focuses on the institutional settings and attractiveness of the different countries as influencing factors of VCs' decisions, whereas the second investigates which firm-level characteristics make VCs more propense to invest abroad. Assuming a *home institutions perspective* (i.e. studying the conditions of the domestic country as drivers of VC firms' cross-border investment decisions), this work sheds lights on the role of *domestic VC market saturation* as determinant country-level. The extent to which an increase in the saturation level of the home VC market affects VC firms' probability to invest abroad, is analysed for the different investor types, as their patterns of reaction may differ due to their diverse objectives' structure and scopes.

The thesis is structured as follows. In Chapter 2 a broad review of the literature is presented, starting from a general presentation of the VC business history and main features, followed by a description of the different investor types, and by an overview of the VC internationalization phenomenon. In Chapter 3 the research gap is identified and addressed through the formulation of the specific research question and the Hypotheses. Chapter 4 reports a description of the VICO dataset, the process of dataset reduction that led to the definition of the final sample, and an overview of the sample main statistics. The econometric model specification and the main variables included are illustrated in Chapter 5. Chapter 6 presents the analyses performed to test the Hypotheses and the numerical results obtained. The discussion of the results is developed, and extended through further analytical considerations in Chapter 7. Chapter 8 is dedicated to the check of the results' robustness, that is verified through two additional tests. Finally, the work's conclusions, contributions, limitations and suggestions for future research avenues are addressed in Chapter 9.

2. LITERATURE REVIEW

In this Chapter, the theoretical background of this work is presented. First, a general overview on the VC phenomenon is provided; second, since most of the literature focused on Independent VCs, a detailed description of the alternative VC types is reported; third, the internationalization theme, that is the core of this research, is deepened.

2.1 GENERAL OVERVIEW VCS

In this Section, the rationale and function of the VC business in the economic system is presented; afterwards, the main activities the VC firms carry out (i.e. fundraising and investing), are described, together with some evidence of the literature about the average outcomes of their investments.

2.1.1 VC business definition, history and scope

VC refers to the professional asset management activity that raises financial resources from institutional investors and wealthy individuals, and invest them on young and risky entrepreneurial ventures with high potential to grow (Sahlman, 1990; Da Rin et al., 2013; Grilli et al., 2019).

The first VC fund was established in the US immediately after the World War II in 1946 - by MIT President Karl Compton and Harvard professor Georges F. Dariot - and focused investments on companies exploiting technologies that were developed during the military conflict (Gompers & Lerner, 2001). “Draper, Gaither, and Anderson” fund was the first to adopt a model based on limited partnership in 1958; although it started diffusing, this organizational structure became dominant only in the ‘80s and led to the industry take-off, overcoming bureaucratic constraints imposed by the poorly designed SBIC (Small Business Investment Companies) program, launched by the US government to stimulate the VC industry providing generous public funds or loan guarantees (Gompers & Lerner,

2001; Bottazzi & Da Rin, 2002; Grilli et al., 2019). Although the VC industry originated in the US, it then spread around the world, experiencing its real boom in late '90s due to the explosion of high-technology industries and activities in the IPOs market (Gompers & Lerner, 2001; ECB, 2005). VC has always been a very much US-centric industry, with the USA still today accounting for 51% of the global worldwide activity (NVCA, 2021). However, when dealing with Europe, it is worth considering the internal heterogeneity of the VC industry across countries: UK & Ireland and France & Benelux together account for around 54% of the total invested amount of European venture capitals (Invest Europe, 2020).

Entrepreneurial firms usually experience lack of resources, both in terms of fundings (*funding gap*) and in terms of knowledge and competences (*knowledge gap*). When seeking for funds, entrepreneurs should thus wisely evaluate the alternative sources based on investment focus and amount to be raised - financial dimension -, and the nature of involvement they need beyond the provision of capital - knowledge dimension -, since the choice may be determinant for the future venture's performances and growth perspectives (Drover et al., 2017). Indeed, there are several alternative financing channels the ventures can resort to, from traditional to novel ones - as for example Crowdfunding, Initial Coin Offerings (ICOs) -, that guarantee a wide range of options based on the amount to be raised by the venture and its lifecycle stage (**Figure 1** and **Figure 2**).

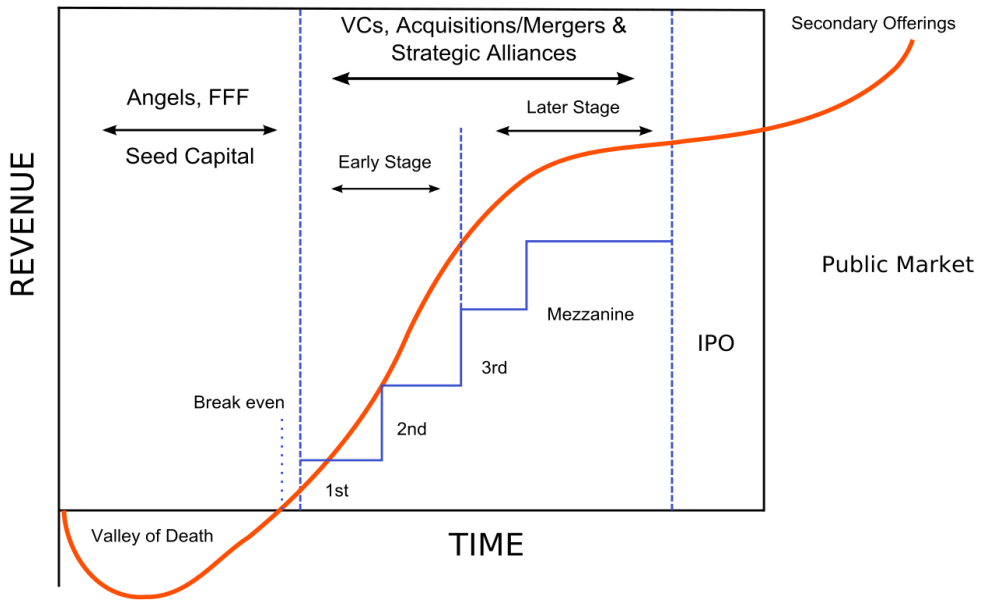

***Figure 1**: Startup life and financing cycle (from Cumming & Johan, 2013)*

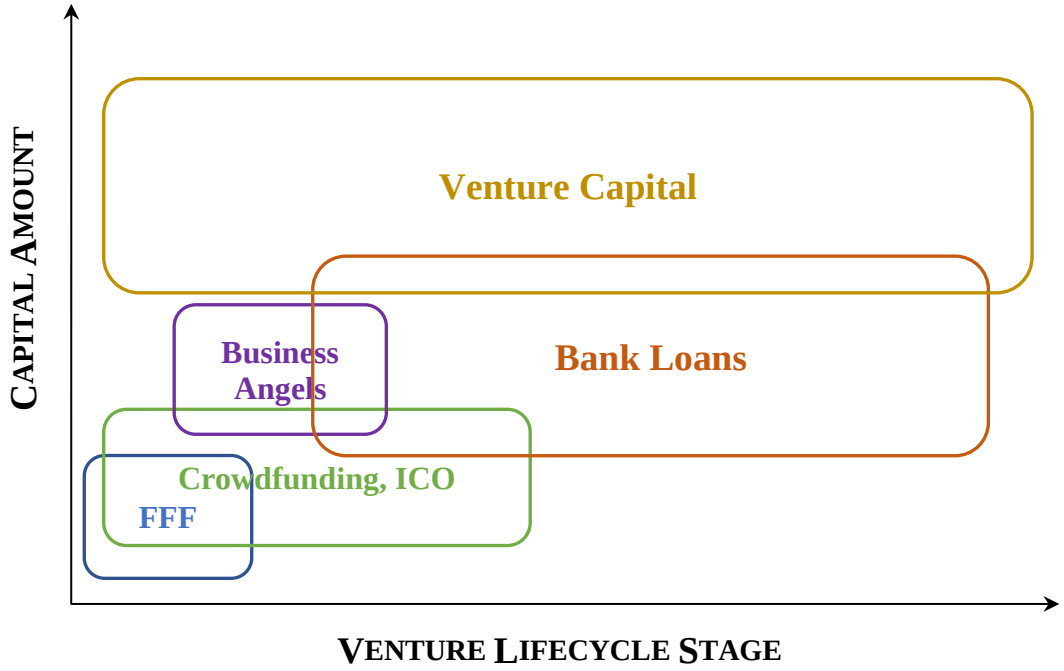

***Figure 2**: Map of potential financers based on venture stage and capital requirements (from Dushnitsky, 2011)*

Financings from *friends, family and fools* and angel investors - i.e. usually former entrepreneurs with specialized abilities in recognizing promising business opportunities (Cumming & Johan, 2013) - are more relevant in the seed stage, when the venture is still burning money to make research and develop the concept (Abrams, 2017); in fact, they are

the only real financing options due to the great uncertainty at that moment. Given the nature of these types of financiers, the amount of capital they can provide is limited.

Crowdfunding and ICOs, instead, allow to collect funds from the crowd and their success depends also upon whether the campaign is well-designed or not. They may be helpful during various phases of the venture lifecycle, also for the non-monetary benefits they can bring, such as feedbacks about potential product improvements (Di Pietro et al., 2018) and relevant information on customers' potential demand (Agrawal et al., 2014).

Another source of external capital, available along all the stages, is bank debt. Commercial banks, however, tend to require sizeable collateral that ventures might not possess - the value of young companies often stays in intangible assets, that are not eligible for collateralized loans (Berger & Udell, 1998) -, to mitigate the information asymmetry (Cumming & Johan, 2013). Additionally, banks are more likely to finance low-risk projects, since their main interest is to ensure being repaid and remunerated in time (Cumming & Johan, 2013). As a result, ventures may be credit rationed in the debt market as optimal response by banks against the information asymmetry problem (Stiglitz & Weiss, 1981).

Overall, since debt financing is often not capable to meet the needs of the young and risky venture businesses, the literature considers Venture Capital as the most appropriate financing mechanism (Bottazzi & Da Rin, 2002; Bertoni et al., 2016). Indeed, besides the *funding gap*, VCs support ventures in filling the *knowledge gap* providing them financial and business advice sitting in the board of directors, coaching, networking opportunities (contacts with both other firms and professionals), support in the recruiting activity and monitoring in the post-investment phase (Sahlman, 1990; Sapienza et al., 1996; Gompers & Lerner, 2001; Da Rin et al., 2013).

Apart from the specific advantages brought to the backed ventures, VCs have a broader impact on the entire economic system: they fuel the innovation level of a country, entrepreneurial entry rate and employment growth (Da Rin et al., 2013; Drover et al., 2017).

The type of ownership is one of the most important differentiating factors for VC firms, since it orients governance structure, organizational schemes and VC operations (Bertoni et al., 2015). First, independent venture capitals (IVCs) can be distinguished from *captive* venture capitals. The latter category concerns VCs acting as agents of a parent organization, and includes three main typologies: corporate VCs (CVCs), bank-affiliated VCs (BVCs)

and government-affiliated VCs (GVCs) (Croce et al., 2015). *Captive* VCs will be further deepened in **Section 2.2**.

2.1.2 VC organizational structure, fundraising and reputation

IVCs are organized as a set of managers collecting funds from investors, and arranging the investment activity in *funds* having on average a 10-years life (Tyebjee & Bruno, 1984; Grilli et al., 2019). The typical organizational model is a partnership in which the VC firm executives (*General Partners*, GP) exert active management assuming unlimited liability, while financers (*Limited Partners*, LP) do not intervene in fund's decisions and bear limited liability (Sahlman, 1990; Da Rin et al., 2013). GPs compensation scheme is contractually defined and incorporates two main components: a *management fee* to cover operating costs and salaries, and *carried interests*, that are performance-based remunerations consisting in a percentage of the difference between fund's exit proceeds and committed capital (i.e. the whole capital provided to the fund, gross of fees) (Gompers & Lerner, 1999; Da Rin et al., 2013). The *carried interests* represent the largest portion of GPs' compensation, enabling them to participate in the funds' profits - the typical percentage applied is 20% (Gompers & Lerner, 1999) -, and thus they create high-powered incentives for GPs aligning their objectives with those of LPs, mitigating the moral hazard problem (LPs act as principals and GPs as agents) (Sahlman, 1990; Hill et al., 2009).

The institutional investors VC firms mainly raise funds from, are pension funds, government agencies, sovereign wealth funds, funds of funds, and corporations. In Europe (see **Figure 3** and **Figure 4**), the breakdown of the funds raised by VCs per investor type evidences government agencies as the largest source, accounting for 30%, followed by funds of funds (12%) and private wealthy individuals (11%) (Invest Europe, 2020).

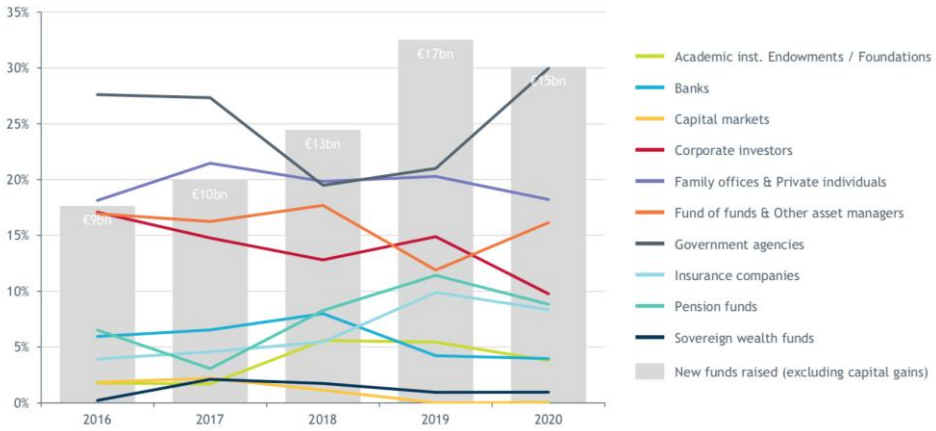

***Figure 3**: Breakdown of European VC limited partners in 2016-2020 (Source: InvestEurope)*

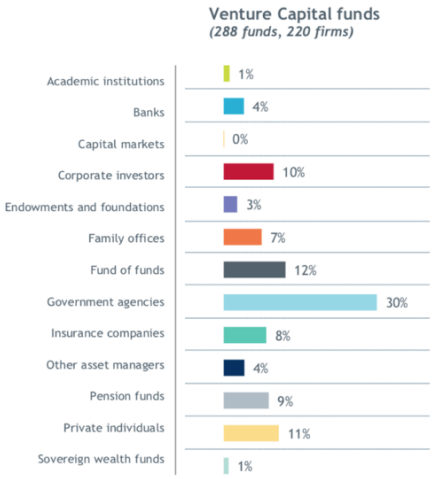

***Figure 4**: Breakdown of European VC limited partners in 2020 (Source: InvestEurope)*

The amount of funds raised can be very volatile from one year to another, and this phenomenon is often coupled with volatility on the IPO markets (Gompers et al., 1998). Such aspect becomes even more significant for IVCs since, differently from *captive* VCs that are backed by an organization guaranteeing funds, they continuously need to seek for LPs to finance their activities. Thus, in this context, reputation plays an important role: VCs that became reputable thanks to prior successful and lucrative investments, raise larger funds more easily (Gompers et al., 1998). Additionally, more reputable VC firms are more likely to see their offers being accepted by ventures (Hsu, 2004) and so have higher probability to capture most promising opportunities, since entrepreneurial firms might be attracted by the enhanced exit prospects a reputable VC backing usually guarantees (Nahata, 2008). On the other hand, the relevance of this topic may lead to the paradoxical

case of GPs hurrying to exit their investments before the ideal time to quickly gain reputation, thus achieving suboptimal results acting against LPs' interests. This behavior is known as *grandstanding* (Gompers, 1996).

2.1.3 VC investing activity and outcomes

Once the fundraising phase has been accomplished and the fund has been set up, VC firms need to select a bundle of investees and support them in their growth. Literature presents a consolidated framework categorizing the activities that VCs carry out into a few defined steps. Being a largely debated topic, some slightly different suggested versions of the investment process exist, although their backbone always remains the same. For this reason, in this work, the most general version presented by Tyebjee and Bruno's (1984) seminal paper is reported (**Figure 5**).

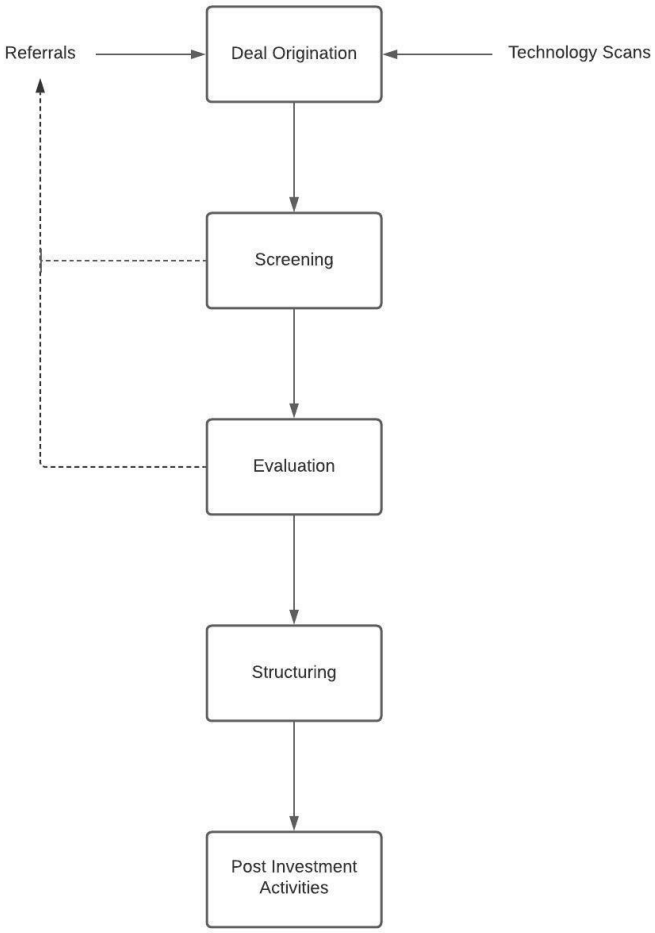

***Figure 5**: Venture Capital investment process (Source: Tyebjee & Bruno, 1984)*

- *Deal origination.* VC firm executives should try to become aware of many projects, in order to increase the likelihood to spot *good cherries*. There are three main mechanisms of deal origination: first, VCs may passively wait for entrepreneurs to submit their proposals; second, many potential investees are suggested through referrals by other VCs, bank advisors, investment banks, portfolio companies' managers, or other people belonging to the VC firm's network; third, the VC might actively seek for potential deals (Tyebjee & Bruno, 1984; Fried & Hisrich, 1994).
- *Screening*. In the large deal flow originated from the first step, VC executives should try to distinguish good companies from *lemons* (Akerlof, 1978), overcoming adverse selection[1] issues. Pre-investment screening is a way to mitigate the information asymmetry generated by the great uncertainty and lack of ventures' track records (Wright & Robbie, 1996; Kaplan & Strömberg, 2001). It consists in analyzing whether the potential deal fits with VC investment preferences (size, industry, etc.), and then making a qualitative assessment of the entrepreneurial firm's characteristics through the business plan and elevator pitch, and consequently deciding whether to reject the proposal or move it to the following steps (Tyebjee & Bruno, 1984; Fried & Hisrich, 1994). The main criteria used by VCs are classifiable in two dimensions: the *horse* one concerning the business opportunity, and the *jockey* one concerning the entrepreneurial team (MacMillan et al., 1985). The first category entails drivers such as market size and growth perspectives, competition level, attractiveness of the technology and business model (Kaplan & Strömberg, 2001); whereas the second includes managerial competences and experience, completeness of the entrepreneurial team, and cognitive aspects such as leadership, commitment and passion (Tyebjee & Bruno, 1984; Fried & Hisrich, 1994; Chen et al., 2009). Finally, some contingent factors related to the investment terms and venture's demographic features (geographic location and stage) are taken into account in the screening process (Fried & Hisrich, 1994; Kaplan & Strömberg, 2001).
- *Evaluation*. The proposals that are not rejected at screening deserve further valuation by the VC. Startup valuation is "said to be more art than science" (Köhn, 2018): the interplay of different factors regarding ventures, VCs and external environment enhances complexity, and the limited willingness of entrepreneurs to

[1] Adverse selection refers to a condition in which investors suffer from the risk of selecting low quality ventures in the market, because of information asymmetry.

disclose full information makes it difficult to accomplish this step (Manigart et al., 1997; Köhn, 2018). The evaluation process starts with additional information gathering, risk appraisal, required return definition, and continues with the actual startup valuation (Manigart et al., 1997). To collect additional information some meetings with the venture's top management team might be planned (Fried & Hisrich, 1994), followed by the draft of the due-diligence report (Manigart el al., 1997). The latter, together with the check of the business plan coherence and the observation of financials, represents the most relevant source of information (Manigart el al., 1997), preparing the ground for the subsequent valuation. Many alternative valuation mechanisms exist (e.g. Discounted Cash Flows, multiples, historic costs valuation), and the frequency of their employment may vary across different legal systems and countries (Wright et al., 2004). For example, in UK multiples are used more compared to other European countries such as Belgium, Netherlands and Germany, where DCF is the most common method (Manigart el al., 1997; Wright et al., 2004).

- *Deal structuring*. Once a potential deal has been positively assessed, VCs and ventures need to close the contract. The outcome of this step, even though it comes at the end of a long and effortful process, is not obvious: many deals actually reach this phase but are not signed (Fried & Hisrich, 1994). In the contractual terms, many aspects need to be defined. Clearly, as first, the pre-money venture's value and the price of the deal (i.e. funds provided by the VC in exchange for a specific equity stake) must be determined (Tyebjee & Bruno, 1984). Besides the quantity of money, also the way and time it is going to be provided is decided at this stage: usually, *staging* and *earn-out* schemes are put in place, making payments contingent to the attainment of milestones (Tyebjee & Bruno, 1984; Gompers & Lerner, 2000). This allows the VC firm to postpone capital provision when more information will be available, and to guarantee alignment of objectives with entrepreneurs. Finally, some covenants are included in the contract to protect VC interests, reducing agency costs: state-contingent *voting, board* and *liquidation rights* allow VC to increase the degree of control in case of poor performances; *redemption rights* enable VC quick exit from non-performing ventures' investments; *anti-dilution clauses* restrict ventures' new equity issues without the VC's approval; *timing vesting provisions* make it costly for entrepreneurs to abandon the company (Tyebjee & Bruno, 1984; Kaplan & Strömberg, 2003).

- *Post-investment activities*. As already anticipated in **Subsection 2.1.1**, VCs remain active also after the deal has been completed through coaching and monitoring. It is up to the single VC firm to decide the level of involvement it wants to maintain (Tyebjee & Bruno, 1984).

As a remark, the above described process is the one VCs run in the case of standalone investments; however, many deals in the VC market are syndicated. *Syndication* refers to the joint investments in projects made by two or more VC firms (Brander et al., 2002). In a syndicate, one VC company acts as lead investor, funding the venture with the greatest amount of capital and leading the monitoring and coaching activities. The rationale behind *syndication* is identifiable in the possibility of risk sharing, obtaining a second opinion in the screening step, performing coaching activities together; additionally, it enables VC firms to participate in large and attractive deals also providing smaller amounts (Lerner, 1994; Lockett & Wright, 2001).

Empirical evidence confirms the positive effect of VC backing on portfolio companies. The positive results obtained may be theoretically explained under two perspectives: *selection effect*, according to which the success comes from the developed VCs expertise in identifying and picking "winners"; *treatment effect*, according to which instead, success is due to the VCs ability to build "winners". The two effects are not mutually exclusive, but rather complementary. Literature, however, identified some methods to disentangle *selection* and *treatment*, thus verifying that VCs are actually able to add substantial value to the investees. Puri and Zarutskie (2012) proved that VC-backed ventures are more likely to survive than non-backed comparable ones, and experience larger sales and employment growth. Chemmanur and colleagues (2011) studied the impact of VCs on portfolio companies' efficiency; results obtained show that they contribute to the increase of Total Factor Productivity (TFP). The US based research has been replicated in a European setting by Croce and colleagues (2013), who consistently found positive VC treatment effect on TFP. Finally, VC backing is associated with managerial professionalization (e.g. appointing experienced managers and adopting stock option plans) (Hellmann & Puri, 2002; Colombo & Grilli, 2013).

The positive treatment effect is reflected in the exit performances as well; in fact, portfolio companies have a higher probability to go public through an IPO and to be acquired through M&A (Puri & Zarutskie, 2012). This result is even amplified as the level of VC *activism*

(i.e. level of involvement in recruiting and in the establishment of the board, support in finding additional funds, post-investment interaction level) increases (Bottazzi et al., 2008).

2.2 CAPTIVE VCS

During the years, most of the literature concentrated efforts on the study of Independent venture capital characteristics and behavior. However, the VC phenomenon is heterogenous and other types of VC firms exist based on the ownership structure. Besides the traditional IVCs, that are financial firms backed by a set of limited partners providing funds to be invested, there are also the so-called *captive* VCs: firms backed by a parent company (CVC, BVC) or by public organizations (GVC) (Bottazzi et al., 2008; Croce et al., 2015). This distinction is very relevant in the VC discussion, since each type of VC has a specific set of objectives in the investment activity (considering the interplay between financial and strategic ones), and own target ventures selection, treatment and monitoring practices, leading to different outcomes in terms of value added and exit performance (Colombo & Murtinu, 2014).

2.2.1 CVC - Corporate Venture Capital

CVC investments are defined as minority equity investments made by non-financial established firms in young privately held ventures (Dushnitsky, 2012), and such programs can be structured as investment vehicles, business units or subsidiaries of non-financial corporations (Bertoni et al., 2013; Chemmanur et al., 2014). CVCs usually are subject to centralized resource allocation from the parent company (Chemmanur et al., 2014); this on one side gives stability to the VC activity, but on the other side implies that the managers need to sometimes accept a lower degree of freedom and respect the investment focus defined by the parent company (Bertoni et al., 2013).

CVC activity was observed to increase a lot in the ‘90s in the US, incentivized by the success of venture-investing experienced in that period (Gompers & Lerner, 2001). This led many corporate executives to reshape their innovation process, with CVC program becoming a significant complement to the internal R&D activities. CVC investments allow to promote an entrepreneurial attitude also in established firms, and to participate in

innovative technologies arising in the industry landscape (Winters & Murfin, 1988). Thus, CVC plays a key role in a firm's *innovation toolkit*, especially for companies operating in certain environments (Dushnitsky & Lenox, 2005a). Indeed, the firms operating in dynamic environments - characterized by rapid technological change, high competitive intensity, weak appropriability regime, huge importance of complementary assets - are the most likely to set up a CVC program (Dushnitsky & Lenox, 2005b; Basu et al., 2011). Besides industry-specific factors, some firm-specific elements enable and drive corporations towards the venturing activity: first, substantial internal cash flows and marketing resources (usually signalling good reputation) are needed; second, the corporation must have a good *absorptive capacity* (i.e. the ability to absorb and use additional external knowledge) (Cohen & Levinthal, 1990; Dushnitsky & Lenox, 2005a; Basu et al., 2011). CVC programs may be organized as *pilots* (i.e. characterized by substantial organizational independence and permanent financial commitment) or as *copilots* (i.e. characterized by strong dependence on corporate management in decision-making and capital commitment) (Siegel et al., 1988). CVC personnel are usually compensated through base salary, plus eventual bonuses based on ventures' performances; only in few cases *carried interests* (or similar bonuses) are put in place (Dushnitsky, 2006).

Overall, differently from IVCs that exclusively seek for high financial returns, CVCs primarily pursue strategic objectives in their activity in order to benefit from synergies through the combination of the existing corporate resources and the venture capabilities (Dimov & Gedajlovic, 2010; Bertoni et al., 2013; Chemmanur et al., 2014). These synergies can be achieved gaining access to technology licenses, acquisition chances, product marketing rights, and international opportunities (Winters & Murfin, 1988). Indeed, Dushnitsky and Lenox (2006) find that CVC activity helps the parent company creating value only when it is strategically oriented: financially oriented CVCs benefit less from the investing activity due to structural limitations (misaligned incentives, internal conflicts, incompatible objectives).

The CVC-venture tie may be beneficial on the young ventures' side as well, as these investors, being part of an established parent company operating in a specific industry long since, usually possess specialized competencies and assets that IVCs cannot provide (Bertoni et al., 2013). The benefits of being backed by a CVC are particularly relevant when there is strategic fit (related products, services and technologies) between the portfolio company and the investor, as the complementary resources and capabilities the CVC can

provide access to are its distribution channels, market knowledge, network of suppliers and customers.

At the same time, however, the ties with CVCs are to be considered a *double-edged sword*, since, if operating in the same industry (or in industries that are close to the corporate's one), the venture may suffer from risk of knowledge misappropriation by the established company, especially in case of weak IPP (i.e. Intellectual Property Protection) regimes (Dushnitsky & Shaver, 2009; Colombo & Shafi, 2016). Empirical evidence from the US demonstrates that when legal IPP defense is weak, the likelihood of tie realization between CVCs and ventures belonging to the same industry drops (Dushnitsky & Shaver, 2009). This evidence is not totally confirmed when replicating the study in a European setting, where, due to the more limited set of financing options in early stage, startups form ties with same sector partners also in the case of weak IPP regime (however still with a lower probability than in the case of tight regimes) (Colombo & Shafi, 2016).

When legal protection is not adequate, portfolio companies may resort to different types of defense to mitigate misappropriation risks: *timing* and *social defenses*. *Timing defense* consists in postponing the realization of a tie with a CVC to a late stage, when misappropriation of knowledge becomes harder (Katila et al., 2008; Colombo & Shafi, 2016). *Social defense*, instead, refers to the realization of a tie with a prominent IVC having a central role in the *syndication* network; this reduces the risks of opportunistic behavior by the CVC investor, since its misconduct would be signalled by the IVC, and thus would be detrimental for its reputation and future investment opportunities (Hallen et al., 2014; Colombo & Shafi, 2016).

If the venture succeeds in overcoming the above mentioned issues, the overall experience of being backed by a CVC shows to be positive, observing the outcomes of the relationship. Bertoni and colleagues (2013) find that CVC investments have a positive effect on sales and employment growth, even though sales increase more slowly than in case of IVC financing (consistently with the hypothesis that CVCs are less inclined to *grandstanding*). Besides being effective in boosting sales, CVCs also help the portfolio companies enhancing the overall efficiency, in fact they show to improve TFP (measured considering sales as output, and payroll expenses and fixed assets as input) (Colombo & Murtinu, 2014). CVCs have a positive impact on ventures' innovativeness level as well - in terms of R&D expenses, patenting outcome quantity and quality -, in a greater extent compared to IVCs (Chemmanur et al., 2014). Finally, CVCs, being often linked to multinational corporations,

are positively related to portfolio companies' sales internationalization (Park & LiPuma, 2020).

All these aspects contribute to the observable good exit performances of CVC-backed firms. Gompers and Lerner (1998), in their analysis based on a set of 30,000 investments made between 1983 and 1994, observed that ventures backed by CVCs are at least as likely to experience a successful exit as those backed by IVCs, with likelihood of success positively related to the strategic fit between the CVC and the portfolio company. In the case of IPO exit, ventures enjoy a valuation premium when a strong strategic fit with the CVC parent company is present (Ivanov & Xie, 2010).

2.2.2 GVC – Government Venture Capital

Young ventures, spreading invention and innovation, bring benefits both in social and, especially, economic terms to the local and national environment (Bertoni & Tykvovà, 2015), positively impacting on the GDP, and stimulating incumbents to improve their efficiency and create jobs (Bosma et al., 2011). However, entrepreneurial firms typically bear difficulties in receiving suitable financings, due to the high uncertainty of their businesses, information asymmetries manifesting into lack of consolidated track records, and the negligible amount of collateral. In Europe, where IVC investors are less willing to make seed investments (Bertoni et al., 2015) and tend to narrow the focus on few specific industries and metropolitan areas, these hurdles are even more pronounced (Tykvovà, 2018). The government can mitigate the impact of this market failure intervening either through indirect policies (supporting the business of private VCs creating favourable environment conditions), or through direct policies (guaranteeing grants, subsidies and loans directly to the ventures, or setting up public-owned VC funds). Thus, GVCs aim at filling the equity gap for those ventures that would have the potential to grow but are not able to raise funds from private VCs, also supporting the development of local innovation ecosystems and yielding social returns (Colombo et al., 2016). Given the nature of their main objectives, GVCs are less focused on financial returns compared to IVCs (Bertoni & Tykvovà, 2015; Colombo et al., 2016).

Previous literature reports evidence posing concerns about the effects of the GVC activity on the selected portfolio companies, when investing on a standalone basis. Indeed, public investors show to have negligible impact on investees' invention (patent stock) and

innovation (citation-weighted patent stock) levels (Bertoni & Tykvovà, 2015), and both on sales and employment growth (Grilli & Murtinu, 2014). However, the effect becomes positive when GVC invests in *syndication* with a private lead VC investor: the presence of the governmental investor boosts the positive impact of IVC's treatment (Grilli & Murtinu, 2014; Bertoni & Tykvovà, 2015).

The same pattern is observable for exit success and performance as well: Cumming and colleagues (2017), in their European study, observed that GVCs have a negligible impact on the likelihood of successful venture exit, while *syndication* of public and private VCs is conducive to a higher probability compared to both the cases of IVC-backed only ventures and GVC-backed only ventures. Overall, the negligible impact of GVC standalone investing activity may be attributable to the possible limited experience and ability both in selecting investee companies and being effective during the monitoring and mentoring phases (Colombo et al., 2016).

Nevertheless, GVC activity seems to succeed in signaling valuable ventures suffering from information asymmetries, attracting investments from private VCs (i.e. *crowding-in* effect) (Leleux & Surlemont, 2003; Brander et al., 2015; Guerini & Quas, 2016; Tykvovà, 2018), that is actually part of GVC programs' mission.

2.2.3 BVC – Bank Venture Capital

The third type of *captive* VC is the bank-owned one. Although the key role played by banks in the financial markets, and their presence in the VC industry, less literature focused on this VC category compared to the others (Da Rin et al., 2013). The rationale behind this kind of activity for the bank is twofold: first, when it comes to ventures with a business that is compatible or complementary to the banking activity, BVC can act as a strategic investor and leverage on complementary assets and competences the startups may offer (Hellmann et al., 2008); second, investing in young companies and, thus, building a relationship with them, increases the likelihood of future financings in the loan market (Hellmann et al., 2008; Da Rin et al., 2013). In fact, observing BVCs investment patterns it is possible to notice they have a particular preference for industries with high debt level and companies showing great debt capacity (Hellmann et al., 2008; Da Rin et al., 2013). Given the nature of the banking activity, and the key role played by banks in the economy, BVCs demonstrate to be quite risk averse. BVCs, and bank-backed funds in general (Mayer

et al., 2005), tend to invest in later stage deals (Hellmann et al., 2008; Da Rin et al., 2013), and prefer large-syndicate deals (Da Rin et al., 2013). Additionally, Croce and colleagues (2015) find that these types of *captive* VCs mainly target ventures showing a low risk of financial distress and, consequently, default probability.

On the venture side, being backed by BVC allows not only to reduce the equity gap to finance long term projects (Croce et al., 2015), but also to obtain loans at lower rates in the future (Hellmann et al., 2008; Da Rin et al., 2013). Finally, although the support that BVCs are able to provide is smaller than IVCs one, they have lower pressure to quickly exit their investments and can eventually inject additional capital in the following rounds (Croce et al., 2015), that could be an advantage for the venture.

2.3 INTERNATIONALIZATION OF THE VC INDUSTRY

In this Section, a detailed review of the VC internationalization phenomenon is developed. The Section is structured as follows: an overview on the recent international trends based on statistical data reported in research articles and websites; VC internationalization strategies; obstacles to be faced and overcome when investing abroad; foreign investments' performances; advantages on startups' side of being backed by an international investor; and finally the determinants of cross-border investment decisions.

2.3.1 Overview of the internationalization phenomenon

VC firms traditionally target nearby ventures as their function consists in providing not only financial resources, but also value adding services. During the post-investment phase, the activities of coaching and monitoring are crucial to boost benefits and reduce agency costs (Cumming & Dai, 2010), and are more easily manageable when the investee company is close to the VC itself, allowing to frequently organize in-person meetings, give constant advice and build a trustworthy relationship. Although improvements in ICT nowadays enable effective remote collaboration, geographical proximity is still considered a significant dimension, both from the VC and venture perspectives. In Europe for example, VCs are mainly located in hubs placed in financial centers and high-tech regions and tend to invest nearby; at the same time, the willingness of a venture to search for external equity

funds rapidly drops when the distance from the potential investor overcomes the threshold of 250 kilometers (Colombo et al., 2019). Even the U.S. VC industry, the largest worldwide, is concentrated in a few specific local areas, such as Silicon Valley, Boston and New York, and most investment decisions have traditionally been guided by the so-called *20-minute drive rule* (Stross & Randall, 2006).

Despite the importance of geographical proximity, in recent years international VC activity gained momentum, with positive trends of growth in cross-border capital flows worldwide. Interconnection of financial markets and improvements in the transportation systems for sure contribute to the increase of cross-border flows, reducing costs related to distance and information asymmetry (Cumming et al., 2009; Bernstein et al., 2016; Zheng et al., 2020). Internationalization of the VC industry concerns both VC firms' inflows (funds raised) coming from foreign limited partners, and outflows (VC investments) to ventures with registered office established abroad (Wright et al., 2005). However, this thesis will concentrate on the second dimension only: the international investing activity.

Zheng and colleagues (2020), in their analysis based on Crunchbase data, identified an annual global growth rate in cross-border VC investments of 25% from 1995 to 2017. For what concerns the European market, between 1988 and 2003 international investments passed from less than $1bn to $8.4bn, while funds raised from foreign countries increased to $12bn from the initial value of $0.7bn (Wright et al., 2005). These figures are relevant also in percentage terms: in fact, in the time window 1994-2004, 22.5% of European VC deals were performed by investors belonging to a different country from the investees (Bertoni et al., 2015). This tendency seems to be confirmed and enhanced, since the percentage in the years between 1998 and 2014 reached the value of 29.5% (Bertoni et al., 2019). According to InvestEurope (2020) statistics, as of 2020 cross-border deals are about 34% of all the European ones (**Figure 6**). A research by Bradley and colleagues (2019) reports more recent data - gathered from Dealroom - showing that only 56% of VC flows in Europe are attributable to European investors, while US and Asia respectively account for 26% and 13% of the market; the study overall confirms that VC market has a global rather than continental dimension. Narrowing the focus on cross-country activity within Europe, data show that the investments in portfolio companies coming from the other European nations ranges between 12% and 33% for all countries (Bradley et al., 2019).

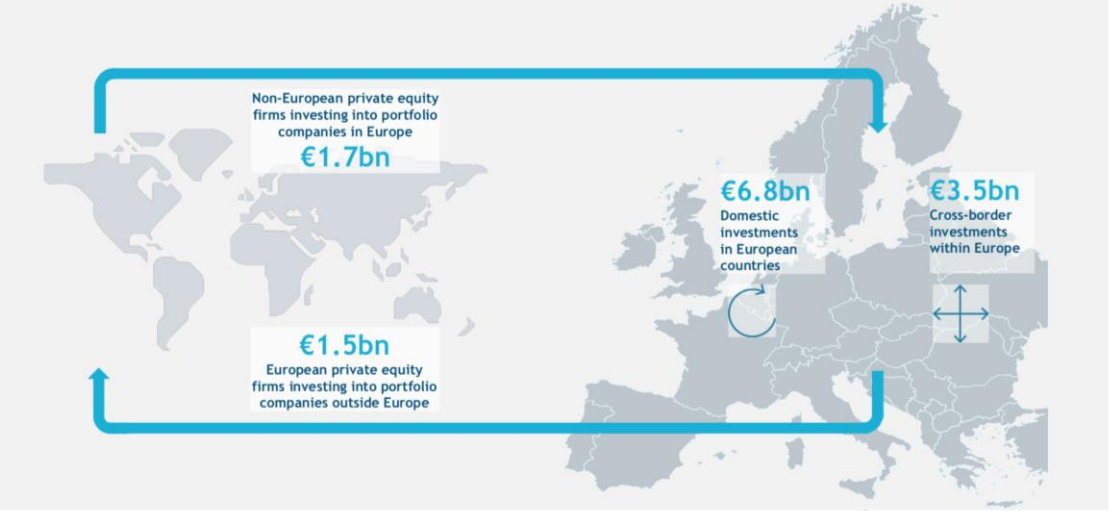

***Figure 6**: International VC investment flows (Source: InvestEurope)*

2.3.2 VC internationalization strategy

The decision to internationalize is determinant for the life of a VC firm and it can arise from the interplay between macroeconomic factors and the observation of other peers' behaviour. Vedula and Matusik (2017) identify three main imitative mechanisms, differing based on the players the firm refers to, through which venture capitalists take the decision to invest abroad for the first time: geographically proximal firms, former syndicate partners with whom the VC firm has prior ties, and competitors investing in similar industry sectors. Internationalization requires a careful strategic approach, as along the process some key decisions need to be taken. The choice of the countries to be targeted is relevant since it can severely impact the success of the investment portfolio, as pointed out by several literature. When moving into foreign markets, VCs are used to define a set of potential investee nations and not to focus directly on one country (Manigart et al., 2000). International VCs are especially attracted by states that can count on "high-end human capital, a better business environment, military expenditure, and deeper financial markets" (Aizenman & Kendall, 2012). Investing abroad implies venture capitalists to relate with environments presenting differences from an economic, regulatory and institutional point of view. Moreover, nations differ not only in their *formal institutions* but also in the *informal* ones, that stay for well-established national culture and values (North, 1990). VCs need to take this second dimension into account in the internationalization process; even the same institutional conditions in different countries can lead to diverse economic

outcomes due to the different cultural settings (North, 1990; Li & Zahra, 2012). The importance of the compatibility of social and cultural backgrounds between the investor and the investee is witnessed by the findings of Bottazzi and colleagues (2016), showing that VC activity tends to be fostered in countries towards which there is higher generalized trust (i.e. "Generalized trust is a set of beliefs about the behavior of a random member of an identifiable group of individuals [...] this trust concerns not only what investors believe about a specific entrepreneur, but also what they believe about the entrepreneur's countrymen and institutions").

Another relevant decision for VC firms is the choice of the entry mode in the foreign VC market, both from an organizational and operational point of view. As Devigne and colleagues (2018) highlight in their synthesis of the former internationalization literature, this topic has been undertreated so far, only identifying - along the organizational dimension - the dichotomy between direct investments from the headquarters and establishment of local subsidiaries. In terms of operations as well, investors need to decide whether to replicate their domestic practices or modify them consistently with the host country environment conditions (Wright et al., 2005), since different institutional contexts usually mean different local common practices (Bruton et al., 2005). The discussion on the entry modes can be enlarged analyzing how, once the organizational choice has been made, VC firms can structure their investment activities. Dixit and Jayaraman (2001) identified three possible main models: specialized fund model (the VC firm creates several funds specialized by geographic region and eventually by sector too), organic growth model (investments made by the same fund with a consistent investment policy throughout the globe, determined and controlled by a central committee), affiliate model (consisting in either forming a joint venture or co-investing with another investment firm in *syndication*). In cross-border deals, syndicating with VC firms that are headquartered in the foreign target country, is a recurrently adopted strategy - as supported by the empirical evidence (Hain et al., 2016; Meuleman & Wright, 2011) -, since it allows to cooperate with experienced investors in the host environment, overcoming the difficulties arising from institutional differences (Meuleman & Wright, 2011) and, more in general, mitigating the impact of the *liability of foreignness* (Nahata et al., 2014) - defined to as the additional costs a firm operating in a foreign market needs to face with respect to a local firm (Zaheer, 1995). Local investors may be more able to spot the best deals and may be facilitated in providing coaching and monitoring, while the VC firm coming from abroad may be mostly involved at a strategic level (Wright et al., 2005), also given that strategic advice is easier to provide

from a distant location than operational support (Pruthi et al., 2003). Thus, *syndication* also can solve the problem of how to organize operations in the host country, since most of the time the operational part is in the hands of the partner. Besides being recurrent, syndicating with local VCs shows to be effective since it has positive impact on the investments' performances in terms of sales growth, total assets growth, employment growth (Devigne et al. 2013). This leads to a higher probability of exit through Initial Public Offering, with larger proceeds (Dai et al., 2012; Cumming et al., 2016).

At the same time, it is worth to point out that *syndication* is not free from challenges; for example, Liu and Maula (2016) show that the uncertainty of a foreign environment negatively impacts on the likelihood to syndicate with firms established in that environment, since it can be detrimental to the success of the partnership and, consequently, the investment. Moreover, *syndication* might bring additional costs when the relationship between investors does not work in a proper way, provoking the risk of opportunistic behaviour by the partner selected (Park et al, 2019).

2.3.3 Obstacles in cross-border VC activity

In the entrepreneurship and entrepreneurial finance debate, information asymmetry is always presented as one of the hurdles that need to be overcome in order not to compromise the success of the VC activity. Larger information asymmetry makes it necessary for investors to put in place higher effort in their business, it increases the costs to be faced and augments the risk of failure of the investment campaigns. With respect to the VCs investment process, asymmetries mainly manifest in the difficulty of gaining information about ventures and being thus able to distinguish the high-quality from the low-quality ones, without stumbling into adverse selection problems (i.e. ex-ante information asymmetry). This generates high transaction costs - in particular information, screening and due diligence ones - for the investing firm. Geographical distance enlarges the information asymmetries posing real challenges to the VC investors (e.g. De Prijcker et al., 2012), and this effect is even more intense when the investee is established abroad (Wright & Robbie, 1998; Nahata et al., 2014). Investing from another country makes it harder as well to carry out monitoring activities - especially when distance increases -, and to control partners' behaviours in case of *syndication* (Park et al, 2019). Empirical evidence supports the thesis that spatial distance and likelihood of VC investments have a negative

relation (Colombo et al., 2019; Zheng et al., 2020). In the financial research, even when it comes to Mergers and Acquisitions, Chakrabarti and Mitchell (2013) highlight that low geographical proximity hinders flow of resources, requiring more information processing.
These arguments integrate with the *liability of foreignness* theme. The specific disadvantages that foreign firms typically can suffer from are: spatial distance, unfamiliarity with the host country, lack of legitimacy due to economic nationalism, and home country restrictions on activities in the host country (Zaheer, 1995). As pointed out in much literature, international companies need to tackle political-institutional, economic and cultural differences (Zaheer, 1995; Wright et al. 2005), that increase complexity and generate additional learning, adaptation - to the operations of the foreign market -, transportation and coordination costs (Zaheer, 1995; Manigart et al., 2000; Zheng et al., 2020).
Institutional differences are key for the VC cross-border activity. Diverse institutional settings from one country to another mean different property rights protection mechanisms, contracting rules, economic and tax regimes; thus, institutional distance generates inconsistencies between foreign VCs' practices and local ones, increasing as well the risks of sanctions, compliance costs and legitimacy losses (Li et al., 2014).
As previously anticipated, institutions can be divided into *formal* and *informal* ones. Formal institutions are defined as "a set of political, economic and contractual rules that regulate individual behavior and shape human interaction"; the more developed they are, the greater is the VC activity (Li & Zahra, 2012). Complementarily, the informal side of institutions deals with norms, values, common beliefs and assumptions, which can be more generally merged under the title of culture (Li & Zahra, 2012). Bustamante and colleagues (2021) affirm the importance of informal institutions' role in the development of VC markets. Cultural distance gives rise to communication problems, lack of legitimacy, and other issues depending on the different values and beliefs (Li et al., 2014). These differences are deeper than formal institutional ones, and for this reason they have been often considered more relevant in the literature to study VCs' behaviour and activity: Moore and colleagues (2015), for example, observed that cultural distance actually has a negative impact on VC cross-border activity, while the same does not hold when considering formal regulatory distance. Li and Zahra (2012) results support the view that culture, studied along the dimensions of collectivism and uncertainty avoidance (i.e. two of the five dimensions defined by Hofstede's (1994) framework), impacts on the size of VC activity. Gantenbein and colleagues (2019) observe that the different levels of individualism (opposite to

collectivism) can explain around 30% of cross-country variation in VC activity; individualistic culture usually leads to better investor protection, accountability, transparency and governance.

Although venture capitalists have to cope with severe burdens in internationalizing their activities, some researches have identified factors allowing to partially mitigate the impact of information asymmetry and distance along all the dimensions reported:

- New air connections' proliferation, reducing the time necessary to move around the globe, moderates geographic distance (Zheng et al., 2020).
- Trust - including both institutional trust ("trust in the institutional structure and the honest behavior of citizens in a particular country") and relational trust (trust between two actors joining a specific relation) - mitigates the impact of geographical and cultural distance (Hain et al., 2016).
- *Syndication* with local VCs can help reducing distances (Tykvová & Schertler, 2011; Nahata et al., 2014; Dai & Nahata, 2016).
- Learning and experience help to bridge distances (Chakrabarti & Mitchell, 2013; Li et al., 2014).
- Investing in later stage makes the information asymmetry's effect less severe (Dai et al., 2012).

2.3.4 Performance of VC cross-border investments

The theme regarding the exit performances of VC cross-border investments has been largely debated in the literature, with mixed evidence depending also on the perspectives adopted in the different researches: the first perspective refers to the analysis of the exit probability for the portfolio companies when they are backed by foreign VCs, the second to the effect of distances on the success of the investments, and the third to the comparison between the returns of equivalent domestic and cross-border investments for a VC firm.

Discussing evidence from the first perspective, for those investors that succeed in managing the hurdles of cross-border coordination, there is potential space for likely IPOs and M&As

(Cumming et al., 2016). Several studies confirm the positive impact of foreign VCs' backing for the ventures, especially when syndicating with local partners. Cumming and colleagues (2016) analyzed whether internationalization of the ownership structure impacts on the ventures' exit success (through IPOs or M&As) and deal value; results show that portfolio companies that collect financial resources from foreign investors have a higher exit probability (more relevant for IPOs than for M&As), and performance in terms of proceeds. This evidence is compliant with the previous work by Chen and colleagues (2010), reporting that non-local deals outperform local ones in terms of Initial Public Offering exit probability. Cross-border financings differ from domestic ones, among other things, also for the investment duration - that is the time elapsing between the acquisition of equity stakes and the exit -, in fact data show that cross-border investments seem to be exited faster (Wang & Wang, 2012; Espenlaub et al., 2015). This behaviour may be associated with macro-factors such as economic, legal and financial market conditions (Espenlaub et al., 2015).

The success and positive performances of the cross-border VC backing are often connected to the presence of a syndicate in the host country with other investing firms, since networking can facilitate the coordination of value adding services with portfolio companies (Humphery-Jenner & Suchard, 2013). In Asia, for example, entrepreneurial firms that collect funds from an international syndicate composed by both foreign and domestic VCs, are 5% more likely to experience a successful exit (Dai et al., 2012). In addition, comparing mixed syndicates with homogenous ones made either only of local or only of foreign investing firms, Chemmanur and colleagues (2016) noted that the former leads to more successful exits and superior post-IPO operating performances. It is worth to notice that the benefits hold not only in case of *syndication* with local VCs, but also in case of partnering either with other foreign VCs having experience in that market, or with foreign VCs experienced in countries with similar cultural settings (Dai & Nahata, 2016); in fact, experience in international activity and superior local knowledge are key factors in achieving great investment performances (Chemmanur et al, 2016).

Overall, evidence suggests that entrepreneurial firms should consider to seek for international VC investors in order to enhance the likelihood of exit (Cumming et al, 2016).

The second perspective focuses on the interplay between distance and investments' success. The literature offers two alternative points of view on the topic: distance having a positive effect versus distance having a negative effect on cross-border VC activity success.

Nahata and colleagues' (2014) empirical evidence reports a positive relation between cultural distance and success, in particular with regards to early-stage investments. The rationale behind these results suggested by the authors is that higher distance incentivizes venture capitalists to carry out more severe ex-ante screening and deal selection processes. Another advantage that foreignness and distance can provide to VC firms, arises from the reduced social involvement with the venture and the limited embeddedness in the host economic environment: this allows investors to reduce individual decision biases and the tendency to the escalation of commitment (i.e. human behavior pattern in which an individual, facing increasingly negative outcomes from some decisions, continues the same behavior rather than alter course), exiting their investments efficiently (Devigne et al, 2016).

On the contrary, some studies find out that distances have negative implications on exit and performances of cross-border investments. Li and colleagues (2014) concentrated on cultural and institutional differences, whose increase was found to lead to lower likelihood of successful exit (both for IPO and M&A), opposite to the above mentioned work by Nahata and other academics. Besides these burdens, geographic distance as well can negatively affect foreign VC activity. Local ventures' (i.e. those backed by nearby VCs) probability of successful exit via IPO or M&A is larger than that of non-local ones (Cumming & Dai, 2010), because of all the issues arising from low geographical proximity explained in the **Subsection 2.3.3** (information asymmetry and monitoring).

Finally, the third perspective aims at comparing the success of home-country versus host-country investing, for the VC firms. Cumming and colleagues (2009) found that returns coming from investments in US-based entrepreneurial firms were lower than those from domestic investments, for Asian-Pacific VC firms. Buchner and colleagues (2018) were able to make a global systematic analysis on the comparison between domestic and equivalent foreign investments, using IRR for the VCs - not the likelihood of exit - as measure of performance. Overall, results demonstrate that equivalent foreign investments underperform domestic ones, as they persistently generate lower returns. In particular, this effect is amplified by the increase of distances along cultural, institutional and geographic dimensions.

2.3.5 Benefits for foreign VC-backed ventures

Searching for foreign VC financings may be helpful for entrepreneurial firms, since it allows them to gain several benefits and overcome eventual domestic environment's limitations. In particular, this could be a strategy to compensate for potential domestic lack of financial resources on the VC supply side and not appropriate exit conditions (Schertler & Tykvová, 2012; Colombo et al., 2019).

In addition, several literature tells that international VCs contribution is substantially valuable in improving the performances of the portfolio companies (Maula & Mäkelä, 2003; Mäkelä & Maula, 2005; Devigne et al., 2013; Guo & Jiang, 2013; Cumming et al., 2016; Park et al., 2019). In the first place, foreign VCs, having different backgrounds and practices, may bring to the venture complementary competences and capabilities to those already provided by the local investors, thus enriching the pool of resources (not only financial) available for the growth of the portfolio company; for example, Guo and Jiang (2013) observed that foreign venture capitalists, compared to local Chinese venture capitalists, were able to provide more experienced professionals and high-powered incentives to investment experts. The thesis that foreign VCs add value to the ventures' performances is strengthened by evidence on the growth they experience - measured in terms of sales, total assets and employment - when backed by a *syndication* including an international investor; whereas if backed by a foreign investor only, the additional growth effect appears in the long (but not short) term (Devigne et al., 2013). The magnitude of the benefits a startup can obtain when it is backed by a foreign VC depends on the single VC's characteristics as well (e.g. experience, precise geographical location). Differently from domestic investors, cross-border venture capitalists are able to provide portfolio companies not only with large amounts of capital, but also with access to broad international networks (Park et al., 2019). In that way, ventures can expand their knowledge of foreign markets and build contacts with suppliers and consumers established abroad (Mäkelä & Maula, 2005) - helpful in case of internationalization of their business activities -, assuming a global perspective and becoming legitimized in the new market (Maula & Mäkelä, 2003). Foreign VC contribution might be especially important for companies operating in some specific developing VC markets and/or industries requiring huge amounts of fundings, to scale up and become international players (Devigne et al., 2018).

Assuming an international perspective entails not only advantages from a strategic and operational point of view, but also the rise of additional exit opportunities, made possible

by the access to overseas markets provided by the foreign VC. Bertoni and Groh's (2014) empirical evidence from Europe confirms that the presence of a foreign investor - controlling for VC syndicate size, local exit conditions, and investee performance - increases the portfolio companies' exit opportunity, exploiting the cross-border VC firm's home market as a second avenue for a potential deal, thus positively impacting on the final exit probability. The cross-border investor can in fact mitigate the "informational problems related to do IPOs and trade sales in foreign markets" (Jääskeläinen & Maula, 2005).

2.3.6 Determinants of cross-border investment decisions

Previous research tried to study the determinants of the process leading a VC fund to opt for investing in an entrepreneurial firm established abroad. In this Subsection, the topic is deepened summarizing what is reported by the literature (see **Table 1**).
The internationalization decision can be guided either by the attractiveness of a specific foreign country conditions (*country-level determinants*), or by the policy and goals of the VC (*firm-level determinants*). Finally, apart from analysing cross-border investment decision making as a structured process in which several determinants come into play, it is worth to consider that the foreign investment choice could be opportunity-driven. It means that it may be pulled by the very high quality of the entrepreneurial firm (Cumming et al., 2016) - based on venture's signals and eventually VC managers *gut feel* (Huang & Pearce, 2015) - rather than pushed by a decisional process.

As anticipated in the Subsection dedicated to the internationalization strategy (**Subsection 2.3.2**), some countries, thanks to their peculiarities, can be more attractive to the eyes of the potential investors. More institutionally developed countries are more willingly targeted by VC firms, as information asymmetries are mitigated thanks to the structural conditions of the environment (Devigne et al., 2018). Nations characterized by robust public governance guarantee protection against knowledge spillover and corruption, offer developed IPP regimes, ensure more stable macroeconomic and political perspectives (Pezeshkan et al., 2020). In fact, VCs are mainly attracted by institutions able to provide stability and protection, and to foster innovation ensuring a friendly ecosystem for entrepreneurial proliferation, commercialization of technological advancements - since in different cultural settings the degree of adoption of disruptive innovations may vary

(Uzuegbunam & Geringer, 2021) -, and fair appropriation of returns; this argument holds especially for less-experienced VC firms (Guler & Guillén, 2010).

To report *country level determinants*, it was decided to use the classification adopted by Groh and colleagues (2010). Their research, however, had the objective of defining the attractiveness of a country for the VC activity in general, without making explicit reference to the impact of these determinants on VC cross-border activity. Nevertheless, the variables that they identified as determinants for the attractiveness of a given country were proved, in other researches, to be actual determinants for VC cross-border investment decisions.

For each of the six drivers an explanation of why they have an impact on attractiveness, and a reference to the articles that verify their impact on cross-border VC activity are provided:

- *Economic activity and GDP growth*. Flourishing economies may present more entrepreneurial opportunities, with better market conditions on both sales and capital sides, thus offering potential for satisfactory returns from investments. The impact of expected GDP growth on the willingness of VC firms to invest into a specific country was proven to be positive (Schertler & Tykvová, 2011; Aizenman & Kendall, 2012).
- *Development and size of the stock market*. An active and liquid stock market in the host country gives the VC investors enhanced perspectives for profitable and successful IPO exits, and thus it is a strongly considered factor in the VC firms internationalization decision process (Aizenman & Kendall, 2012).
- *Fiscal policies*. Tax regimes impact on the entrepreneurial ecosystem, and in particular on the determination of the quality of the national entrepreneurs' pool; in fact, they were proven to influence willingness to self-employ (Poterba, 1989). On the investors' side, capital gain taxation has a further direct impact on investment policies: the reduction of the capital gain taxation - profit realized on the sale of the shares of the investee at the exit moment - boosts the attractiveness of a country for investors, facilitating thus an increase in the capital flows (Grilli et al., 2019). Empirically, the impact of taxation regimes on cross-border VC investments, has not been tested yet. However, the large evidence about the role of fiscal policies for the VC activity in a given country, may suggest a relation between them and foreign VC financings likelihood.
- *Investors' protection rights and corporate governance*. Capital markets in general benefit from the presence of strong and clear minority investors' protection rights

(Roe, 2006). Countries with low protection levels might be perceived as riskier by any type of investor; indeed, legal structures impact on ventures' chances to receive outside financing (La Porta et al., 1997). With respect to the VC industry, Guler and Guillén (2010) confirm that US venture capitalists are more likely to invest in countries with strong investors' protection rights. Moreover, the quality of legal and governance frameworks influences ventures' contracting capabilities and consequently cross-border investments; in fact, when there is inability to enforce complex contracting, VCs international activity is hindered (Balcarcel et al, 2010).

- *Human and social environment*. This dimension deals with nationally spread values, culture and background (that shape individual behaviour), and with the quality of the human capital in terms of knowledge and competences. Aizenman and Kendall's (2012) research reports that VCs are particularly interested in countries with local high-end human capital when crossing borders.
- *Entrepreneurial culture*. The widespread entrepreneurial culture of a nation is mainly reflected by the Research and Development efforts, and the innovation output levels in terms of patents and scientific articles (Gompers et al., 1998; Schertler, 2003). Guler and Guillén (2010), measuring the level of innovation activity in a state through the above mentioned factors, showed that it has an actual positive impact on foreign VCs willingness to invest in that given country.

The country-level determinants described so far are relevant to define a single target country's overall attractiveness - for cross-border investments -, and how it enhances the willingness of a foreign VC firm to invest there. Hence, these determinants can be grouped together in a category whose perspective is the *host institutions* one, according to the taxonomy used by Mingo and colleagues (2018) in their international business study. However, it is important to have not only a static, but also a dynamic view of such determinants, analyzing their interplays and differences across countries, thus assuming a *home-host institutions* perspective (Mingo et al., 2018). Many times, in studying the drivers of cross-border activity, a country-pair perspective approach could further explain VCs decisions, compared to a single-country one: Tykvová and Schertler (2011), for example, report that the decision to target a specific country may be guided by the differential expected GDP growth between that country and the domestic one, rather than by the attractiveness of the foreign state's GDP per se. The same pattern is observable taking into account and comparing the market capitalization of the stock exchanges across countries.

Besides differential conditions or expectations, a country-pair perspective is useful for analyzing as well the effects of countries' distances and eventual integrations. In fact, less geographically and culturally distant host countries from the investor's home one, are more likely to be targeted in cross-border investments due to the lower difficulties faced (Moore et al., 2015) (see **Subsection 2.3.3**). In addition, VC firms are more attracted by countries whose economies are well structurally integrated in terms of common markets and currencies with the domestic VC one (Alhorr et al., 2008). In a similar way, VC funds' flows from a country to another, are fostered when strong human networks between the two exist, in particular in case of the presence of *transnational technical communities* (i.e. "groups of immigrants active in both home and host country networks") (Madhavan & Iriyama, 2009).

Country level determinants should impact transversely all the VC investors belonging to the same nation; however not all of them undertake internationalization, and in the case they decide to, VC firms behave differently one from each other. VCs international investments are in fact influenced by specific firm level factors, that must be taken into account when analysing the decision-making process (i.e. *VC firm level determinants*).

The VC landscape is broad and heterogeneous, since firms differ in investment focus, policy, ownership and reputation. These elements already significantly influence business strategies adopted in the domestic markets, ranging from investment targets to governance and organization; hence, they play as well a key role in cross-border decisions. Gupta and Sapienza's (1992) results show that VC firms whose focus is investing in early-stage ventures usually tend to concentrate more their activities locally. When dealing with ownership diversity, CVCs tend to have a broader geographic scope compared to IVCs (Gupta & Sapienza, 1992). Even though the samples of the researches are representative of different contexts (respectively American area and European area), Gupta's evidence can be integrated with the one by Bertoni and colleagues (2015) reporting that GVCs show narrow geographic focus. Additionally, more reputable - larger and more experienced - VC firms are less locally biased in their investment decisions, as they seem to have stronger capabilities in mitigating information asymmetries (Cumming & Dai, 2010).

Beyond the structural features of VC firms, that orientate their approach to decision making, also the contingent goals they may have in managing the investment portfolio need to be considered. For example, they may face the necessity to diversify their portfolio in order to modify their risk profile (when investments are too unbalanced towards a specific stage, or area, or industry). Buchner and colleagues (2018) proved that VC firms benefit

from diversification when investing cross-border, and hence suggested this factor may explain a part of their international investment decisions. Foreign investing is a way to accomplish geographic diversification; the degree of diversification could be amplified targeting ventures in different development stages, or operating in different industries, compared to the investment focus traditionally maintained by the VC firm (Knill, 2009).

Shifting the focus inside the VC firms, since the investment decision is a human process it is influenced by the managers who run it. Much literature points out the importance of managers' traits and background in the VCs' international expansion (Devigne et al., 2018): *human capital* can be "either a deterrent to or an enabler of internationalization" (Manigart et al., 2007). International prior experience increases the likelihood of managers to invest less locally, and especially to invest in foreign countries; this argument is supported by the evidence obtained both at a European (Manigart et al., 2007; De Prijcker et al., 2012) and global level of analysis (Schertler & Tykvová, 2011). Manigart and colleagues' (2007) findings also show that having many VC executives makes the firm's probability to invest abroad larger.

Besides the *human capital* of the company, it is worth to highlight the importance of the *social capital*, too. The network the VC can count on is determinant in increasing the chances to spot opportunities even beyond domestic borders, since syndicate partners - established abroad or with international track record - may signal the presence of high-quality ventures, due to their enhanced knowledge of the foreign environment and *certification effect* (Wright et al., 2005; Jääskeläinen & Maula, 2014), and propose to join them in the deal (Sorenson & Stuart, 2001). The *social capital* determinants amplify their relevance in the internationalization decision process as the size of the potential deals increases (since prior syndicate partners may need another investor to share the risk) (Schertler & Tykvovà, 2011), and as the VC firm network status both in the home and host country enhances (this aspect leads also to better VC exit performances) (Alvarez-Garrido & Guler, 2018; Liu & Maula, 2021).

Perspective	Authors, Year	Findings
Host country perspective	Guler & Guillén, 2010	- VCs are mainly attracted by institutions providing stability and protection, fostering innovation ensuring a friendly ecosystem for entrepreneurial proliferation, commercialization, fair appropriation of returns. - US venture capitalists are more likely to invest in countries with strong investors' protection rights. - The level of innovation activity in a state has an actual positive impact on foreign VCs willingness to invest in that country.
	Aizenman & Kendall, 2012	- International VCs are especially attracted by states that can count on a better business environment, military expenditure. - The impact of expected GDP growth on the willingness of VC firms to invest into a specific country is positive. - An active and liquid stock market in the host country gives the VC investors enhanced perspectives for profitable and successful IPO exits, and thus it increases host country attractiveness in the VC firms crossing-border decisions. - VCs are particularly interested in countries with local high-end human capital when crossing borders.
	Schertler & Tykvová, 2011	- The impact of expected GDP growth on the willingness of VC firms to invest into a specific country is positive.
	Balcarcel et al, 2010	- The quality of legal and governance frameworks influences ventures' contracting capabilities and consequently cross-border investments: when there is inability to enforce complex contracting, VCs international activity is hindered.
Home-host country perspective	Tykvová & Schertler, 2011	- The decision to target a specific country may be guided by the differential expected GDP growth between that country and the domestic one, and by the different stock market capitalization conditions.
	Moore et al., 2015	- Cultural distance actually has a negative impact on VC cross-border activity.
	Alhorr et al., 2008	- VC firms are more attracted by countries whose economies are well structurally integrated in terms of common markets and currencies with the domestic VC one.
	Madhavan & Iriyama, 2009	- VC funds' flows from a country to another increase in presence of ''transnational technical communities'' (i.e., "groups of immigrants active in both home and host country networks").

Table 1: *Summary of the cross-border investment determinants, grouped by perspective.*

Perspective	Authors, Year	Findings
VC firm perspective	Gupta & Sapienza, 1992	- VC firms focused in early stage investing usually tend to concentrate more their activities locally. - CVCs tend to have a broader geographic scope compared to IVCs
	Cumming & Dai, 2010	- More reputable VC firms are less locally biased, as they have enhanced capabilities in mitigating information asymmetries.
	Manigart et al., 2007	- International prior experience increases the likelihood of managers to invest less locally, and especially to invest in foreign countries - Having more VC executives enhances the firm's probability to invest abroad larger.
	De Prijcker et al., 2012	- International prior experience increases the likelihood of managers to invest less locally, and especially to invest in foreign countries
	Schertler & Tykvová, 2011	- International prior experience increases the likelihood of managers to invest less locally, and especially to invest in foreign countries
	Sorenson & Stuart, 2001	- The VC network is determinant in increasing the chances to spot opportunities even beyond domestic borders: syndicate partners may signal the presence of high-quality ventures and propose to join them in the deal.

***Table 1 (continued)**: Summary of the cross-border investment determinants, grouped by perspective.*

3. THEORETICAL FRAMEWORK

This Chapter presents the theoretical framework of the work, through the description of the research gap identified in the literature and, subsequently, the development of the model's Hypotheses.

3.1 LITERATURE GAP AND RESEARCH QUESTION

In this Section, first a research field that has been almost never investigated by the previous literature is identified (*research stream gap*); then, a specific gap belonging to that research stream is selected as main topic of this thesis and the research question is developed.

3.1.1 Research stream gap

When analyzing the international dimension of the VC industry, several studies initially focused on cross-country comparison, with an eye on the different practices, legal and economic conditions, and outcomes of the investing activities (Wright et al., 2005). The aim of the literature was to understand the extent to which a determined national setting was favourable or not for the VC activity. Afterwards, research, stimulated by the increasing real trends, gained interest towards the internationalization of the VC firms in terms of cross-border investing activity. Particular attention was paid to the determinants affecting the VC firms' likelihood to invest abroad, that, as summarized in **Subsection 2.3.6** can be grouped in two main categories: *VC firm-level determinants*, *country-level determinants*. The latter were investigated under different perspectives: on one hand, they concern the factors that determine the attractiveness of a host country, thus pushing VCs established in other nations to invest there (*host institutions perspective*); on the other hand, they deal with the dynamic interplay between countries, since, apart from the host country

attractiveness per se, cross-border deals may be guided by the comparison between home and host market conditions, and facilitated by a lower level of distance or a higher degree of integration (*home-host institutions perspective*).

However, VC firms' internationalization decisions may be influenced by some features of the domestic market as well: regardless of the host countries' conditions and attractiveness, investors may choose to employ funds abroad because of the disadvantageous circumstances or structural deficiencies of the home market, or specularly may refrain from going abroad when the domestic conditions are strongly favourable. This point of view gives rise to a third perspective: *home institutions perspective* (**Table 2**). To the best of the authors' knowledge, the home dimension was almost neglected by the literature, that investigated only the favourable status of the domestic stock market as determinant of cross-country VC activity: in fact, given the possibility to make the foreign portfolio companies relocate in the investor's home country, VCs may exploit their local bull-market conditions (Tykvová & Schertler, 2011; Devigne et al., 2018).

It is reasonable to think that a country's weak attractiveness - based on the institutional dimensions identified by Groh and colleagues (2010) (see **Subsection 2.3.6**) - not only reduces the chances of collecting investments from abroad (based on a *host institutions perspective*), but also may encourage local VCs to undertake cross-border deals (based on a *home institutions perspective*); on the other way around, strong attractiveness not only favours the inflow of investments from abroad, but also may tempt domestic VC firms to concentrate their activities within their national borders. Literature limited itself to state that favourable economic and financial domestic market conditions may discourage VC exports (Devigne et al., 2018). However, there is a lack of empirical studies demonstrating that domestic factors can be actually considered as determinants of cross-border investing activity; in particular, this means it still has to be proven that unfavourable home conditions increase the likelihood of VCs established in that country to allocate investments abroad.

Thus, there is a broad space for future research in the *home institutions perspective*, in order to understand the extent to which domestic conditions affect internationalization patterns of VC investors. This entails shifting the focus of the previous literature, that was mainly narrowed on the host countries' attractiveness and did not conceive the possibility that the cross-border investments might be induced by the home country's structural deficiencies and circumstances.

Perspective	Description
Host institutions	VC firms' cross-border investments are driven by the attractiveness of the potential target foreign countries.
Home-host institutions	VC firms' cross-border investments are driven by the more favourable settings of a foreign country compared to the domestic one.
Home institutions	VC firms' cross-border investments are encouraged by the conditions of the domestic country.

***Table 2**: Perspectives of the country level determinants.*

3.1.2 Specific gap and research question

Within the *home institutions perspective*, several possible drivers of cross-border activities, belonging to the economic, fiscal, cultural and legal dimensions, exist and could be analyzed. Potentially, it would be reasonable to study under the home perspective the impact of all those drivers identified and tested in the host perspective literature (i.e. those enhancing host countries' attractiveness) reported in **Subsection 2.3.6**, thus analyzing their influence even on domestic operators, rather than on foreign ones only.

Among all the potential factors belonging to the new perspective, this work aims to focus the attention on the economic dimension, investigating in detail a single specific driver. Being the *home institutions perspective* a quite unexplored research stream and this work one of the first explicitly dealing with it, the objective is to select a factor believed to be among the most important ones in the internationalization decision-making process of a VC firm. On the basis of this reasoning, the *saturation of the domestic VC market* emerged as a suitable potential determinant for the thesis, as it is a structural industry condition that might not only be a merely influencing factor in investors' decisions, but also force them to seek alternative courses of action. Adjusting the general definition of the saturation of a market to the VC one, a saturated VC market is "characterized by an excess of funds and a shortage of investment opportunities" (Buchner et al., 2018), leading to a condition of disequilibrium between the available and the actually demanded capital. Saturation is an economic factor, not at a macro but at a business economics granularity level, and is a complex indicator since it captures the dynamic interplay between supply and demand. For this reason, differently from other factors such as fiscal regime, IPP regime (etc.) that

usually are static for a mid-long time period, saturation is a dynamic feature characterized by continuous variability over time.

Hence, the contribution this work is able to provide to the research, is the understanding of how the *saturation of the domestic VC market* relates to the internationalization decisions of VC firms. The topic has been mentioned in some previous literature (Sapienza et al., 1996; Wright et al., 2005; Park et al., 2019), but never empirically studied, probably also due to the challenging operationalization of the concept of saturation. Moreover, since the Venture Capital phenomenon is heterogenous and different types of VCs usually show different investment patterns based on their strategic and financial objectives, it is appropriate, and even more informative, to decline the impact of market saturation along the ownership dimension. The necessity to include this dimension in the study is confirmed by the different internationalization behaviour assumed by independent and *captive* VCs (see Bertoni et al., 2015; Bertoni et al., 2019).

Thus, this work offers original insights on the way the saturation issue is perceived by different types of VCs, and the extent to which such specific economic variable influences their cross-border decisions. In this way, it is possible to observe if saturation results to be more relevant for certain VCs compared to others.

According to what stated in this Subsection, the research question of this thesis can be summarized as follows:

***RQ**: How does the saturation of the domestic VC market affect the cross-border investment decisions of different VC types?*

3.2 HYPOTHESES FORMULATION

In this Section, the Hypotheses to be tested are developed to answer the research question. The first Hypothesis refers to the IVCs, whereas the second and the third refer to the different behaviour of respectively CVCs and GVCs compared to the IVCs. It was decided to exclude the BVC case from the study, since, given the scarce literature background, it would have been tough to interpret the internationalization behaviour of this focal VC type category and develop an appropriate Hypothesis.

3.2.1 Hypothesis 1

The saturation argument has at times been presented in the literature as possible interpretation of the observed international investment patterns in the IVC landscape. Wright and colleagues (2005) justified the increasing interest of foreign VC firms towards developing economies with the saturation level reached by the developed countries' VC industries; to take advantage of this situation, governments of developing nations undertook radical regulatory reforms to make their environment more attractive to experienced investors. Park and colleagues (2019) as well, refer to cross-border VC activity as alternative pattern when looking for investment opportunities in the context of a saturated domestic market. However, as anticipated, the link between *saturation of the domestic VC market* and the tendency to internationalize the investment portfolio has been almost taken for granted and never explicitly verified. It is worth to point out that continuing to invest domestically and investing cross-border are not the only two alternative decisions a VC can take: when domestic saturation increases, and thus VC firms face more difficulties in investing locally, they can actually choose to invest abroad, or not to employ the available capital, waiting for more favourable conditions in the next future. Nevertheless, given the nature of this business's objectives (i.e. to remunerate limited partners usually within 8-10 years), the authors believe that the second alternative is not popular among VCs because of the opportunity costs that keeping part of the funds in house would imply, and agree with the above presented literature that neglected this option when suggesting the positive relation between home saturation level and international investments.

A unique attempt to investigate this relation has been made by Buchner and colleagues (2018) in their "Extensions of the study" section. The article focused on the comparison between the performances of cross-border investments and equivalent domestic ones (see **Subsection 2.3.4**), and found that the former persistently achieve lower returns. Given the outcomes of the study, the authors tried to answer why VC firms showed an increasing internationalization pattern despite the underperformance of foreign investments. The results of their extension study suggest that home VC market saturation might be determinant in domestic investors' cross-border activity decisions. However, the empirical analysis provides a summary judgment presented in the extension section and it cannot claim to have tested properly the relation between saturation and cross-border investments: there is not a real operationalization of saturation reflecting the precise definition of the variable. In fact the empirical analysis takes into account only the available supply of VC

funds without considering the demand side, assuming that when new funds are available to VCs, they try to invest them domestically as first alternative, and thus the eventual positive relation between the increase of funds and amount of international investments might be explained by an excess of supply or a shortage of investment opportunities at home. Hall and Tu (2003), in their VC firm-level study, observed that the willingness to invest abroad increases with the funds available to the single investors; it is reasonable to generalize the findings to the case in which more capital is available to many VCs and thus to the whole industry (larger supply in the domestic market), but even in this case the authors did not account for the demand side and thus the research cannot be considered dealing with the saturation topic. Both Buchner and colleagues' (2018) and Hall and Tu's (2003) studies, suggesting a positive relation between cross-border investments and the domestic supply of funds, that is one of the two saturation dimensions, can still provide valuable insights for the Hypothesis formulation. However, the link between saturation and internationalization still needs to be verified through original and appropriate measures, explicitly entailing the interplay between domestic supply of capital and demand for investments.

Moreover, the effects of saturation are likely to impact the average deal valuation and, consequently, the price to be paid to purchase domestic ventures' equity stakes. Indeed, based on the traditional economic law of supply and demand, the increase of saturation, mainly consisting in excess of supply or shortage of demand, should provoke an increase in deal prices: strong competition on supply side makes it harder for VCs to negotiate with promising entrepreneurial firms, forcing them to submit larger bids. An increase in the price to be paid reduces the expected return of the investments, and so IVCs may be more willing to internationalize searching for less expensive opportunities, since their activity is driven by financial objectives.

Finally, besides the argument on the average deals' value, and the positive influence of saturation of the domestic VC market on cross-border deals suggested by the researchers, the rationale is supported by additional side arguments, taking cues from the observation of other industries. For example, in the case of the traditional product business, exports become more frequent when the firms' home market is saturated (Reid, 1983). Although the Venture Capital industry is different, by analogy it reinforces the idea that when there are difficulties in the domestic environment due to excess of supply or shortage of demand (or both), investors might be induced to look for alternative opportunities even beyond national borders.

In accordance with the presented literature, evidences and reasonings, the first Hypothesis is as follows:

***HP1**: As the level of domestic VC market saturation increases, the likelihood of IVCs' cross-border tie formation increases.*

3.2.2 Hypothesis 2

As presented in **Subsection 2.2.1**, the corporate venture capital programs mainly pursue strategic objectives such as absorbing new technologies and competences, and accessing new markets (Drover et al., 2017), aiming at creating long-term value for the parent company (Hellmann, 2002). Financial goals are still relevant, but often secondary to the strategic returns: past research, based on surveys or case studies, confirmed this hierarchy of objectives (Yost & Devlin, 1993; Ernst & Young, 2002). This strategic orientation is reflected on CVC investment behaviour, both in the selection of potential investees, and on the way negotiations are conducted and contracts are closed: they could be propense to invest also in case of expensive deals or, in general, in case of not high expected financial returns, if the tie with the entrepreneurial firm offers relevant strategic benefits. The empirical evidence confirms a measurable difference between corporate and independent VCs in closed deals price, with CVCs showing a tendency to pay higher valuations (Hellmann, 2002; Gompers & Lerner, 2007). Thus, it is reasonable to think that CVCs are less influenced by the saturation level of the domestic context: in the case of a saturated market provoking an increase in average deal value, in which it becomes necessary to pay higher prices to secure contract closings, corporate investors may be willing to accept less attractive terms in order to still benefit from the strategic returns a domestic investee may bring. This suggests that, differently from IVCs, CVCs cross-border activity might be less affected by the domestic saturation level, given their weaker elasticity to prices.

Furthermore, it is worth to consider that corporate venture capitals have a stronger inclination to operate internationally, seeking ventures that fit their strategic goals. The evidence reported by Dushnitsky (2011) shows that an increasing portion of American CVCs' portfolios includes entrepreneurial firms located outside the US (the fraction of ties with domestic investee companies decreased from 88% between 1991 and 2000, to 75%

between 2001 and 2009). According to Bertoni and colleagues (2015), European CVC investors seem to care less about the geographic distance with the portfolio companies, and are 77.4% more likely to invest across national borders than the other types of VC firms; the same behaviour is confirmed by the similar study replicated by Bertoni and others (2019). This international pattern may be explained by the nature of CVCs' parent companies, that are usually multinational enterprises interested in employing resources and effort in international activity (Maula et al., 2005), and able to provide an extensive network of subsidiaries, partners and channels worldwide (MacMillan et al., 2008). In fact, in 2009, around 20 percent of Fortune 500 companies started a CVC program (Dushnitsky, 2011). Given the international vocation of this type of venture capital, CVCs are hard to be framed in the country in which they are headquartered only, since their investment scope is, by nature, less geographically constrained.

Finally, the no-investment alternative when saturation increases should not be relevant since, as just explained, CVCs are also willing to pay a premium price to grab a deal, when the investee fits their strategic features. Their habit to operate abroad, which is likely to reduce the difficulties and costs they face investing internationally, reinforces the argument that avoiding to invest would not be the favorite choice, even in the case they decide to decrease the domestic activity level.

Thus, the cross-border corporate venturing activity might be assumed to be less affected by domestic saturation issues than IVCs' one. These arguments are reinforced by Drover and colleagues' (2017) article, according to which home conditions have little impact on the degree of CVC internationalization.

Summarizing the presented reasoning, the second Hypothesis is as follows:

***HP2**: As the level of domestic VC market saturation increases, the likelihood of CVCs' cross-border tie formation increases, but to a lower extent compared to IVCs' one.*

3.2.3 Hypothesis 3

Governmental venture capital activity has a specific mission, that is supporting promising domestic young ventures unable to raise capital to reduce the impact of information asymmetry, fill the equity gap, and also to develop local domestic economy (see **Subsection 2.2.2**); thus, GVCs show a similarity with CVCs in following a specific

strategic purpose rather than seeking for financial returns only. Given the rationale of the GVC programs, that are oriented to nurture the home economic-financial ecosystem, and finance their activity through national funds, this type of investor could be theoretically excluded from a study on cross-border investments. This is the reason why, to the best of the authors' knowledge, no past research focused on this topic. However, the observation of statistical data (e.g. Bertoni et al., 2015; Bertoni et al., 2019) discloses the presence of GVC cross-border investments, even if to a smaller extent than the other VC types. For this reason, in this thesis, the government-backed investors are considered as well, despite their domestic scope.

Regarding the impact of domestic VC market saturation, it is reasonable to assume that the international GVC activity is not stimulated by the home country conditions in general, whereas the few and occasional foreign investments might mainly be driven by other factors (e.g. the presence of international projects with other countries or the willingness to scout some strategically important technologies that may have social and economic impact in the domestic nation). Overall, this reasoning suggests that cross-border GVC activity should be less sensitive to the variations in saturation of the domestic VC market level compared to IVC one.

Concluding, based on the above mentioned arguments the third Hypothesis is as follows:

***HP3**: As the level of domestic VC market saturation increases, the likelihood of GVCs' cross-border tie formation increases, but to a lower extent compared to IVCs' one.*

4. DATASET

This Chapter starts with the presentation of the VICO 5.0 dataset, followed by the description of the process that led to the definition of the final sample of realized investments used in the analysis, and by some statistics on the sample itself.

4.1 OVERVIEW OF THE VICO DATASET

In this Section, a quick picture of the way VICO is built is provided; then, some descriptive statistics is reported.

4.1.1 VICO database structure

The sample used in the analysis is a subset of the new VICO 5.0[2], the latest version of the VICO dataset, containing information on high-tech companies operating in 27 European countries, plus the United Kingdom and Israel. The dataset reports data on deals closed by entrepreneurial firms founded starting from 1/1/1988, which have received one or more VC or angel investments (or in few cases also investments from other sources as Crowdfunding campaigns or Private Equity funds) in the period ranging from 1/1/1998 to 31/12/2018.

VICO 5.0 is obtained through the merger of data coming from some main commercial databases, namely Thompson One Private Equity, Zephyr, Crunchbase and Orbis. From the first three sources, data on financings received by ventures are gathered, while from the last one additional information on companies are obtained. VICO 5.0 consists of five main tables:

1. The first table contains data on around 38,000 ventures, disclosing demographic information such as geographical location, industry, date of foundation.

[2] The dataset, which is developed within the VICO project, is constantly updated by the project RISIS (Research Infrastructure for Research and Innovation Policy Studies), again funded by the 7th Framework Programme of the European Commission.

2. The second table includes accounting information on the young companies (balance sheet items and profit and loss account items) plus their market value and number of employees.
3. The third table reports information on almost 13,000 investors of which about 11,000 VCs and 2,000 BAs: the type of investor, country and city of origin.
4. The fourth table assembles data on about 58,000 deals, specifically on the equity invested amount and date of investment.
5. The fifth and last table contains information on companies' successful exit (type of exit, year of exit, deal value) or, eventually, failure.

4.1.2 VICO dataset descriptive statistics

Merging the three available files of Companies, Investors and Investments it is possible to obtain a set of rows containing information on the specific deal, and on the features of the investor and the investee.

The dataset includes 103,744 observations (or investments), although corresponding to a lower number of distinct rounds of financing (see **Table 3**); indeed, in case of *syndication,* information on the same round appears once for each of the participating partners. The distinct rounds thus become 58,780, already highlighting a strong tendency to invest together with other actors.

Number of deals in VICO dataset	
Number of observations	103,744
Number of distinct rounds	58,780

***Table 3**: Number of deals in VICO (observations and distinct rounds).*

Table 4 shows the number of investors and investees that are present in VICO. The investments are performed by 32,649 distinct investors, but detailed information on the specific investor's characteristics is available only for 12,747 of them, whereas the remaining ones have not been successful identified, yet. On the other side, the distinct companies that were able to receive funds in the period between 1998 and 2018 are 38,673.

Number of actors in VICO dataset	
Number of distinct investors (of whom successfully identified)	32,649 (12,747)
Number of distinct companies	38,673

***Table 4**: Number of actors in VICO dataset (investors and companies).*

It is interesting to have a look at the years distribution both of the overall investments and distinct financing rounds. Observing them along the time dimension (see **Figure 7** and **Figure 8**), it is possible to notice that the investment activity increased a lot at the end of '90s and beginning of '00s, at the time of the "dot-com" bubble, and faced instead a partial drop at the turn of the financial crisis of 2008; from 2010 onwards, the trend is positive.

***Figure 7**: Number of investments per year in VICO (1998-2018)*

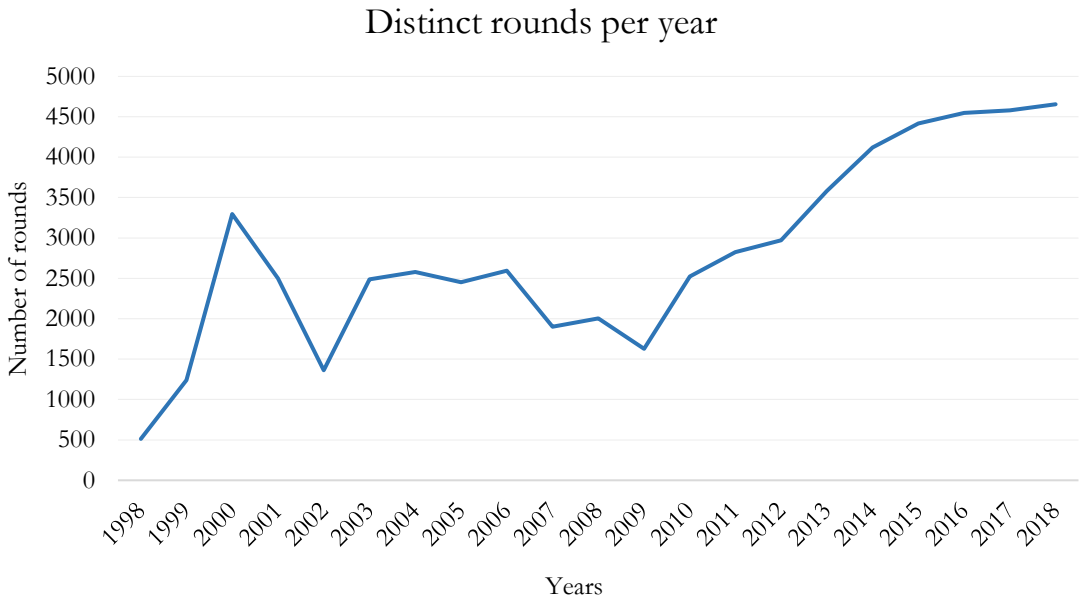

***Figure 8**: Number of rounds per year in VICO (1998-2018)*

For what concerns the geography of investments, on startups side United Kingdom, France and Germany, together account for almost the 54% (respectively 25.3%, 16.5% and 12%) of the overall sample of 38,673 companies able to receive financings (**Figure 9**). The same pattern is confirmed, as shown by **Figure 10**, when looking at the countries whose startups were able to have more successful financing rounds, meaning that the geographic distribution of the investees successfully reflects also the distribution of rounds.

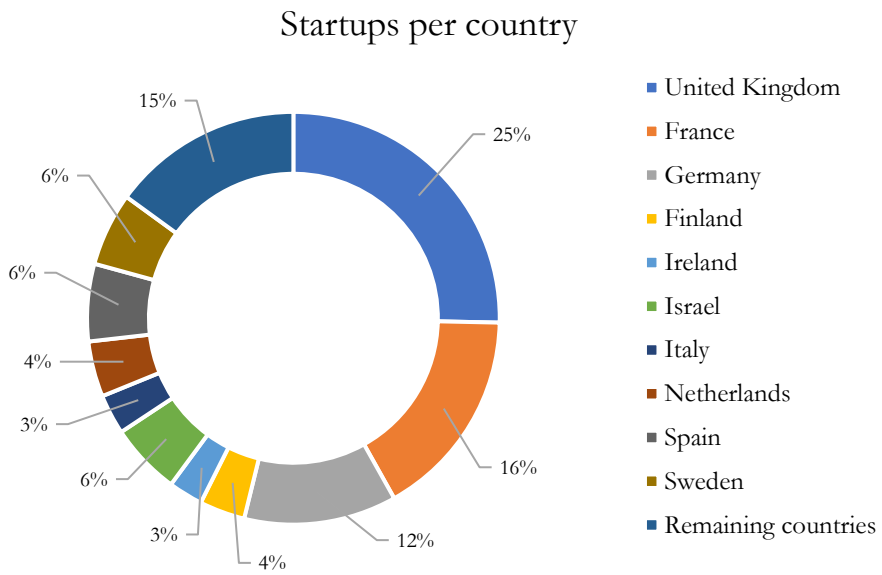

***Figure 9**: Geographical breakdown of the startups present in VICO*

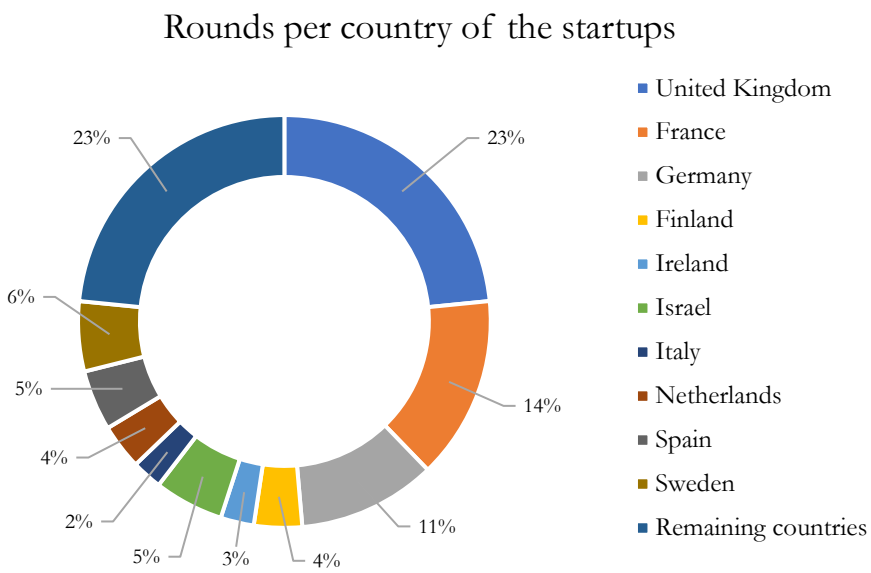

***Figure 10**: Geographical breakdown of the financing rounds present in VICO, based on the receiving startup's country of origin*

On the investors' side, VICO does not include only European (plus UK and Israel) players, but also the ones belonging to other continents that funded at least one startup of the 29 focal countries. However, for sake of simplicity, here all the extra-European investors are grouped under the name of *Rest of the world*, whereas only USA and China are left apart and explicitly reported. **Figure 11** and **Figure 12** respectively show the country of origin of the investors (in absolute terms) and the number of investments per country of the investors, thus allowing to understand which countries can count on the most "active" investors set. Even in this case, the European landscape seems to be dominated by UK, France and Germany, reflecting the same pattern observed on the demand side (startups). Though geographical distance, US investors are strongly present in Europe as well, placing at the third spot in terms of number of undertaken investments.

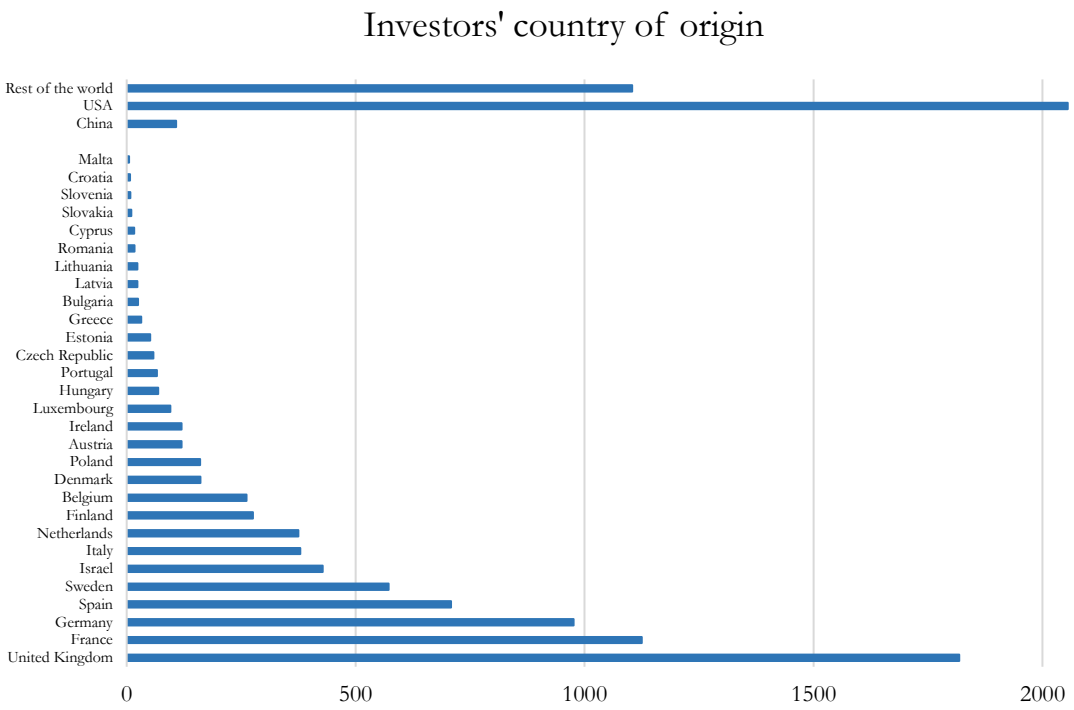

***Figure 11**: Geographical breakdown of the distinct investors present in VICO*

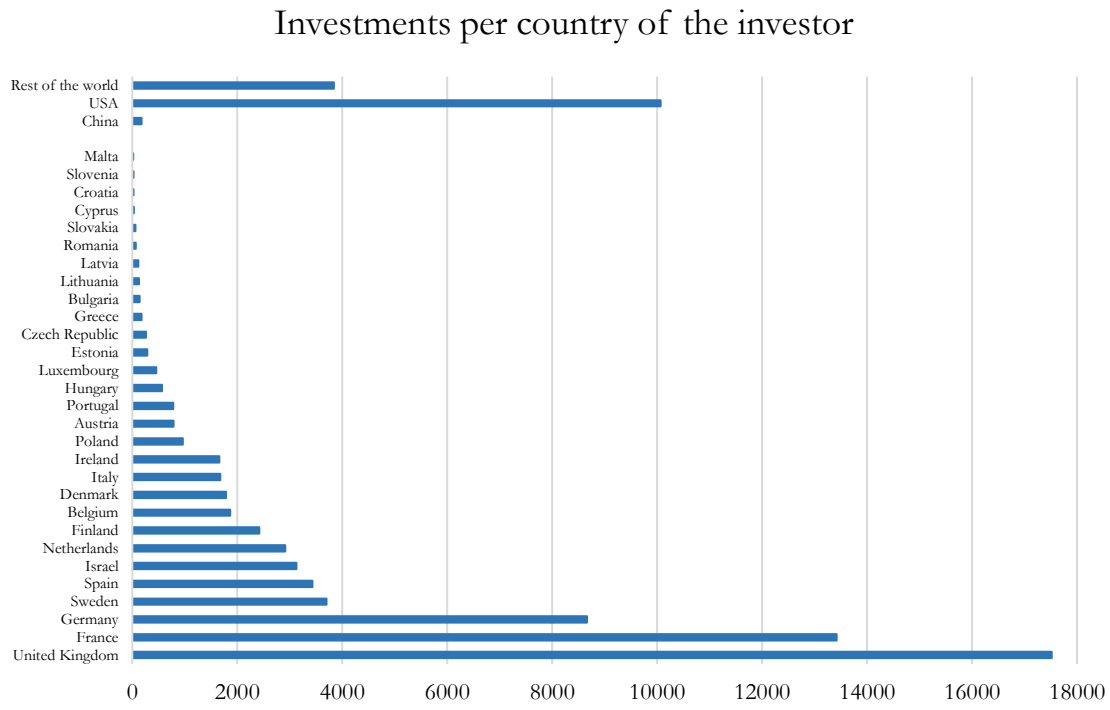

***Figure 12**: Geographical breakdown of the investments present in VICO, based on the investor's country of origin*

It is worth to notice that when analysing the supply side (investors) it is more meaningful to look at all the observations, rather than at the distinct financing rounds. In fact, in the syndicated deals, all the investors involved follow their process and decide whether to undertake the investment or not; thus within the same syndicate round there are many investment decisions.

The VICO dataset contains information as well on the specific type of investor that participated in a financing round of an entrepreneurial venture on 11,900 investors, out of the 12,747 initial ones. Besides the venture capital investors - present in the data source with the traditional ownership classification among IVC, CVC, GVC and BVC -, other forms of financers are reported: Business Angels (BA), Crowdfunding, UVC (i.e. universities venture capital, that are owned and managed by third-grade schools to finance startups founded by students, professors or alumni) and a last generic type, called "Other" for investors whose classification has not been properly identified.

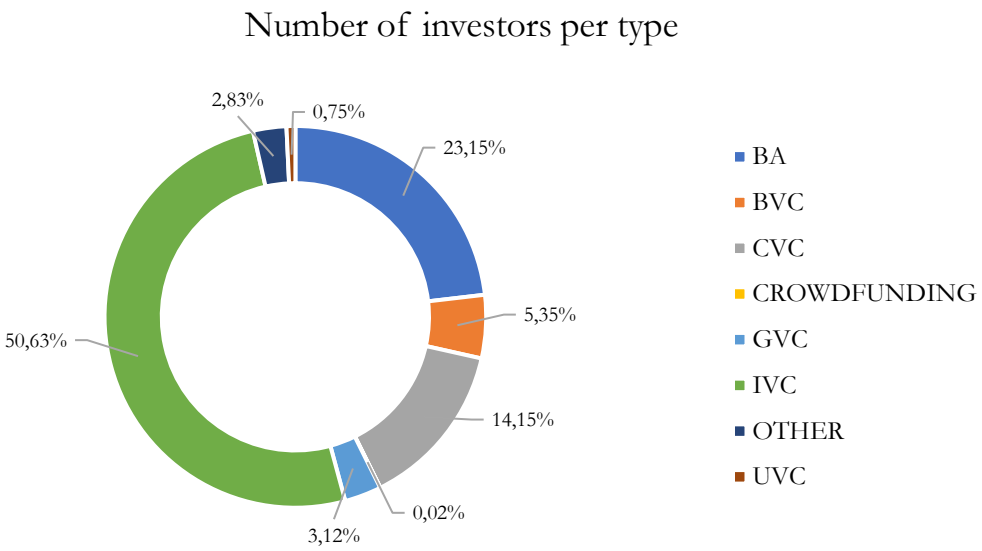

***Figure 13**: Breakdown of the investors present in VICO, per investor type*

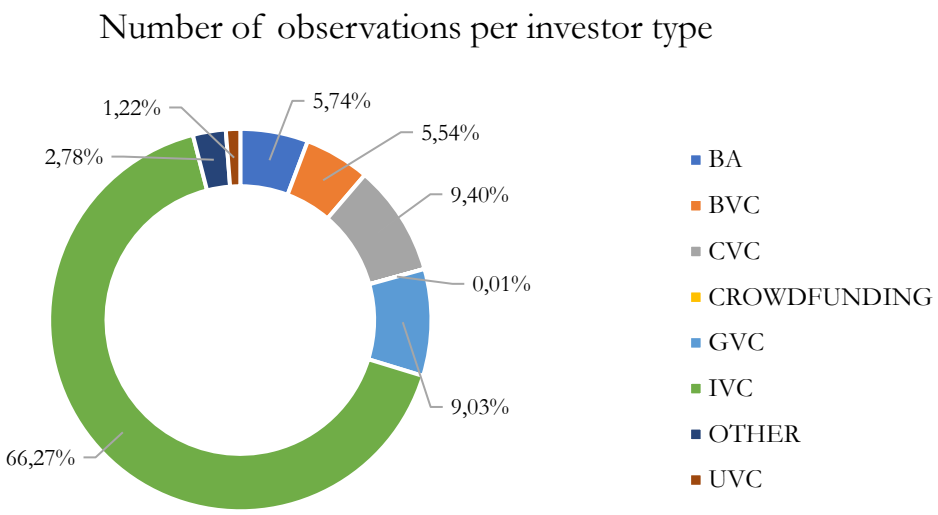

***Figure 14**: Breakdown of the investments present in VICO, per investor type*

As shown by **Figure 13**, IVCs dominate the data source, since they represent half of the investors included in VICO 5.0; BAs and CVCs account respectively for the 23.15% and 14.15% of the investor population, while all the other types have a marginal representation. Given the wide range of financers, it is worth to compare the number of investors per type with the number of observations (still per ownership type) in order to verify whether all the governance schemes are characterised by the same level of activity. In fact, **Figure 14** shows that independent VCs closed 54,003 investments out of 81,485, representing the 66.27% of the sample: this means that IVCs are on average more active than the other investor types, since they constitute half of the investor population, but they perform more than the 50% of the deals. On the contrary, Business Angels disclose an opposite pattern, as they are present only in 5.74% of the total observations, despite representing one fourth of the investors. This behaviour is aligned with their characteristics, in fact BAs are past entrepreneurs or high-net-worth people whose financial availability cannot be compared to the VCs' one, leading to a lower number of transactions concentrated in the early-stage (e.g. pre-seed and seed) of the ventures' lifecycle.

The data source provides also the industry of the investee company, through the NACE code (i.e. the statistical classification of economic activities in the European Community; see **Annex E** for the classification). This information is useful to gain insights about the kinds of business more likely to seek financings and the industries that are more targeted by investors. According to the VICO dataset, the European entrepreneurial ventures that

received equity financings, mainly operate in four sectors (see **Figure 15**): *Information & Communication* (J), *Professional Scientific & Technical activities* (M), *Manufacturing* (C) and *Wholesale & Retail trade* (G). The ICT business, first by far, confirms the interest of venture capitalists toward the ventures specialized in digital and innovative technologies.

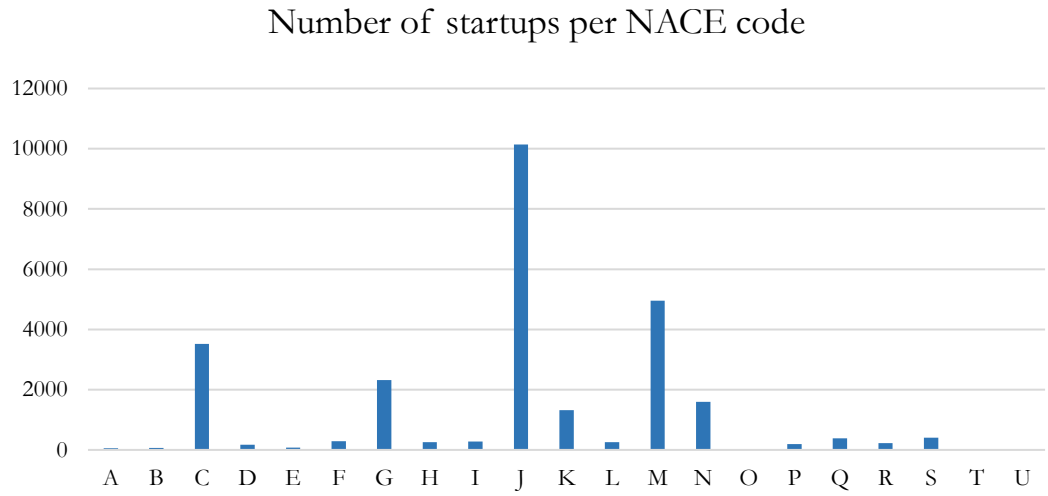

***Figure 15**: Breakdown of startups present in VICO, based on the NACE category (see **Annex E**)*

Since in the data source both the investor's and the investee's nations are available, it is possible to analyse the order of magnitude of cross-border investments. However, it is important to point out that VICO 5.0 owns information on the deals regarding only European entrepreneurial firms and not ventures coming from other continents. Thus, when investigating the internationalization patterns of VC investors, the level of cross-border investments is biased if the whole sample of venture capital firms is considered, since some of them are headquartered in extra-EU countries and the dataset does not contain the deals that took place in their domestic nations. In fact, all the observations regarding the extra-EU investors result cross-border and never domestic, due to the European focus of VICO. Hence, the assessment of international outflows from the data source should be interpreted not as the willingness of VCs to cross the national borders when investing, but rather as the capability of European ventures to attract international investors.

Cross-border investments		
	Domestic	*Cross-border*
Frequency	55,457	25,687
Percentage	68.34%	31.66%

***Table 5**: Frequency and percentage of cross-border investments in VICO dataset.*

Looking at the numbers provided by the data source (see **Table 5**), the internationalization of the VC industry is confirmed being a significant phenomenon, since the 31.66% of observations in the sample are realized between ventures and investors of different nationalities.

As the venture capital landscape is heterogeneous, the international patterns of different VC types mirror such diversity. In fact, CVCs are the investors characterised by the strongest tendency to perform cross-border investments, with a percentage of 43.92 (see **Figure 16**, detailed figures are reported in **Annex A**); IVCs show this pattern as well, since more than one third of their deals are closed with foreign ventures, while finally GVCs, as expected for their mission, exhibit an almost exclusive focus on the national territory, with the 91.00% of investments done in the domestic arena.

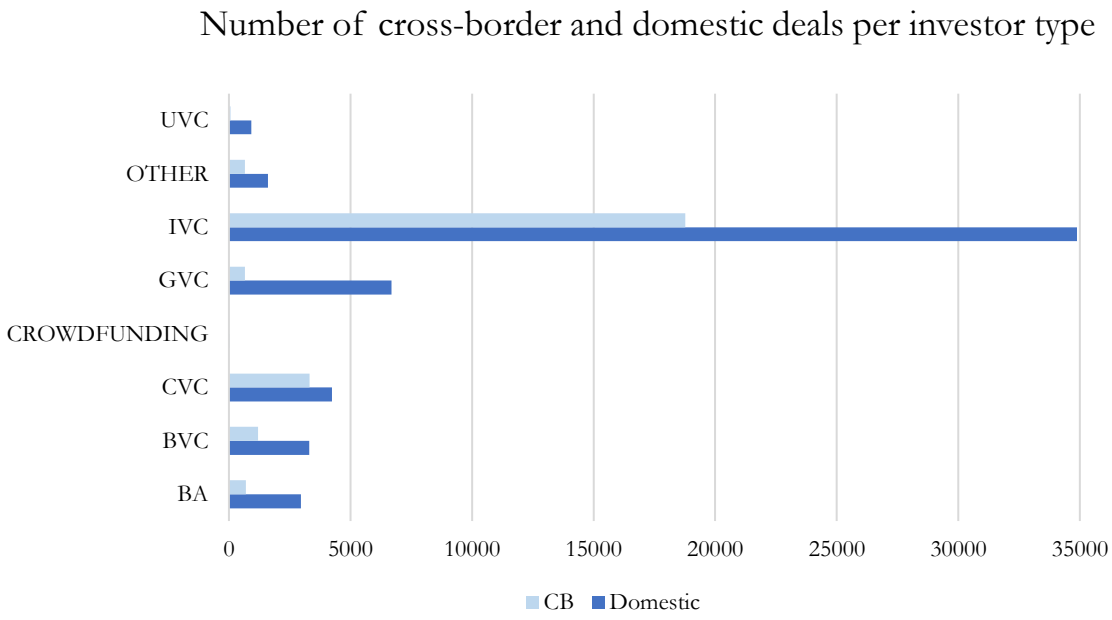

***Figure 16**: Cross-border and domestic investments present in VICO dataset, per investor type*

As shown in **Annex B**, it is possible to analyse what are the nations ventures are placed in, that attract the largest number of international investors. The United Kingdom is the country of origin where local entrepreneurial firms realized investments with foreign investors the most, closing 7,033 deals, followed by Germany with 3,452, and Israel with 3,324. In relative terms however, the percentage of cross-border deals is higher in small countries, such as Malta, Cyprus, Luxembourg and Slovenia, while decreases in large and mature markets, like Italy, Portugal and France. This pattern may show that startups located in the latter nations find financings directly in the domestic countries where the availability of funds from VCs is already significant and appropriate.
At the same time, **Annex C** illustrates the number of investments performed by the investors per country of origin, revealing the degree of international activity of each European nation regarding the financial outflows. Still in this case, the highest values are shown by the micro and small countries, whose investor reveal a larger tendency to invest abroad, probably for the lack of several promising domestic opportunities.

4.2 METHODOLOGY

This Section describes the process to build the sample of realized investment ties used in the empirical analysis starting from the information contained in the VICO dataset. Furthermore, it describes the activity of data entry and data elaboration that was necessary to integrate some relevant information for the operationalization of the independent variable that were not already present in VICO.

4.2.1 Identification of realized investment ties

In order to obtain a dataset suitable to properly test the Hypotheses stated, the overall data source available (VICO 5.0) has been subject to a cleaning process.
After the merge of the three files containing information on the entrepreneurial firms, the investors and the deals, all the observations where the financer was missing were deleted, since without data regarding the identity of the investor it is not possible to conduct an analysis testing the topic of interest. This cut reduced the sample from 103,744 to 83,227 realized investments.

At the same time, the ownership of the investor is another relevant piece of information for the Hypotheses of this thesis, therefore the database has been cleaned from all the investors whose governance structure was absent, but also whose ownership type was different from IVC, CVC and GVC. In conclusion, excluding BVC, UVC and other types of investors such as BA, Crowdfunding and "Others", the remaining observations were 69,027.

As anticipated in **Section 4.1**, the VICO dataset owns data about the financings of European entrepreneurial ventures, and some of them could have received funds from extra-EU investors. In order to conduct a fair comparison between domestic and cross-border investments so, the VCs not placed in the 29 countries of the ventures were cut, otherwise their observations would have been only cross-border. Additionally, excluding from the sample also the investors and the companies whose nation was not available, the number of investments was reduced to 56,046.

Another restriction realized concerns the timeframe under analysis. The data source offers a time span that ranges from 1998 to 2018, however the availability of external information, needed in the analysis, could be very limited for such a long period. Thus, the investments between 1998 and 2006 were deleted and the focus was limited on 2007 onwards to capture also the effects of the Great Recession and the Debt Crisis on the European VC industry. The sample was indeed reduced to 36,898 observations.

In the VC business staged financing is widely used, thus VCs may finance the same venture several times in following rounds (i.e. *follow-on rounds*). This investment decision is typically undertaken according to the contractual terms drafted between the counterparts at the time of the first entry in the equity capital. However, in analysing the saturation as determinant of cross-border investments, only the first investment of a VC in a specific venture (so the entry of the investor in the investee's ownership structure) should be taken into account, since the *follow-on rounds* are driven by contractual specifications defined at the first round, rather than by home country conditions. Deleting the observations that are part of subsequent investments of a VC in the same startup (7,018), the sample was reduced to 29,880 realized investment ties.

Finally, all the entrepreneurial firms whose industry specialization was not known, were excluded from the sample, since the database was still quite large, thus limiting the focus to those ventures with the highest degree of information available. Then, the companies founded more than 10 years before the first investment round, were cut as well in order to guarantee that the investee was actually a startup and to enhance the reliability of the sample.

At the end of the cleaning process, the sample consists of 16,869 realized investment ties, involving 10,621 ventures and 2,985 investors.

4.2.2 Collection of capital supply and demand data

In order to build a saturation index for the test of the Hypotheses, it is needed to model both the supply of equity capital from the VCs and the demand for financings from the entrepreneurial firms.

On the supply side, the availability of investors to finance promising ventures has been proxied through the fundraising activity: it is reasonable to assume in fact, that the available potential supply of equity capital for risky and young companies has an order of magnitude comparable with the amount of financial resources raised by the venture capital investors in a given year.

The data contained in the VICO database were not sufficient to cover the information needed, so an external data source was consulted to collect reliable figures. The fundraising activity was so gathered from PitchBook, that is a financial data and software company which delivers data, research and technology covering private capital markets, including Venture Capital, Private Equity and M&A transactions. PitchBook publishes periodical reports regarding the European VC industry, providing a wide range of figures describing different aspects of the venture capital investors. For what concerns the fundraising activity, the numbers published in the subsequent reports differ although they are referred to the same geographical area in the same year, so the data collected for this work are those present in the last report available (Q3-2021), that is considered as the most updated and consequently the most reliable source.

A limitation of the PitchBook numbers on fundraising concerns the geographical granularity at which they are provided, in fact the supply of funds is aggregated at an international region level[3] (except for Israel, whose level of fundraising is national), in particular:

[3] Note that the choice of the source felt on Pitchbook because it was the only one providing a geographical breakdown of the funds raised in the European VC market (even if not at the ideal granularity level). The other alternative sources reported only the whole amount of funds raised in Europe, and the process of allocation of the funds to the single countries would have led to less precise results.

- Central and Eastern Europe: Albania, Bosnia-Erzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia and Slovenia
- Dach: Austria, Germany and Switzerland
- France and Benelux: Belgium, France, Luxembourg and Netherlands
- Nordic countries: Denmark, Finland, Iceland, Norway and Sweden
- United Kingdom and Ireland

Data regarding Malta and Cyprus are absent, since they are not included in the geographical classification adopted by PitchBook.

As the aim of this work is to assess the *domestic VC market saturation* as a determinant of cross-border investments, the focus is at the country level, so the funds raised per international region were allotted to the single states according to the number of active investors in every country for each reference year. This proxy implies the assumption that each VC investor raises on average similar amounts of financial resources, while the actual level of fundraising is affected by the reputation and experience of the VC firm in the real world. However, this criterion is more fair according to the authors' opinion with respect to a second alternative proxy: aggregating the country VC demand at the international region level, obtaining a saturation level per international region and then adopting the same saturation level for each country that belongs to the same international region.

On the demand side instead, the willingness of entrepreneurial firms to seek equity financings was approximated cumulating the investments received by ventures in every country for each year, in this case using the VICO dataset. It was assumed hence, that a company being financed in a given year, was actually searching for fundings in that period, thus representing a real source of demand for equity capital.

The demand proxy was computed using the whole data source (VICO 5.0) and not the restricted and cleaned sample, since, being the demand a market variable, including all the deals in the measure was deemed the most appropriate approach. Moreover, it is true that considering only the ventures included in VICO, the demand measure is not accounting for the startups that have never obtained funds (since they are not present in the data source); however, excluding them is reasonably not an issue, if it is assumed that the actual demand perceived by VCs is that coming from high-quality ventures only.

4.3 DESCRIPTIVE STATISTICS ON THE SAMPLE OF REALIZED INVESTMENT TIES

At the end of the process that led to the definition of the final sample through the reduction of the initial whole database, it is relevant to report again some statistics on the data that will be used in the analysis, since some features and patterns may have changed with respect to the starting situation.

First of all, the updated time distribution of the investments (see **Table 6**) reflects the trend observed in the whole dataset, with a downturn in 2009 after the financial crisis breakdown and an almost constant growth in the following years.

Number of investments per year												
Years	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Investments	1,281	1,282	952	1,183	1,145	1,192	1,389	1,491	1,560	1,768	1,842	1,784

***Table 6**: Number of investments per year present in the sample.*

Distinguishing the cross-border activity from the domestic one (**Figure 17**), it is possible to notice that the former has an almost steady trend of growth, differently from the latter. This evidence confirms the recent increasing interest of VC firms towards international investing activity, already highlighted in **Subsection 2.3.1**.

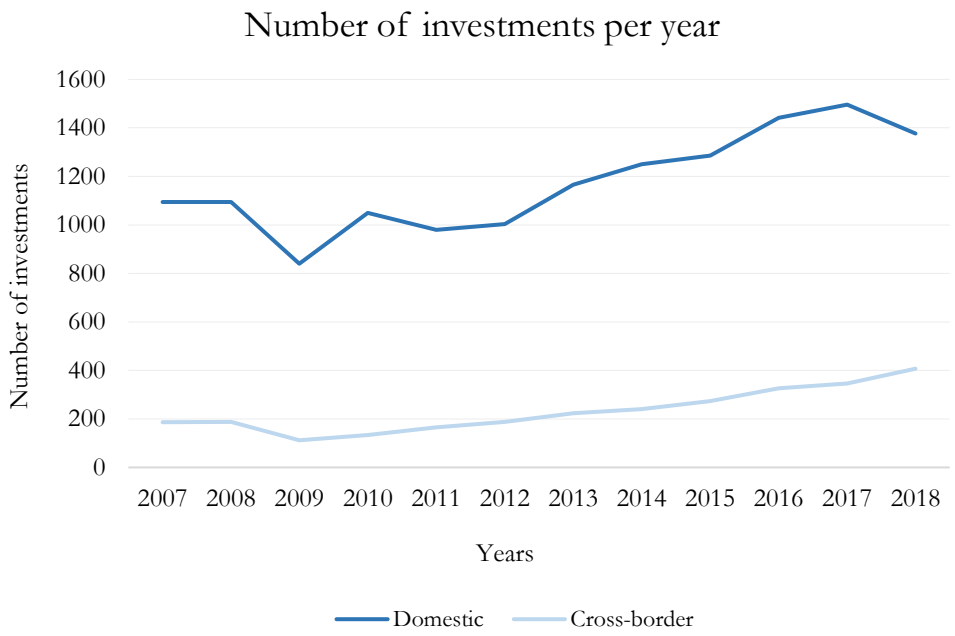

***Figure 17**: Breakdown of cross-border and domestic investments in the sample, per year*

For what concerns the geographic breakdown of the investments, given the objectives of this study the focus is narrowed on the countries of origin of the active VCs, whereas the countries of destination are not significant per se but rather to distinguish domestic from cross-border activity. Even after the drop of several observations, the balance of power among countries remains the same observed in the whole initial VICO dataset, with three countries (UK, France, Germany) dominating the VC landscape (see **Figure 18**). However, cross-border activities are a bit less polarized than domestic ones, apart from the case of UK that almost doubles the activity of all the other countries (**Figure 19**). In general, looking at the ratio between the number of cross-border investments and domestic ones, it is observable that the international activity becomes more relevant for countries with less developed markets in terms of size (see **Annex D**). The Netherlands for example are the 7th country by domestic activity level, but reach the 4th spot, immediately behind the three biggest nations, when accounting for cross-border one. In the same way, several other nations climb positions from the first ranking to the second, such as Austria, Belgium, Denmark, Luxembourg. The last country, in particular, shows an international activity significantly bigger than the domestic one (respectively 133 and 5 investments), with home established VC firms collecting capital within national borders and then employing it abroad, thus suggesting that the country might have favourable institutional settings for the VC activity but few investment opportunities. This statistical observation seems to be

consistent with the Hypotheses of this work, since smaller countries with less investment opportunities (and thus a lower demand level) have a stronger attitude towards investing abroad than bigger ones, measuring it relatively to their domestic investing patterns.

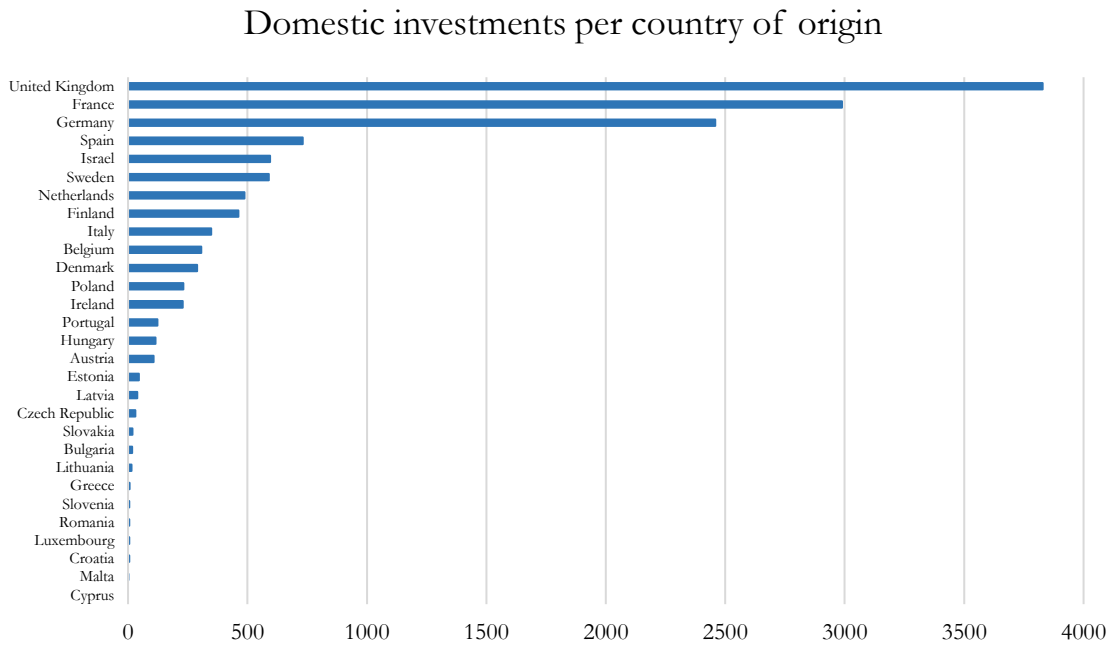

***Figure 18**: Number of domestic investments in the sample, per each country*

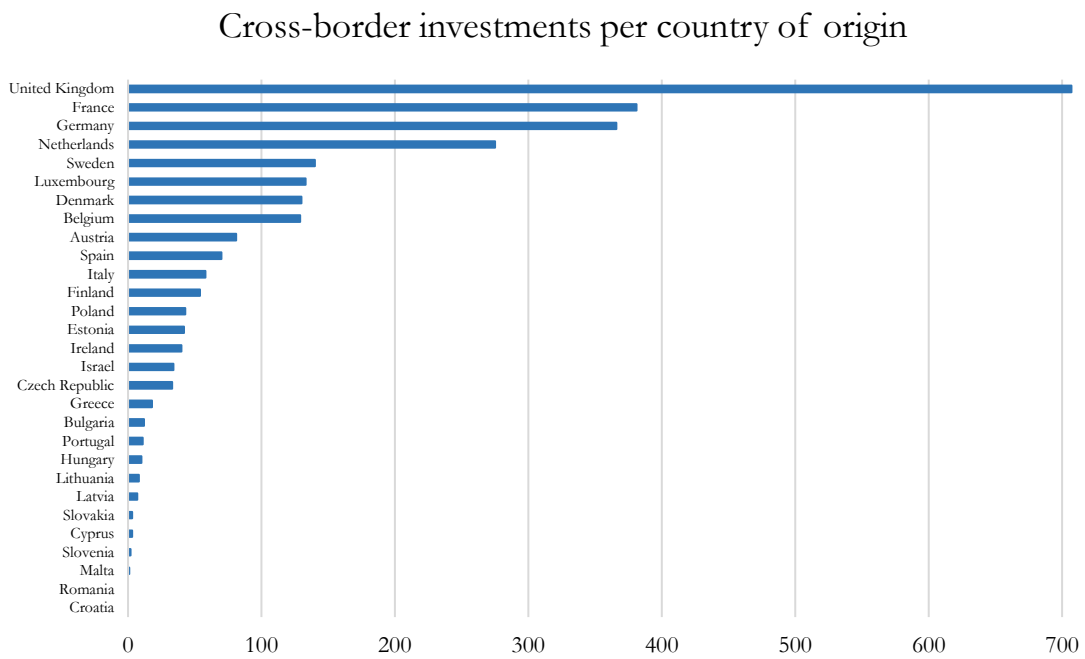

***Figure 19**: Number of cross-border investments in the sample, per each country*

As presented in **Subsection 2.3.3**, literature suggests that *syndication* becomes particularly relevant for VC firms when investing abroad (Hain et al., 2016; Meuleman & Wright, 2011), since it allows to reduce information asymmetry, share risks and be backed by investors established in the host country. The sample under analysis shows a slightly stronger tendency to syndicate when crossing national borders compared to the case of domestic investments; the percentage in fact increases from 39% to 45% (**Figure 20**).

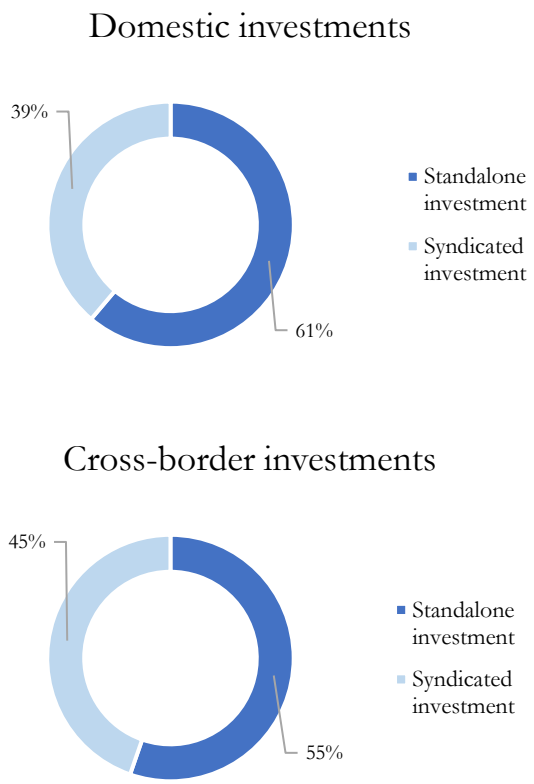

***Figure 20**: Number of syndicated domestic and cross-border investments, in the sample*

Also in terms of industries attracting the most the VC firms, the sample is representative, since **Figure 21** confirms the same distribution shown in the whole data source. In particular, the startups obtaining more investments are those belonging to the NACE categories of *Information and Communication* (J), *Professional, Scientific and Technical activities* (M), *Manufacturing* (C) and *Wholesale and Retail trade* (G).

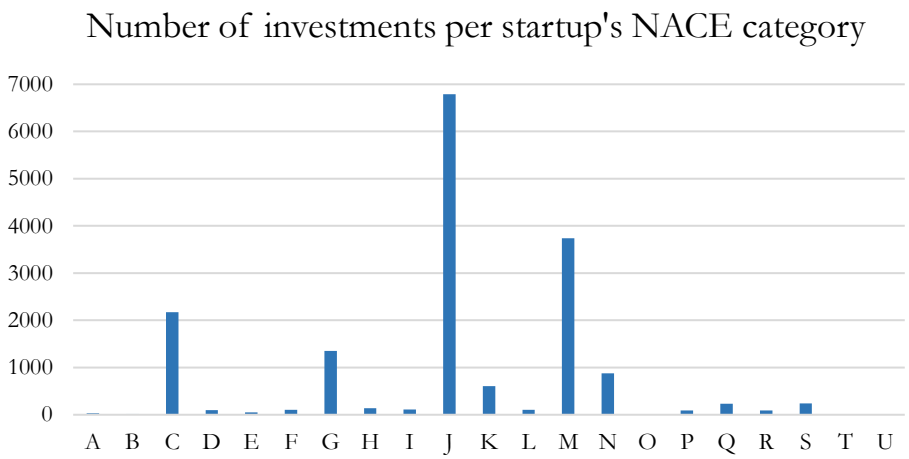

***Figure 21**: Number of investments in the sample per NACE category of the venture*

It is interesting to understand whether some industry categories attract more cross-border investments. However, **Annex E** highlights an almost common pattern for all NACE categories: apart from a few cases, the percentage of international investments over total ones always varies in the range between 10% and 20%. This might suggest that in the sample, the industry is not one of the most significant factors taken into account when deciding to invest abroad.

Independent VCs dominate over *captives*, accounting for three quarters of the set of 2,985 distinct investors present in the sample (**Figure 22**). As expected, this reflects on the investment activity size as well: IVCs performed 12,638 investments, against the 1,683 and 2,548 sustained respectively by CVCs and GVCs. A peculiarity is that GVCs are less than half of CVCs in the sample (199 versus 520 funds), but their degree of activity is larger (see **Figure 23**). This evidence seems to be coherent with the nature of these investors' objectives. CVCs pursue strategic goals and usually invest only when they find a venture that can fit with their business, for this reason the set of potential investees may be sometimes narrower; moreover, having broader geographical scope, part of their investments may be destinated to extra-EU countries and thus not visible in the dataset. GVCs, instead, mainly aim to reduce information asymmetry issues on startups' side and develop local economy, thus having a larger set of potential targets to fund.

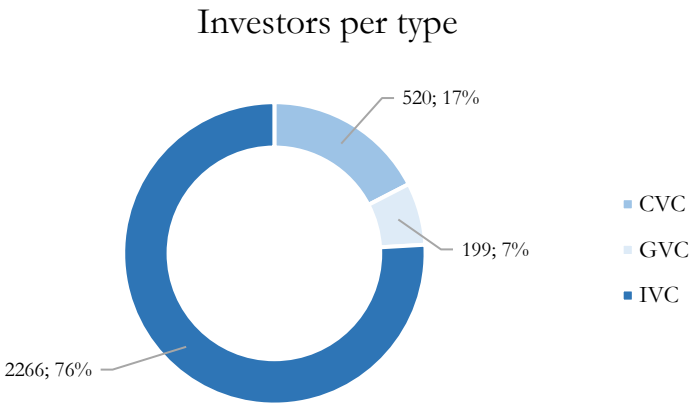

***Figure 22**: Breakdown of the investors present in the sample, per investor type*

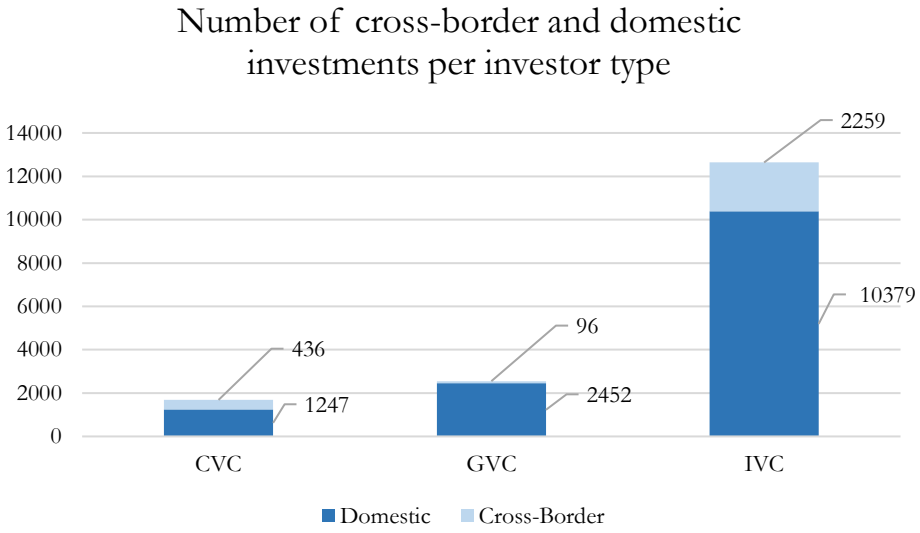

***Figure 23**: Breakdown of cross-border and domestic investments in the sample, per investor type*

Figure 23 reports also the breakdown of domestic and international investments performed by the three types of VCs. CVCs confirm to be the most propense to invest abroad, with almost 25% of cross-border over total investments, while the same ratio equals to 18% in the case of IVCs; GVCs, as expected, are totally focused on the domestic field, with only a few occasional foreign deals.

For what concerns the size of the VC market in Europe, equity collected by companies and funds raised by investors year by year, that were introduced in the dataset (see **Subsection 4.2.2**), are presented in **Figure 24**. In several years, equity collected overtakes funds raised by European VCs, highlighting the strong impact of investors coming from the other continents; for example, as presented in **Subsection 4.1.2**, US was the third country per

number of performed investments (almost 10,000) in the initial dataset. The graphical representation may suggest that overall, the European VC market did not face issues of saturation in some years, since the demand for capital was larger than the total funds collection; however, this work investigates the level of saturation for each country year by year: even though the whole European context shows a low level of saturation, a single nation can exhibit the opposite pattern.

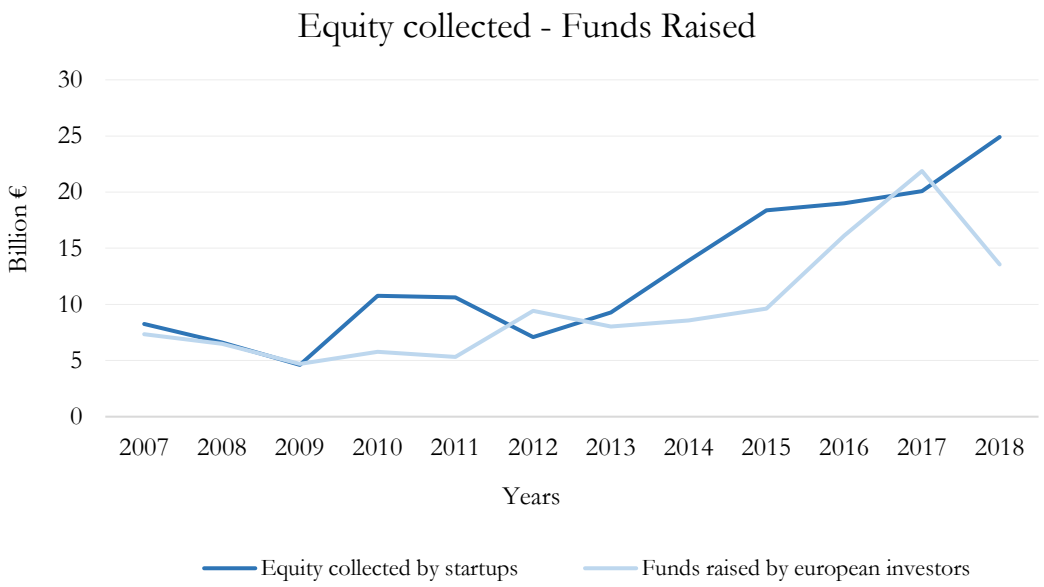

***Figure 24**: Equity collected and funds raised in Europe, in each year*

For sake of space, the trends of capital collected by startups and funds raised by VCs overtime are not reported for all the 29 countries in the sample, but only for the three countries with the most developed VC markets and, additionally, Italy. Moreover, they belong to four distinct international regions (UK & Ireland, France & Benelux, DACH, Southern Europe), thus making the comparison even more varied and interesting. **Figure 25** and **Figure 26** evidence UK as the dominant player both in terms of demand and offer for capital; the peak of funds raised by UK VCs in 2017 reflects the sudden increase characterising the overall European market in that year (see **Figure 24**). Equity collected and funds raised show a slightly growing trend in the period under analysis also for the other three nations. As it was expected, Italy is far from the peers' condition, and does not have the same pace of growth, especially in the most recent years when it seems to have faced difficulties in riding the positive wave that ran over Europe.

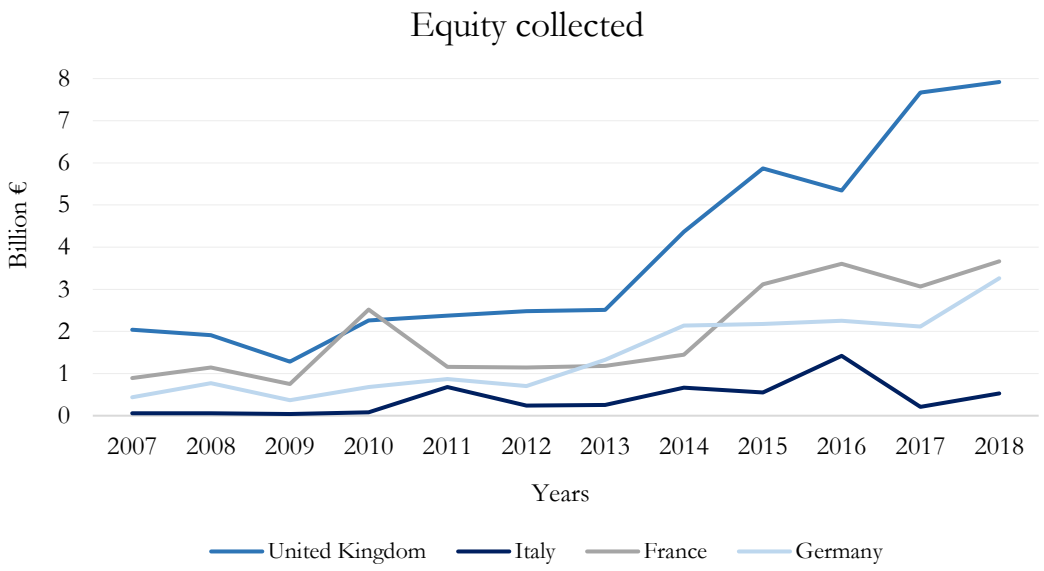

***Figure 25**: Equity collected along the years by startups in UK, Italy, France, Germany*

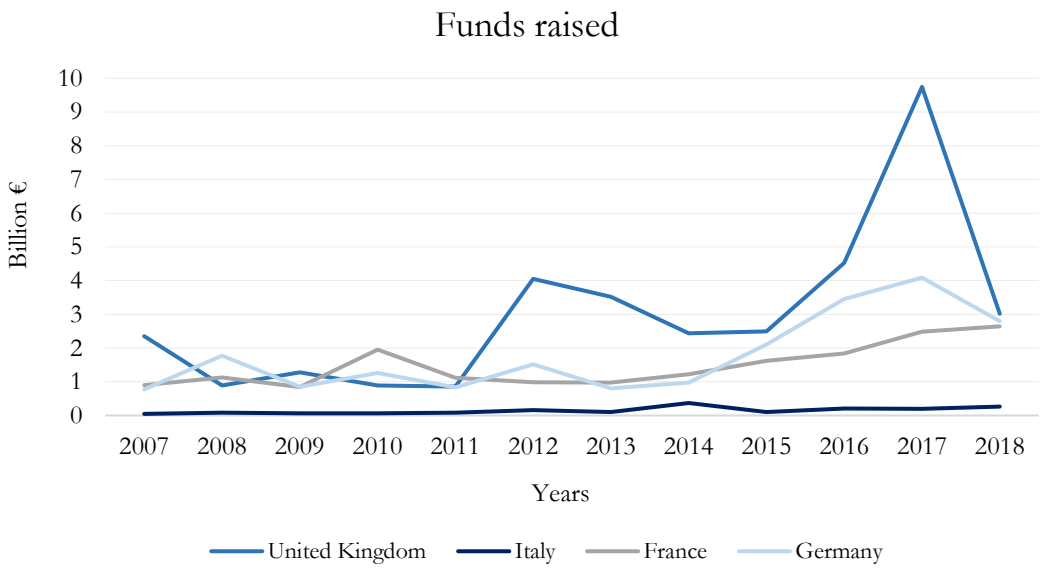

***Figure 26**: Funds raised along the years by VCs in UK, Italy, France, Germany*

5. THE ECONOMETRIC MODEL

This study adopts a *matching model*, consisting in the creation of a set of potential ties (*dyads*) between VCs and ventures (see for example Bottazzi et al., 2016; Colombo & Shafi, 2016), to be integrated with the sample of realized ties described so far. In this way, it is possible to look at the tie realization probability and propensity as conditions change; this is indeed not possible looking at realized investments only, but it becomes so generating a counterfactual dataset (based on logic and detailed reasonings). This methodology furnishes a wider perspective on the observation of the phenomenon, since it allows to better go through the decision process acknowledging also the no-investment possibility, and to look thus at the probability of tie realization.
The Chapter, thus, starts with the process of the potential deals' set creation; afterwards, it continues with an overview of the models' variables, a description of each variable, and it ends with the presentation of the econometric specification.

5.1 CONSTRUCTION OF THE POTENTIAL DEALS

Since VICO reports only information about happened deals, it is not possible to observe the cases of unrealized ties between companies seeking for capital and investors willing to employ capital; for this reason, a set of potential links was created through a *matching model*. Working with this setting, rather than with the realized investments only, allows to better catch the decision-making process of the VC investors, relatively to the *domestic VC market saturation* level: in this way it is possible to observe whether the increase of saturation corresponds to an enhanced probability of cross-border investments or to a reduction of the overall investment probability, that are the two main alternatives available to VC firms when facing difficulties in the domestic environment.

The rationale of the model was to connect the companies that received financings in a given year, with the investors that made at least an investment in the same year. Indeed, it is assumed that a startup that received financings might have been actively seeking for capital during that period, and that an investor who closed at least one deal might have been looking for investment opportunities to employ its financial resources; for this reason, the two actors represent a potential tie. In practice, the lists of "active investors" and "active startups" per year were created starting from the sample containing overall 2,985 investors and 10,621 investees, and then crossed in order to obtain all the possible combinations that could have realized in each year observed. The crossed datasets were then merged into one, leading to an initial set of around 8 millions of *dyads*. To make the model more realistic - and to reduce the number of rows avoiding the case of loading too much the statistical software -, it was then decided to exclude from the potential ties the links between an investor and the companies established in countries where the former have never invested between 2007 and 2018. It is reasonable to imagine that a VC firm may strategically choose not to consider the cross-border opportunities arising from certain foreign countries (some nations may be too distant, too different in terms of institutional settings, etc.); it may be thus wrong to assume that the VC firm became aware of all the startups seeking for funds in those countries and then decided not to invest. In this way, several links were dropped and the dataset achieved the size of around 2 millions of rows.
Finally, to be coherent with the sample construction where it was decided to exclude all the *follow-on* investments made from a VC towards the same startups, in case of actually realized ties also the potential *follow-on* fundings that the algorithm had generated were cut off. However, the dataset size remained unchanged since it was the case only of a few thousands of observations.

5.2 VARIABLES OVERVIEW

In this Section are reported the variables included in the econometric model to test the Hypotheses and answer to the research question. The dependent variable *RealizedTie* is related to three explanatory variables and some control variables. The list is presented in **Table 7**.

Variable	Description of the variable
RealizedTie	It is a dummy variable assuming the value 1 when the tie is realized and the value 0 when the tie is unrealized.
Saturation	It is a continuous variable computed as ratio of funds raised and equity collected in the year of the potential tie in the nation of the investor.
d_Ownership	It is a vector of two dummies where d_Ownership1 corresponds to *CVC* and d_Ownership2 corresponds to *GVC*.
CrossBorderYesNo	It is a dummy variable assuming the value 1 when the tie is cross-border and the value 0 when the tie is domestic.
GDPGrowthHost	It is a continuous variable measuring the GDP growth of the startup's country.
StocksTradedHost	It is a continuous variable included in the model to take into account the activeness of the startup's country stock market.
WGIAvgHost	It is a continuous variable measuring the degree of development of the startup's country institutions.
DeltaGDPGrowth	It is a continuous variable measuring the differential GDP growth between the country of the investor and that of the potential investee.
DeltaStocks	It is a continuous variable measuring the differential stock markets' conditions between the country of the investor and that of the potential investee.
DeltaWGI	It is a continuous variable measuring the differential degree of institutional development between the country of the investor and that of the potential investee.
CulturalDistance	It is a continuous variable measuring the level of cultural distance between investor's and investee's countries.
Experience	It is a continuous variable measuring the VC firm experience as cumulative sum of the previous undertaken investments.
d_InvestmentYear	It is a vector of 12 single-year dummies.
d_InvestorNation	It is a vector of 27 single-nation dummies.
d_CompanyNation	It is a vector of 29 single-nation dummies.
d_Nace_category	It is a vector of 21 single-Nace category dummies.
FirstInvestmentYesNo	It is a dummy assuming the value 1 when the potential tie represents the first potential investment for the startup; 0 otherwise.
CompanyAge	It is a continuous variable measuring the age of the venture.

***Table 7**: Description of the variables of the model.*

The correlations between variables were computed to detect any eventual strong collinearity. As **Table 8** shows, there are no significant correlation issues, apart from the case of *CrossBorderYesNo* and *CulturalDistance*. This outcome is explainable by the way the cultural distance measure is operationalized (that will be described in **Subsection 5.5.2**): it is 0 when the deal (real or potential) is domestic and positive otherwise, whereas it never assumes negative value; similarly, *CrossBorderYesNo* is 0 when the deal is domestic and 1 when it is cross-border. This is the reason why the algorithm spots a correlation between the two variables. Theoretically, *CulturalDistance* might be excluded from the model to avoid multicollinearity issues; however, this is a relevant variable in the international VC activity topic and the authors preferred not to neglect it - the analyses were run both with and without the control variable, and results obtained from the two cases were coherent -, also given the fact that it was the only computable measure of distance together with *DeltaWGI* (institutional distance). In fact, it was not possible to include a measure of geographical distance, since the required information were not present in the VICO dataset, and manually entering data on longitude and latitude resulted impossible because of the absence of the indication on the precise location of VCs and startups.

Pairwise correlations

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 CulturalDistance	1.000														
2 GDPGrowthHost	0.050	1.000													
3 StocksTradedHost	-0.012	-0.083	1.000												
4 WGIAvgHost	0.010	0.052	0.162	1.000											
5 Experience	0.145	0.003	-0.032	0.007	1.000										
6 CrossBorderYesNo	0.832	0.029	-0.039	0.056	0.167	1.000									
7 RealizedTie	-0.044	-0.001	-0.020	-0.024	0.022	-0.052	1.000								
8 d_Ownership1 (CVC)	0.020	0.005	-0.048	0.002	-0.115	0.024	-0.010	1.000							
9 d_Ownership2 (GVC)	-0.068	-0.014	0.019	0.027	0.111	-0.067	0.031	-0.107	1.000						
10 DeltaStocks	0.229	-0.035	0.377	0.083	0.031	0.243	-0.019	0.008	-0.027	1.000					
11 DeltaWGI	0.166	0.022	0.062	0.394	0.032	0.062	-0.009	-0.061	-0.057	0.164	1.000				
12 DeltaGDPGrowth	-0.024	0.226	-0.090	-0.014	-0.008	-0.062	0.006	0.018	-0.033	-0.164	0.016	1.000			
13 Saturation	0.091	-0.018	0.000	0.026	-0.035	0.069	0.003	-0.011	-0.010	0.115	0.077	-0.033	1.000		
14 FirstInvestmentYesNo	0.001	-0.016	-0.026	0.010	-0.001	0.004	-0.002	-0.002	0.004	0.003	0.007	0.002	0.004	1.000	
15 CompanyAge	-0.007	-0.004	0.060	-0.083	0.005	-0.015	-0.001	-0.006	-0.005	0.019	-0.027	-0.002	-0.012	-0.416	1.000

***Table 8**: Matrix of correlations between the explanatory and control variables. The vectors of dummies d_InvestmentYear, d_InvestorNation, d_CompanyNation and d_Nace_category were not included in the table for sake of space.*

Finally, the summary statistics (mean, standard deviation, minimum value, maximum value) per each variable is presented in **Table 9**.

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
CulturalDistance	2,011,823	.715	.955	0	4.973
GDPGrowthHost	2,011,839	1.56	1.603	-14.434	25.176
StocksTradedHost	1,230,786	66.797	33.232	.01	181.888
WGIAvgHost	2,011,839	1.364	.217	.09	1.89
Experience	2,011,839	34.584	63.561	0	1075
CrossBorderYesNo	2,011,839	.448	.497	0	1
RealizedTie	2,011,839	.008	.091	0	1
d_Ownership1 (CVC)	2,011,839	.138	.345	0	1
d_Ownership2 (GVC)	2,011,839	.067	.249	0	1
DeltaStocks	1,073,681	5.603	29.962	-172.748	181.408
DeltaWGI	2,011,839	.015	.268	-1.78	1.5
DeltaGDPGrowth	2,011,839	-.083	1.475	-24.162	24.063
Saturation	2,011,839	1.058	2.293	.064	151.156
FirstInvestmentYesNo	2,011,839	.726	.446	0	1
CompanyAge	2,011,839	3.444	3.253	-13	28

***Table 9**: Summary statistics of the explanatory and control variables of the model. The vectors of dummies d_InvestmentYear, d_InvestorNation, d_CompanyNation and d_Nace_category were not included in the table for sake of space.*

5.3 DEPENDENT VARIABLE

The dependent variable of the econometric model is a boolean variable *RealizedTie*, assuming the value of 0 when the potential tie did not realize and the value of 1 when the investment actually occurred. So, in the overall dataset, 16,869 venture-VC *dyads* over 2 millions are marked with the value 1, equal to the size of the sample of realized investments the process of potential deals creation started from.

Given the decision of adopting a *matching model*, the choice felt on this type of dependent variable, which allows to study the probability of VC investment, and its variation upon the

occurrence of different circumstances and on the basis of some reference variables, such as saturation, ownership and type of deal (domestic or cross-border).

5.4 EXPLANATORY VARIABLES

In this Section, the three selected explanatory variables are presented.

5.4.1 Level of domestic VC market saturation

The first independent variable (i.e. *Saturation*) aims at capturing the interplay between supply and demand for capital, and it is useful to spot how investment patterns and probability change under different circumstances, such as increasing equity demand on startups' side or funds available on VCs' one. The variable was computed as a ratio of the funds raised by VCs and the equity collected by startups, per country per year, in order to be coherent with the home country perspective and have a dynamic view of the phenomenon over time. As saturation is defined as an excess of supply and a shortage of investment opportunities (Buchner et al., 2018), the funds raised are at the numerator of the ratio, whereas capital collected by ventures is at the denominator; in this way, an increase in the supply level makes the saturation grow, as well as a decrease in the demand for equity by startups. The measure adopted treats saturation as a continuous variable, rather than a dummy assuming the value of 1 in case of supply exceeding demand, in order to catch its variability. Moreover, it allows to successfully take into account the demand side as well, overcoming the limitation of Buchner and colleagues' (2018) extension study. It is worth to point out that the adopted one does not claim to be an exact index of the saturation of a market, since the real measure should consider the precise amount of capital that VCs are available to invest during one year, and the overall capital startups are seeking for (including those that did not succeed to raise money); instead, due to unavailability of such detailed information, the adopted indicator is built on proxies of both demand and supply that however allows to consistently catch the increase or drop of the real values. In fact, what is really interest of this study is to understand how investment patterns change when the saturation varies, rather than punctually compute the exact value of saturation.

In the final dataset obtained through the *matching model*, to each *dyad* was associated the value of saturation corresponding to the country of origin of the investor in that specific year. Afterwards, all the cases of saturation equal to 0 were dropped to avoid inaccuracies in the analysis, and since they were caused by the absence in VICO of active investors in that year in that country (thus generating a null value of funds raised, according to the allocation approach adopted in this study), but it is unrealistic to assume that no funds were collected at all.

Figure 27 shows the trend of saturation along the period under analysis for France, Germany, Italy and UK. Germany saturation level is often higher than the other countries' one, whereas France seems to be the nation with the lowest variability. In general, the value is continuously changing, with peaks and drops, that makes this thesis' analysis even more interesting and significative, because the relation with the cross-border investment probability can be tested both in favourable and unfavourable home market conditions.

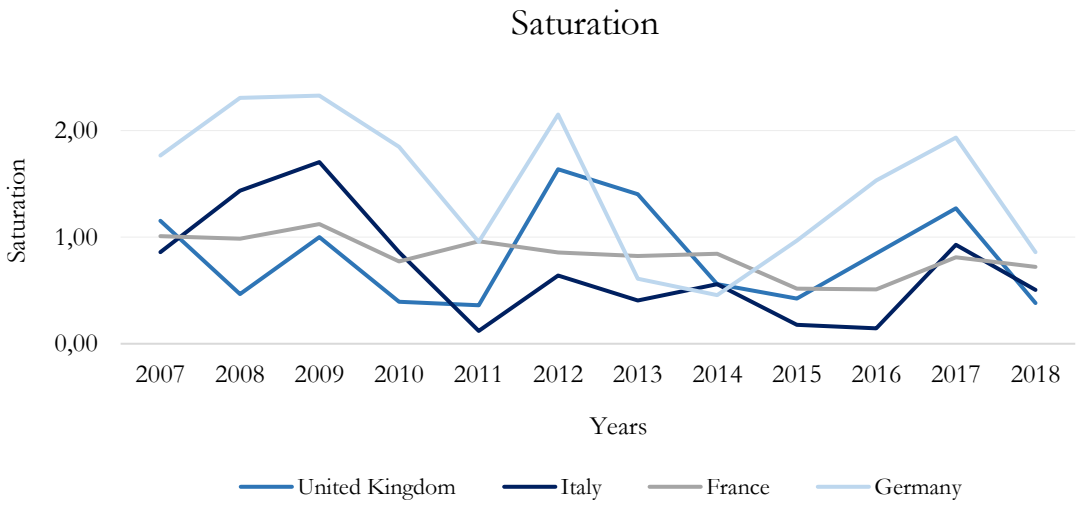

***Figure 27**: Saturation level of UK, Italy, France and Germany, along the years*

5.4.2 Ownership

Governance dimension has a strong relevance in this work's Hypotheses, thus a vector of dummies (i.e. *d_Ownership*) was created to distinguish the three types of VCs present in the sample. In this way, it is possible to analyse the different investment patterns and probabilities based on the type of investor, given the strongly diverse missions and

structure of objectives of their activities. This is significant and informative in general, and in particular when considering the interaction with the cross-border dimension.
Being the three categories (IVC, CVC, GVC) complementary in the sample, a two-level dummy vector needs to be considered, to avoid collinearity issues in the models; indeed, the first dummy (*CVC*) assumes the value of 1 when the investor in the *dyad* is backed by a corporate, the second (*GVC*) assumes the value of 1 when the investor in the *dyad* is owned by a government, whereas when both dummies are 0, the investor is identified as independent.

5.4.3 Cross-border investment

Given the nature of the Venture Capital business, that benefits from geographical proximity and was indeed defined many times as a local business, as explained in **Section 2**, the VC firms are likely to show a diverse tendency towards domestic and cross-border investments. The introduction of a dummy variable (i.e. *CrossBorderYesNo*) assuming the value of 1 when the investment is international, allows to investigate explicitly the different likelihood of tie realization when the potential *dyad* matches the VC with a domestic venture, or with a foreign one. Regarding the Hypotheses of this work, the interaction of this variable with the ownership one can explain how saturation impacts on the probability of cross-border investments realization for different investor types.

5.5 CONTROL VARIABLES

In the model, several variables are introduced to control the analysis. As the goal of the analysis is to study the likelihood of cross-border investments, first of all some variables that were identified by the literature as determinants of the international investing decisions - and thus may affect investments' likelihood - have been included (i.e. *host country level control variables*, *home-host country level control variables*, *VC level control variables*), in order to interpret with more precision the specific outputs of the analysis that answer the research question. Moreover, as the dependent variable looks at whether a tie is realized or

not, some control variables that are relevant in the whole VC investment patterns discussion have been introduced (i.e. *General control variables*).

5.5.1 Host country level variables

As highlighted in the description of the determinants of the cross-border activity, the features of the countries in which the potential investees are located are key in guiding VC firms' decisions both of whether and where to invest.

The first selected control variable measures the GDP growth of the host country (i.e. *GDPGrowthHost*). The expected GDP growth of a foreign country was found to positively affect the willingness of VCs to invest in a given country (Schertler & Tykvová, 2011; Aizenman & Kendall, 2012). Since the information on the expected GDP growth of the nations under analysis was not available, the real GDP growth was selected as a proxy, since usually the real values result aligned with the expectations. The information was obtained from the World Bank's open data in the official website, and the measure is expressed as percentual variation on an annual basis.

The second variable (i.e. *StocksTradedHost*) aims at capturing the development of the venture countries' stock markets, since active and liquid stock markets increase the investors' chances to make a successful exit via IPO and thus enhance nations attractiveness (Aizenman & Kendall, 2012). The measure adopted is the value of shares traded, normalized by the national GDP, per each country and year combination; again, the data were downloaded from the World Bank's website. The 0 values in the data source were removed and transformed into missing values, because they did not represent an actually inactive stock market, but referred to countries lacking a stock exchange or to a real missing information that World Bank was not able to collect.

The third variable (i.e. *WGIAvgHost*) measures the overall level of institutional development of a country, since nations with more advanced institutional settings are more likely to be targeted by VCs (Groh et al., 2010; Devigne et al., 2018). The WGI (Worldwide Governance Indicators) designed by Kaufmann and colleagues (2009) was already adopted in some studies, such as Li and colleagues' (2014) one. WGI measure is not static, but varies along the years; it summarizes information from more than 30 sources, and it reports scores in a 5 notches scale for 200 countries under six main dimensions, namely Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government

Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption (see **Annex F** for the explanation of each category). However, to take into account all the dimensions, but have a unique measure summarizing the overall level of institutional development, the average of the six scores was introduced as variable in the model. This approach is consistent with the one adopted by Li and colleagues (2014), also considering the fact that the scores of the six categories are observed to be strongly statistically correlated and could generate problems in the analysis, if considered separately. The WGI index is comprehensive and it already accounts for all the relevant aspects to define the attractiveness of a certain institution - for example, it entails the degree of minority investors rights' legal protection - thus allowing to avoid the introduction of too many distinct institutional level control variables in the model.

5.5.2 Home-host country level variables

In **Section 2.3.6**, it was highlighted the relevance not only of the host country's conditions, but also of the differential conditions between the host country and the one in which the investor is established. For this reason, the same indicators presented in the *host country level control variables*, have been repeated in a pairwise perspective: *DeltaGDPGrowth, DeltaStocks* and *DeltaWGI* variables were defined as the difference between the host country and home country measures, consistently with the approach by Hain and colleagues (2016).

Additionally, another variable belonging to this category was introduced, namely *CulturalDistance*. To observe the cultural features of a nation, the cultural dimensions model of Hofstede (1994) was adopted: the scores from the six categories (Uncertainty avoidance, Individualism/Collettivism, Power distance, Masculinity/Femininity, plus Long-term orientation and Indulgence) were gathered from the Hofstede-Insights website, per each country. Afterwards, per each home-host country pair the cultural distance was calculated with the approach designed by Kogut and Singh (1988) (**Figure 28**[4]):

[4] In the formula, i, j and k respectively indicate the country of the investor, the country of the investee and the category of the Hofstede's framework; I_k indicates the score of the country along the k^{th} dimension of the framework; V_k indicates the variance of the scores along the k^{th}dimension.

$$CD_{i,j} = \frac{1}{6} \times \sum_{k=1}^{6} \frac{(I_{i,k} - I_{j,k})^2}{V_k}$$

***Figure 28**: Kogut and Singh's (1988) equation for the computation of the cultural distance*

This measure was already adopted in several international business research on multinational enterprises and in the Venture Capital literature (see Li et al., 2014; Hain et al., 2016).

The cultural dimension was considered only in the home-host country perspective, since Hofstede's measures are meant for comparison between countries and are less informative per se. This control variable is the only time-invariant one, among those introduced so far, since the data reported on the website are static; however, this does not represent an issue, because the cultural aspects are rooted in the countries and their change is observable over the very long term, whereas this thesis' analysis focuses on just twelve years time frame.

5.5.3 VC firm level variables

The literature highlights also the relevance of the specific firm level characteristics in the investment behaviour in general, and in particular also in the internationalization decisions. VC age, reputation, size and experience were found to increase the likelihood to invest in geographically distant locations and abroad, as they allow to mitigate information asymmetries (Cumming & Dai, 2010). On the basis of the information available in the VICO database, VC experience resulted the only variable that could be calculated and taken in consideration. This aspect is however not limiting for the analysis, since the listed variables are often deeply related one with each other: older and more experienced VC firms often develop a strong reputation and grow in size as well.

Coherently with the approach of several researches (Chen et al., 2010; Guler & Guillén, 2010; Li et al., 2014; Liu & Maula, 2021), the VC firm experience was operationalized through the number of investments performed in the past. Indeed, the variable *Experience* was computed as the cumulative sum of the number of investments performed by the specific VC (using VICO registered investments), until the year before the one of each tie. To be as correct as possible in defining VC experience, the computation took into account also the stock of data on deals happened between 1998 and 2006 (that, as already explained,

were not considered in the sample and in the analysis), since they contributed to the increase of the investor experience.

5.5.4 General control variables

A few other control variables, that are relevant in the whole VC investment decisions topic, were included in the model.

First of all, a vector of year dummies (i.e. *d_InvestmentYear*) was created, to control for the impact of the different momentums on the probability of investments, given the cyclicality of the VC industry. For each *dyad*, only the dummy of the vector corresponding to the year of the tie assumes the value of 1.

Second, a vector of dummies *d_InvestorNation* was introduced to control for the different investment frequency that VCs belonging to different countries may have. Indeed, as observed in the description of the dataset and the sample, the nations show different activity levels across Europe. The way the vector technically works is the same described for *d_InvestmentYear*.

Third, the vector of dummies *d_CompanyNation* allows to control for the different likelihood of obtaining funds that ventures established in specific countries may have. This might depend on the more favourable settings and features that a nation might possess; thus, this variable extends the control guaranteed by the variables made explicit among the host country level control variables, that focus on the most relevant features of a country but might neglect other ones (e.g. average education level of the country). Per each *dyad*, only the dummy corresponding to the country of the venture equals to 1, and the others maintain the value of 0.

Fourth, the dummies' vector *d_Nace_category* is useful to control for the impact on the probability of investment realization given by the specific industry in which the startup operates. Indeed, some industries (e.g. high-tech, ICT) are considered more attractive by investors, as often pointed out in the literature and observable analysing the real distribution of the investments. The vector works in the same way described for the previous ones.

Fifth, a dummy (i.e. *FirstInvestmentYesNo*) was included in the model to signal when the investment (or potential investment) corresponds to the first VC funding received by the startup. When a venture has been already financed, the information asymmetry usually reduces since more information becomes available and there is a *certification effect* given

by the previous investors; for this reason, it can affect the probability of success in receiving subsequent financings by other VCs. In practice, the dummy assumes the value of 1 when the tie is in the year of the venture's first investment, 0 otherwise.
Finally, the last variable (i.e. *CompanyAge*) controls for startups' age. Similarly to the case of *FirstInvestmentYesNo,* older ventures usually can count on more detailed track records, are bigger in size, and thus the information asymmetry lowers. Differently from the previous ones, *CompanyAge* is a continuous variable, computed per each row as the difference between the year of the tie and the foundation year of the venture.

5.6 ECONOMETRIC SPECIFICATION

A general econometric specification allowing to test all the 3 Hypotheses was defined. The adopted model is the logit regression, that better model the phenomenon being the dependent variable a binary variable that can only assume the values 0 and 1. The formula derives from all the possible interactions of the three independent variables described in the previous Section.
The final specification is the following:

$$\begin{aligned}\text{prob}\,(RealizedTie_{i,j,t}) = f\,(&\eta_0 + \beta_1 \cdot Saturation_{i,t} + \beta_2 \cdot CVC_i + \beta_3 \cdot GVC_i + \\ &\beta_4 \cdot CrossBorderYesNo_{i,j} + \beta_5 * Saturation_{i,t} \cdot CVC_i + \beta_6 \cdot \\ &Saturation_{i,t} \cdot GVC_i + \beta_7 \cdot Saturation_{i,t} \cdot \\ &CrossBorderYesNo_{i,j} + \beta_8 \cdot CVC_i \cdot CrossBorderYesNo_{i,j} + \beta_9 \\ &\cdot GVC_i \cdot CrossBorderYesNo_{i,j} + \beta_{10} \cdot Saturation_{i,t} \cdot CVC_i \cdot \\ &CrossBorderYesNo_{i,j} + \beta_{11} \cdot Saturation_{i,t} \cdot GVC_i \cdot \\ &CrossBorderYesNo_{i,j} + \gamma \cdot Controls_{i,j,t} + \varepsilon_{I,j,t})\end{aligned} \quad \textbf{(1)}$$

where i indicates the VC firm present in a *dyad* of the final dataset generated through the *matching model*, j stays for the matched startup, and t indicates the year of the potential tie since most of the variables in the model are time variant.

As anticipated, the dependent variable (i.e. $RealizedTie_{i,j,t}$) is a dummy indicating whether the potential tie between investor i and startup j at year t has been realized; $Saturation_{i,t}$ is

the first explanatory variable of the model and measures the level of saturation of the investor i home country VC market in year t; CVC_i and GVC_i are dummies indicating whether the VC investor i is a corporate or government venture capital fund, or otherwise independent, when both variables are 0; $CrossBorderYesNo_{i,j}$ equals to 1 when the tie between investor i and venture j is cross-border. The other terms present in the econometric specification are generated through the interaction of the described explanatory variables. Additionally, in the model the control variables $Controls_{i,j,t}$, that depend either on the year of the potential tie, or on the investor i or startup j demographic and business features, have been incorporated (for the entire list of the control variables, see **Section 5.5**). Finally, $\varepsilon_{i,j,t}$ is the error term.

Thanks to this specification, it is possible to observe and analyse several scenarios, through the combinations of the different investor types and deal type (cross-border or domestic), that are generated by the values assumed simultaneously by the dummy explanatory variables.

5.6.1 Econometric model applied to Hypotheses

This work makes use of a single complete model to test all the three Hypotheses, that is the one presented in **Formula 1**. In fact, as it was anticipated, given the presence of three explanatory dummy variables (i.e. *CVC, GVC, CrossBorderYesNo*), through the same specification it is possible to analyse several cases, based on the values those dummies assume.

To test Hypothesis 1, the interested case is the IVCs' cross-border activity one. Since the goal is to understand how the probability of realizing a cross-border tie is affected by the variation of the *Saturation* level, the terms to be looked at are the following:

$$\text{prob}(RealizedTie_{i,j,t}) = f(\eta_0 + \beta_1 \cdot Saturation_{i,t} + \beta_2 \cdot CVC_i + \beta_3 \cdot GVC_i + \beta_4 \cdot CrossBorderYesNo_{i,j} + \beta_5 * Saturation_{i,t} \cdot CVC_i + \beta_6 \cdot Saturation_{i,t} \cdot GVC_i + \beta_7 \cdot Saturation_{i,t} \cdot CrossBorderYesNo_{i,j} + \beta_8 \cdot CVC_i \cdot CrossBorderYesNo_{i,j} + \beta_9 \cdot GVC_i \cdot CrossBorderYesNo_{i,j} + \beta_{10} \cdot Saturation_{i,t} \cdot CVC_i \cdot CrossBorderYesNo_{i,j} + \beta_{11} \cdot Saturation_{i,t} \cdot GVC_i \cdot CrossBorderYesNo_{i,j} + \gamma \cdot Controls_{i,j,t} + \varepsilon_{i,j,t}) \quad \textbf{(2.1)}$$

The highlighted terms respectively represent the reactivity to the independent variable in the case of domestic deals and the differential reactivity in the cross-border case with respect to the domestic one. Together, they represent the overall influence that *Saturation* has on cross-border ties realization.

To test Hypothesis 2, CVCs' cross-border activity needs to be analysed. This time, the addends that express the extent to which *Saturation* affects the investment probability are:

$$\text{prob}(RealizedTie_{i,j,t}) = f(\eta_0 + \beta_1 \cdot Saturation_{i,t} + \beta_2 \cdot CVC_i + \beta_3 \cdot GVC_i + \beta_4 \cdot CrossBorderYesNo_{i,j} + \beta_5 * Saturation_{i,t} \cdot CVC_i + \beta_6 \cdot Saturation_{i,t} \cdot GVC_i + \beta_7 \cdot Saturation_{i,t} \cdot CrossBorderYesNo_{i,j} + \beta_8 \cdot CVC_i \cdot CrossBorderYesNo_{i,j} + \beta_9 \cdot GVC_i \cdot CrossBorderYesNo_{i,j} + \beta_{10} \cdot Saturation_{i,t} \cdot CVC_i \cdot CrossBorderYesNo_{i,j} + \beta_{11} \cdot Saturation_{i,t} \cdot GVC_i \cdot CrossBorderYesNo_{i,j} + \gamma \cdot Controls_{i,j,t} + \varepsilon_{i,j,t}) \quad \textbf{(2.2)}$$

As in the previous case, the highlighted terms together indicate the overall reactivity to a change in *Saturation*. However, differently to Hypothesis 1, Hypothesis 2 does not aim to test the reactivity in the CVC cross-border case per se, but rather to the differential reactivity of CVC cross-border investments to *Saturation* with respect to the IVC one; thus, afterwards, the marginal reaction to VC market saturation in the CVC cross-border case will be confronted with that of the IVC cross-border case.

Hypothesis 3 follows the same principle of Hypothesis 2 - comparing the reactivity of *captive* VCs' cross-border activity to *Saturation*, with the independent VCs' one -, but focusing on GVCs instead of CVCs.

$$\begin{aligned}\text{prob}(RealizedTie_{i,j,t}) = f(&\eta_0 + \beta_1 \cdot Saturation_{i,t} + \beta_2 \cdot CVC_i + \beta_3 \cdot GVC_i + \\ &\beta_4 \cdot CrossBorderYesNo_{i,j} + \beta_5 * Saturation_{i,t} \cdot CVC_i + \beta_6 \cdot \\ &Saturation_{i,t} \cdot GVC_i + \beta_7 \cdot Saturation_{i,t} \cdot \\ &CrossBorderYesNo_{i,j} + \beta_8 \cdot CVC_i \cdot CrossBorderYesNo_{i,j} + \beta_9 \\ &\cdot GVC_i \cdot CrossBorderYesNo_{i,j} + \beta_{10} \cdot Saturation_{i,t} \cdot CVC_i \cdot \\ &CrossBorderYesNo_{i,j} + \beta_{11} \cdot Saturation_{i,t} \cdot GVC_i \cdot \\ &CrossBorderYesNo_{i,j} + \gamma \cdot Controls_{i,j,t} + \varepsilon_{i,j,t})\end{aligned} \quad \textbf{(2.3)}$$

Again, the highlighted terms all together represent the impact of *domestic VC market saturation* level on the probability of cross-border tie formation, but to test Hypothesis 3 what will be necessary to look at is the difference between the marginal reaction to saturation in the GVC and IVC cross-border cases.

6. EMPIRICAL RESULTS

In this Chapter, the results obtained from the logit regression are reported and discussed. Then, the models used to specifically test the Hypotheses are presented in detail.

6.1 RESULTS OF THE LOGIT REGRESSION MODEL

Table 10 presents the results obtained from the logit regression model, complete of all explanatory variables and interaction terms that allow to observe their synergistic effects, plus the control variables defined in **Section 5.5**.

Logit regression

RealizedTie	Coef.	St.Err	t-value	p-value	[95% Conf.	Interval]	Sig
CrossBorderYesNo	-2.01	.114	-17.70	0	-2.232	-1.787	***
d_Ownership1 (CVC)	-.371	.086	-4.31	0	-.54	-.202	***
d_Ownership2 (GVC)	.287	.066	4.35	0	.158	.416	***
Saturation	-.078	.039	-2.00	.045	-.155	-.002	**
CrossBorderYesNo#d_Ownership1 (CVC)	.928	.2	4.64	0	.536	1.32	***
CrossBorderYesNo#d_Ownership2 (GVC)	-.789	.353	-2.23	.026	-1.482	-.096	**
CrossBorderYesNo#Saturation	.245	.086	2.86	.004	.077	.412	***
d_Ownership1 (CVC)#Saturation	.086	.079	1.10	.273	-.068	.241	
d_Ownership2 (GVC)#Saturation	.361	.058	6.24	0	.248	.475	***
CrossBorderYesNo#d_Ownership1 (CVC)#Saturation	-.199	.178	-1.12	.263	-.549	.15	
CrossBorderYesNo#d_Ownership2 (GVC)#Saturation	-.397	.321	-1.24	.216	-1.026	.232	
GDPGrowthHost	.011	.008	1.37	.171	-.005	.028	
DeltaGDPGrowth	.017	.016	1.07	.285	-.014	.048	
StocksTradedHost	0	.001	-0.33	.743	-.002	.002	
DeltaStocks	.001	.002	0.92	.36	-.002	.004	
WGIAvgHost	-.624	.241	-2.59	.01	-1.097	-.151	***
DeltaWGI	1.194	.503	2.38	.018	.209	2.18	**
Experience	.003	0	36.79	0	.003	.003	***
CulturalDistance	-.077	.043	-1.79	.074	-.162	.007	*
FirstInvestmentYesNo	-.109	.026	-4.22	0	-.159	-.058	***
CompanyAge	-.003	.004	-0.74	.458	-.01	.005	
Constant	-4.356	.391	-11.13	0	-5.123	-3.589	***

**** p<.01, ** p<.05, * p<.1*

***Table 10**: Logit regression model results. The vectors of dummies d_InvestmentYear, d_InvestorNation, d_CompanyNation and d_Nace_category were not included in the table for sake of space.*

Before deepening the discussion of the results obtained, it is worth to point out that, being the logit regression a non-linear model, the coefficients do not represent the marginal variation of the dependent variable for a change of the value of the explanatory variable they refer to, that is the case of the linear regression. They rather represent the increase (when positive) or decrease (when negative) of the natural logarithm of the odds (i.e. the ratio between probability of realized tie and the probability of unrealized tie). The coefficients' sign (for the non-interactive terms) allows however to look at whether the variables positively or negatively affect the likelihood to realize tie, but the extent to which they do so is less straightforward to be observed. In fact, a constant change in odds does not imply a constant change in probabilities, as the magnitude of the effect of the same odd change varies based on the value assumed by the explanatory variable (Hoetker, 2007).

First, evidence indicates a negative and statistically significant impact of the explanatory variable *CrossBorderYesNo* (-2.01), suggesting that IVCs' probability to realize a tie is lower in the case of cross-border potential deals than in the case of domestic ones. This is consistent with the IVC preference for local investments reported in the literature, and aligned with the data shown in the descriptive statistics of both VICO dataset and final sample.

The likelihood to realize domestic ties seems lower for CVCs (-0.37, with statistical significance) compared to IVCs, whereas is higher for GVCs (+0.29, with statistical significance) compared to IVCs. These relations reflect the investment policies and rationales of the different investor types, that were discussed in the Literature Review and Hypotheses Formulation Sections: CVCs have broader geographical scope and international vocation, whereas GVCs focus on nurturing the domestic economic environment.

Results suggest that the increase of *Saturation* level negatively impacts the willingness of IVCs to invest domestically (-0.08, with statistical significance), coherently with the reasoning made in **Subsection 3.2.1**.

The interactive terms' coefficients are instead more difficult to be interpreted, due to the non-linear nature of the logit model, and require to conduct additional analyses to assess their impacts, as it will be done in the following Section. In fact, the sign of the interaction coefficient may not indicate the real direction of the interaction effect; moreover, in the case of significant interaction coefficients, there might not be any real significant effect, or,

specularly, in the case of low statistically significant interaction coefficients, the real interaction effect may be significant (Hoetker, 2007).

6.2 MARGINAL EFFECT MODELS TO TEST THE HYPOTHESES

Given the difficulty to interpret the relation expressed by the model in the case in which the interactive terms are considered, to look at the overall reactivity to changes in the *domestic VC market saturation* level for IVCs, CVCs and GVCs - and consequently test the Hypotheses – an average marginal effect (AME) analysis per each case needs to be carried out (Hoetker, 2007; Mize, 2019). The analyses were run with the objective of determining the average marginal impact of *Saturation* on the likelihood of tie realization under the imposed conditions of interest (i.e. ownership type and cross-border investment). In this Section, these additional analyses and their results are presented.

6.2.1 Marginal effect model to test Hypothesis 1

The statistically relevant coefficient (+0.24, *CrossBorderYesNo#Saturation*) in **Table 10** suggests that the relation between the probability to realize a tie and *Saturation*, is different in the cases of domestic and cross-border investment activity for IVCs. However, because of the issues presented above that accompany the interaction terms' coefficients, nothing can be still stated about the overall relation between *Saturation* and the probability to realize a tie in the cross-border case. The marginal effect analysis allows to understand the average impact on the dependent variable of an increase of 1 unit of *Saturation*. The analysis is run under the conditions of *CrossBorderYesNo* equal to 1, *CVC* and *GVC* equal to 0, because Hypothesis 1 refers to the case of IVCs' international investment activity.

The results obtained are the following (**Table 11**):

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
IVC cross-border case	0.0004	0.0002	2.00	0.046	7.37e-06	0.0008	**

**** p<.01, ** p<.05, * p<.1*

***Table 11**: AME analysis IVC cross-border case.*

The results highlight a positive and statistically significant average marginal effect of *Saturation*. Indeed, the probability to realize a cross-border tie (relative to the number of potential deals a VC firm might undertake) increases by 0.04%, with a 95% significance level. The magnitude of the effect might appear low, but, actually, its relevance is not negligible if the starting proportion of realized cross-border ties on potential cross-border deals is considered. In fact, the percentage of IVC realized international investments on potential ones in the dataset obtained through the *matching model* was 0.31%. Thus, a marginal effect of 0.04% represents a 13% increase of the previous percentage.

6.2.2 Marginal effect model to test Hypothesis 2

In the case of CVC cross-border investments, the reactivity to the *domestic VC market saturation* level, compared to the IVC cross-border case, is also impacted by the interactive term between *Saturation* and *CVC* and by the interactive term between *Saturation, CVC* and *CrossBorderYesNo* (see **Subsection 5.6.1**). From **Table 10** the coefficients of the logit regression output of these two terms can be observed; both of them have a low degree of statistical significance (respectively, p-value=0.27, p-value=0.26), suggesting there might not be evidence to confirm Hypothesis 2. However, because of the already explained issues, in general, looking at coefficients of the interactive terms is not sufficient to test the relation of interest, and thus a marginal effect analysis is required, even in the case of non-significant values (**Section 6.1**).

The marginal effect analysis shows the average impact of a unitary change in *Saturation* on the dependent variable, under the conditions of *CrossBorderYesNo* and *CVC* equal to 1, and *GVC* equal to 0, because Hypothesis 2 deals with CVCs' international activity. So, the results will show the overall average reactivity to saturation for CVCs in the cross-border investments, and not directly the differential value of reactivity with the IVCs' case; for this reason, subsequently, an additional test to compare the reactivity of CVCs with that of IVCs (i.e. the result obtained in **Subsection 6.2.1**) needs to be carried out to test the Hypothesis statement.

The results of the marginal effect analysis are as follows (**Table 12**):

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
CVC cross-border case	0.0002	0.0005	0.37	0.714	-0.0009	0.0013	-

*** p<.01, ** p<.05, * p<.1

***Table 12**: AME analysis CVC cross-border case.*

Table 12 highlights the non-significance of the average marginal effect value obtained; this finding will be discussed in detail in the next Sections. Since the result is strongly non-significant, the test of comparison between it and the reactivity observed in IVCs case would not lead to significant results, as it is possible to already observe looking at the overlap of the two 95% confidence intervals in **Table 11** and **Table 12**.

6.2.3 Marginal effect model to test Hypothesis 3

In the GVC cross-border case, the incremental effect on propensity to invest given by *Saturation* is affected also by the interactive term between *Saturation* and *GVC* and by the interactive term between *Saturation*, *GVC* and *CrossBorderYesNo* (see **Subsection 5.6.1**), with respect to the IVC cross-border one. This time, only the second coefficient is not statistically significant (p-value=0.216) (**Table 10**), but, however, to confirm or reject Hypothesis 3 it is again necessary to carry out a marginal effect analysis. The conditions under which the analysis is run are *CrossBorderYesNo* and *GVC* equal to 1, and *CVC* equal to 0, since Hypothesis 3 looks at GVCs' cross-border activity. Again, as in the case of Hypothesis 2, afterwards, an additional test to compare the results that will be obtained from this analysis with those obtained in the case of Hypothesis 1 is needed.
The results are (**Table 13**):

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
GVC cross-border case	0.0002	0.0004	0.42	0.672	-0.0007	0.0011	-

*** p<.01, ** p<.05, * p<.1

***Table 13**: AME analysis GVC cross-border case.*

The results are not significant and will be commented in the next Sections. As in the CVC case, the test to compare the GVC and IVC reactivity is not necessary.

7. DISCUSSION

In this Chapter the results obtained from the analyses are interpreted. The Chapter is structured in three Sections, one per each ownership type, in which Hypotheses' results are discussed and extended with additional tests.

7.1 IMPACT OF SATURATION ON IVC INVESTMENT PATTERNS

The obtained results confirm there is statistical evidence to state that independent venture capitals increase their willingness to invest abroad when the *domestic VC market saturation* level increases. The marginal effect of a change in *Saturation* was demonstrated to be positive at a confidence level of 95% (see **Table 11**). The lower bound of the confidence interval is greater than 0 as well, reinforcing the idea that the relation is indeed positive.

IVCs, given the financial nature of their main objectives, show to be affected by an economic condition such as market saturation, that reflects both on the ease to find local investees and on the average domestic deals' price. An increase in the saturation level can be caused either by an increase on the capital supply side, or by a shortage of investment opportunities provoking a reduction of domestic capital demand. In both cases, the difficulties faced by VCs when looking for potential deals increase, and, together with the likely eventual increase in average deal prices, this represents a cost for the investors. Greater costs or prices to be paid to purchase equity stakes can undermine IVCs' capability to generate substantial capital gains from the funds invested, and in the long term this could damage IVC reputation and the possibility to guarantee itself a significant funds' inflow from the future fundraisings (Gompers et al., 1998).

It is interesting to check the interpreted results controlling for the impact of saturation on the overall IVC investment behavior, that means, more concretely, to look also at how the domestic investment patterns change when the saturation level increases. This check allows to investigate whether *Saturation* impacts on IVC probability to invest in general, or the statistically observed impact is typical of the cross-border activity only. To investigate the reactivity to VC market saturation in the case of domestic potential investments, the same

analytical approach of the Hypotheses' tests is adopted. The coefficient of the *Saturation* variable in **Table 10** (-0.08), suggests the presence of a negative relation between the explanatory variable and the probability of tie realization, in the IVC domestic case. However, to test the average impact of *Saturation* in the domestic investment behaviour, a marginal effect analysis is carried out (under the conditions *CrossBorderYesNo*=0, *CVC*=0, *GVC*=0). The results are shown in **Table 14**.

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
IVC cross-border case	0.0004	0.0002	2.00	0.046	7.37e-06	0.0008	**
IVC domestic case	-0.0011	0.0005	-2.00	0.046	-0.0021	-2e-05	**

*** p<.01, ** p<.05, * p<.1

***Table 14**: AME analysis IVC cross-border and domestic case.*

The average marginal effect in the domestic case is negative (-0.11% with a confidence level of 95%). This check confirms that the positive relation between market saturation and investment probability is exclusive of the cross-border case, and it is not due to an increase in the overall investment probability. The previous findings are reinforced by this analysis: the probability to realize ties within the national borders decreases because of the home unfavourable conditions to the maximization of the financial returns, whereas the willingness to invest abroad increases.

Figure 29 reports graphically the difference between the two average marginal effects of domestic and cross-border cases.

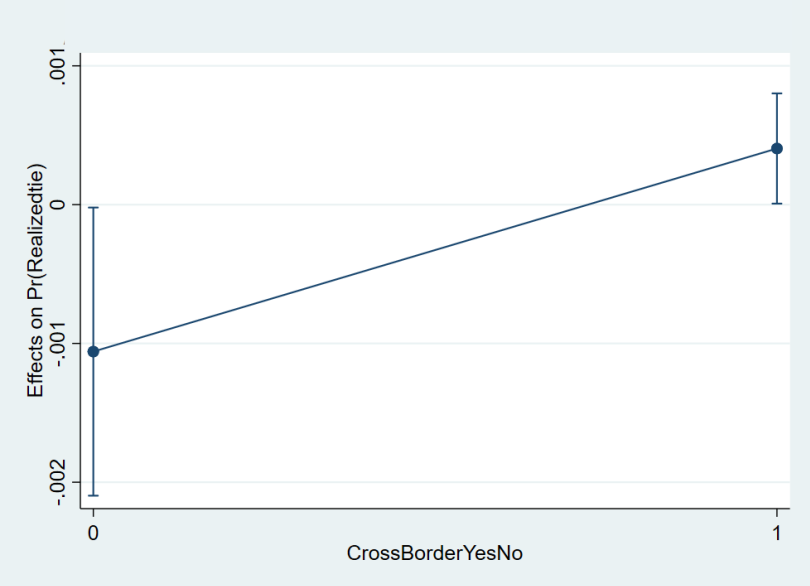

***Figure 29**: Average marginal effect of saturation on IVC domestic and cross-border cases, with 95% confidence level*

To summarize, the statistically evident shift of probability from local to international investments suggests that IVCs change their typical behaviour when saturation increases. As literature suggested (Wright et al., 2005; Park et al., 2019), independent investors seem to employ more effort towards looking for more convenient foreign investment opportunities, to the expense of a reduction on domestic investment likelihood.

7.2 Impact Of Saturation On CVC Investment Patterns

Subsection 6.2.2 results suggest that there is not statistical evidence to affirm the presence of a positive or negative relation between the level of saturation and the probability of cross-border investment for corporate venture capital funds. This outcome did not allow to compare the reactivity of CVCs and IVCs cross-border cases. The argumentations that led the authors to hypothesize a lower impact of saturation on international tie realization propensity compared to IVCs cross-border case, actually manifest in an even more extreme result, that is the absence of correlation between *Saturation* and dependent variables. CVCs' international vocation make them likely suffering less from a specific country's unfavourable home conditions (Drover et al., 2017); moreover, the prevalence of strategic goals in their objectives' set leads them to pay less

attention to the financial returns and to invest almost regardless of the contextual conditions when a venture fitting their business is encountered.

Looking at the reactivity of CVCs to saturation in the case of domestic potential investments may allow to understand if they show a negative local investment pattern when home saturation worsens, as in the case of IVCs, or they do not care about saturation in general and follow different logics. Thus, another marginal effect analysis is run - with *CrossBorderYesNo* and *GVC* equal to 0, and *CVC* equal to 1 - to look at CVC domestic behaviour, whose results are shown in **Table 15**.

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
CVC cross-border case	0.0002	0.0005	0.37	0.714	-0.0009	0.0013	-
CVC domestic case	8e-05	0.0008	0.10	0.919	-0.0015	0.0017	-

**** p<.01, ** p<.05, * p<.1*

***Table 15**: AME analysis CVC cross-border and domestic case.*

The non-significant output obtained (p-value=0.919) exhibits the absence of evidence to conclude that *Saturation* has an effect on the investment realization propensity of CVCs, in the domestic case as well. Being *Saturation* relevant neither in the cross-border, nor in the domestic case, it is possible to state that it seems not to be a relevant determinant in the CVC investment decision process. The arguments based on internationality and strategic goals presented in the cross-border case apply to the whole CVC behaviour. This finding is of particular interest, because it underlines the deeply different nature of corporate and independent funds in reacting against economic market conditions.

7.3 Impact Of Saturation On GVC Investment Patterns

As in the case of CVCs, GVC population seems not to be reactive to domestic saturation level when analysing cross-border investment patterns. The results obtained impede to test the Hypothesis and oblige to stop at the preceding step of analysis, but are however not in contrast with the arguments presented in **Subsection 3.2.3**. Outputs confirm the idea that the rare exceptions of investments performed outside the national borders are

likely to be guided by more occasional motives related to political and strategic objectives, rather than by specific market determinants (such as, for example, saturation).

Since the focus of GVC operations is mainly local, it is interesting to extend the analysis to the domestic investments, to understand whether *Saturation* becomes relevant when shifting the focus on the GVC activity within national borders. Indeed, public owned funds' goals are mainly oriented to develop the local market and foster the local economy, and saturation of the domestic VC market is still an economic factor characterizing the home country. It is thus legitimate to investigate whether this is a variable of interest for GVCs.

For this purpose, a marginal effect analysis under the conditions of *CrossBorderYesNo* and *CVC* equal to 0 and *GVC* equal to 1 is run (**Table 16**).

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
GVC cross-border case	0.0002	0.0004	0.42	0.672	-0.0007	0.0011	-
GVC domestic case	0.0068	0.0014	5.03	0.000	0.0042	0.0095	***

*** p<.01, ** p<.05, * p<.1

***Table 16**: AME analysis CVC cross-border and domestic case.*

The result is positive (+0.68%) and significant, that means the probability of domestic tie realization increases for GVCs as the level of VC market saturation increases.

The first possible interpretation of the evidenced positive relation is that GVCs' intervention itself provokes an increase in the saturation level of the domestic VC market, rising the capital supply. However, this explanation is not satisfactory, given the lower number of investments undertaken by this category of investors and the smaller amount of equity capital they provide to the investees, compared to the IVCs that represent by far the largest portion of the market. Thus, it is unlikely that GVCs can provoke significant shifts on the saturation level, as their impact is marginal relatively to the whole capital supply in the VC market. Moreover, generating an increase in saturation would be detrimental to one of the key objectives of GVCs, that is to *crowd in* the private investors, since IVCs were shown to reduce their domestic investments willingness contextually to a rise in *domestic VC market saturation* (**Section 7.1**).

Therefore, alternatively, this interesting evidence can be interpreted through the countercyclical nature of GVC business, that means their activity is more relevant and

massive when domestic conditions are not friendly for investors. Their enhanced willingness to intervene in the market through an increased number of investments may be coherent with the decrease in IVCs' probability to invest in the domestic country observed in **Section 7.1**. According to this perspective, GVC behaviour might be interpreted as an attempt to maintain the domestic environment attractive and avoid the case of IVCs' shift of interest towards foreign countries. In a context of high saturation, the demand for capital coming from quality startups (that is the real potential demand perceived by VCs), relative to the capital available to VC firms, decreases. There is a portion of demand that is not accounted by VCs, because considered of a too low-quality level, and this is mainly due to information asymmetry issues (e.g. absence of track records and absence of collaterals). The intervention by GVCs in the domestic market to contrast the increasing saturation conditions, may lower the information asymmetries that some startups in the landscape suffer from, offering them *certification*. Thanks to the proved *crowding-in* effect that GVCs' activity has on IVCs' one (see **Subsection 2.2.2**), the behaviour adopted by public funds may help in keeping the focus of IVCs on the domestic market.

Figure 30 compares the outputs of the average marginal effect analyses for GVCs and IVCs, and shows that when in the domestic case IVCs react negatively to the increase of saturation level lowering their investment realization probability, GVCs respond with the opposite behaviour. The marginal increase in investment likelihood of GVC (+0.68%) is quite larger than the marginal reduction in IVC one (-0.11%), but this aspect can be explained by the different orders of magnitude of their activities (reflected in the sample of analysis as well).

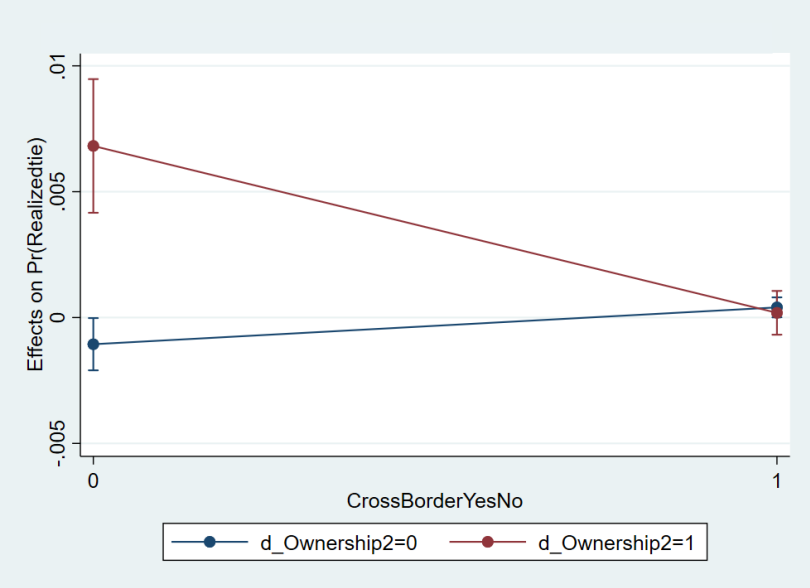

***Figure 30**: Average marginal effect of saturation on IVC and GVC, for both the domestic and the cross-border cases, with 95% confidence level. NOTE: the value assumed by the GVC line when CrossBorderYesNo equals to 1, is not significative.*

8. ROBUSTNESS TESTS

In this Chapter, some tests to check the robustness of the observed results are performed. The Sections analyse separately the two different checks that have been carried out: the first based on the change of the analytical model, the second based on an alternative operationalization of the explanatory variable. Both the carried out tests confirm the results of the analyses in Chapter 6.

8.1 TEST 1: PROBIT MODEL

The probit models the regression function as the cumulative of the normal standard distribution, and it is an alternative model to the logit to interpret the probability of occurrence of an event expressed by a dichotomous variable, where 1 corresponds to the successful case and 0 to the unsuccessful case (i.e. in this case realized versus unrealized tie). Probit and logit often lead to the same outcomes, not in terms of same numerical outputs, but in terms of conclusions drawable observing the results. However, the rationale of this robustness test stays in the low magnitude of the numerical results obtained in the logit, that led the authors to perform the probit check to see whether the signs (positive or negative) of the statistically significant results of the logit are confirmed or not. Furthermore, even though the two methods lead to similar results, the practice of checking the outcomes of the first method with the second, or viceversa, is common in the literature (see for example Liu & Maula, 2021).

The results obtained from the probit and the subsequent average marginal effect analyses are respectively shown in **Table 17** and **Table 18**.

Probit regression

RealizedTie	Coef.	St.Err	t-value	p-value	[95% Conf. Interval]		Sig
CrossBorderYesNo	-.748	.039	-19.07	0	-.825	-.671	***
d_Ownership1 (CVC)	-.144	.032	-4.47	0	-.207	-.081	***
d_Ownership2 (GVC)	.110	.028	3.93	0	.055	.165	***
Saturation	-.029	.016	-1.82	.069	-.059	.002	*
CrossBorderYesNo#d_Ownership1 (CVC)	.337	.070	4.80	0	.199	.474	***
CrossBorderYesNo#d_Ownership2 (GVC)	-.361	.129	-2.81	.005	-.613	-.109	***
CrossBorderYesNo#Saturation	.089	.029	3.04	.002	.032	.147	***
d_Ownership1 (CVC)#Saturation	.038	.029	1.29	.197	-.020	.095	
d_Ownership2 (GVC)#Saturation	.145	.025	5.88	0	.097	.194	***
CrossBorderYesNo#d_Ownership1 (CVC)#Saturation	-.085	.063	-1.36	.175	-.207	.038	
CrossBorderYesNo#d_Ownership2 (GVC)#Saturation	-.158	.117	-1.34	.179	-.388	.072	

**** p<.01, ** p<.05, * p<.1*

***Table 17**: Probit regression model results. For sake of simplicity, only the relevant variables are reported here.*

The coefficients and significance levels in **Table 17** are coherent with those obtained in the logit regression model (see **Table 10**); however, this similarity is not sufficient to check the robustness of the results, being both probit and logit non-linear models, and average marginal effect outputs must be observed.

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
IVC cross-border case	0.0004	0.0002	2.15	0.032	4e-05	0.0008	**
CVC cross-border case	0.0001	0.0005	0.27	0.786	-0.0009	0.0012	-
GVC cross-border case	0.0002	0.0004	0.43	0.670	-0.0006	0.0009	-
IVC domestic case	-0.0010	0.0005	-1.81	0.070	-0.0021	8e-05	*
CVC domestic case	0.0003	0.0008	0.31	0.754	-0.0013	0.0018	-
GVC domestic case	0.0066	0.0014	4.79	0.000	0.0039	0.0093	***

**** p<.01, ** p<.05, * p<.1*

***Table 18**: AME analyses results for all the possible scenarios, after the Probit regression model.*

Table 18 outputs confirm all the results of the main test performed in the previous Chapter. The marginal effect of an increase in the saturation level on the tie realization probability is positive with statistical significance in the IVC cross-border case and it is negative with

statistical significance in the IVC domestic case, confirming the shift of interest towards foreign markets contextually to increased saturation in the home country.
For what concerns CVC, in both domestic and cross-border cases, the absence of sufficient statistical evidence to assert the presence of a relation between saturation level and probability to invest, is confirmed.
Finally, even in the probit case, GVCs show to be reactive to the explanatory variable in the case of domestic investments, whereas no relation is observed in the case of foreign investments.

8.2 TEST 2: SATURATION ALTERNATIVE OPERATIONALIZATION

The second test aims at checking the robustness of the results when the way the explanatory variable *Saturation* is operationalized changes. The other explanatory and control variables were either dummies or were operationalized taking inspiration from to the previous literature. Thus, it makes sense to test the results through an alternative measure of the *Saturation* variable, since on one hand it is the focal and most important one, and on the other hand this work, to the best of the authors' knowledge, is the first to operationalize the saturation of the VC market - except for the simplification of the saturation measure provided by Buchner and colleagues in 2018 - and could not resort for this reason to previous consolidated operationalizations.
The alternative adopted operationalization to measure the saturation of a country in a specific year is the ratio between the share of funds raised relative to the whole European market amount, and the share of demand for capital relative to the whole European market amount. The rationale is still to compare the supply and demand for capital, as in the previous measure, but using the ratio of the shares it is possible to look at the balance (or unbalance) between the degrees of development of the two sides of the market: VC investor one and startups' ecosystem one. For example, a country could show a significantly higher share of supply than of demand, and this may signal a poor development of the entrepreneurial ecosystem compared to the VC domestic industry. The variable is still continuous, as in the first operationalization, and its impact on the investment probability is tested through a logit regression, replicating thus the same analysis of **Chapter 6**. In **Table 19**, the results of the AME analyses run after the logit regression are reported.

	dy/dx	St.Err	z	p-value	[95% Conf. Interval]		Sig
IVC cross-border case	0.0015	0.0007	2.34	0.019	0.0002	0.0028	**
CVC cross-border case	0.0007	0.0017	0.44	0.662	-0.0026	0.0041	-
GVC cross-border case	-0.0003	0.0014	-0.20	0.845	-0.0030	0.0025	-
IVC domestic case	-0.0043	0.0016	-2.75	0.006	-0.0074	-0.0012	***
CVC domestic case	-0.0005	0.0025	-0.19	0.849	-0.0055	0.0045	-
GVC domestic case	0.0235	0.0042	5.62	0.000	0.0153	0.0317	***

*** p<.01, ** p<.05, * p<.1

***Table 19**: AME analyses results for all the possible scenarios, after the Logit regression model run with the alternative operationalization of Saturation.*

The average marginal effects analysis of the new saturation measure on the likelihood to invest confirms the same findings of the main analysis and the first robustness test. Of course, since the operationalization of the explanatory variable changes, the numerical outputs of the coefficients are different; however, the direction of the relations (when the output is statistically significant) and the significance levels expressed by the p-values lead to the same conclusions. IVCs show to care about saturation in their investment behaviour both domestically and in the cross-border case; CVCs exhibit again low interest towards this domestic market economic factor and seem to follow different logics in their investment decisions; GVCs react to an augmented saturation level increasing their domestic investment propensity, whereas no impact is observed in the activity beyond national borders.

9. CONCLUSIONS

This Chapter concludes the work providing first a summary of the main findings and contributions, and then an overview of the study limitations, possible improvements and future research suggestions.

9.1 MAIN FINDINGS AND CONTRIBUTIONS

This thesis aimed at studying the role of *domestic VC market saturation* in the VC firms' internationalization decision process. The work inserts in the broad research stream on the determinants of cross-border VC activity, that gained momentum in recent years motivated by the increasing interest towards foreign investments exhibited by many investors. When investigating the drivers of a specific investor's cross-border investment decision, past literature mainly focused on the attractiveness of foreign countries, both in absolute terms (i.e. *host institutions perspective*) and relatively to the conditions of the investor's home country (i.e. *home-host institutions perspective*). The proposed determinant, instead, belongs to an almost unexplored perspective, that the thesis' authors referred to as *home institutions*, according to which VC firms' cross-border investments may be stimulated (or hindered) by the unfavourable (or favourable) conditions of the domestic country, regardless of the host countries' ones. The heterogeneity of the behaviour and objectives of the different VC types led the authors to decline the study along the ownership dimension, investigating the impact of *domestic VC market saturation* for IVCs, CVCs and GVCs.

In order to answer the research question, a sample of 16,869 deals obtained from the reduction of the VICO 5.0 database was used. Information on the funds raised by the VC firms of a given country in a given year were collected and entered in the dataset as a proxy of the available capital supply; to proxy the capital demand level, the total equity collected by the ventures of a given country in a given year was computed as the sum of the deals' data present in VICO. These figures were used to build a measure of saturation (i.e. the ratio between funds raised and capital demand) coherent with the definition provided by Buchner and colleagues (2018), according to whom a saturated VC market is characterized

by an excess of funds compared to the demand for capital. To better shape the decision-making process of VCs and assess their investment probability, a *matching model* was adopted, building a set of potential *dyads* associating the firms seeking for capital in a given year with the VCs that were looking for investment opportunities in the same year. The final sample of VC-venture *dyads* obtained was analysed using a logit model, where the dependent variable was *RealizedTie* (1 in the case of realized tie, 0 in the case of unrealized tie), and saturation, ownership and deal type (cross-border or domestic) acted as explanatory variables.

The findings obtained are presented here divided per ownership type.

First, independent VCs show to be affected by the saturation level in their cross-border investment activity, verifying Hypothesis 1. This is evidenced by the statistically significant marginal effect of a unitary saturation increase on the probability of cross-border tie realization. When the *domestic VC market saturation* augments, strengthening the difficulties to find potential deals, and generating a likely increment in average deals' price, IVCs seem to shift their attention towards opportunities arising from foreign countries. The observed pattern is consistent with the financial orientation of IVCs, that aim to maximize the returns from their investments and thus seek for favourable market conditions. This argument is reinforced by the additional resulting evidence that, when saturation in the home market increases, IVCs contextually reduce their willingness to undertake domestic investments, as their expected financial returns likely worsen.

Second, corporate VCs do not result to be influenced by the *domestic VC market saturation* level in their international activity, as the outcomes of the analysis are not statistically significant. Hypothesis 2 suggested the presence of a positive but weaker reactivity to saturation compared to the IVCs, when considering cross-border investment probability. Given the nature of the results, Hypothesis 2 is not strictly verified; however, the findings are not in contrast with the argumentations that led to the definition of the Hypothesis. CVCs, since they mainly pursue strategic objectives and financial returns usually come in second place, can be disposed to pay premium prices to close deals when they find target ventures that fit with their business. For this reason, an eventual increase in the average deals' price generated by an enhanced saturation level may not represent a significant issue for these investors. Additionally, since the CVC programs are often set up by multinational corporations, corporate VCs historically show a stronger international vocation and a broader geographical scope, and are more used to consider in the set of potential investees

companies coming from multiple nations, thus suffering less from the worsening of a single specific country's market conditions. As observed in the extension of the analysis, even the patterns of CVCs within national borders are not influenced by the *domestic VC market saturation*, strengthening the interpretation of the results and the idea that CVCs on average follow different rationales in their investment activity: not only they do not increase their likelihood to invest cross-border, but also they do not react to the contextual conditions reducing the domestic investment probability, as it was the case for IVCs.

Third, government-backed VCs cross-border investment likelihood shows not to be statistically affected by the domestic saturation conditions. Similarly to Hypothesis 2, Hypothesis 3 suggested a positive reactivity for GVCs, despite weaker than for IVCs, and it is not strictly verified. GVC programs' mission is to fund and provide *certification effect* to those qualitative ventures that, due to market failures, are not able to receive financings from the other professional investors. For this reason, the geographical scope of the GVC business is almost purely domestic, and the cross-border financing events are limited and likely contingent to specific strategic and political objectives. This argument, presented in the Hypothesis development, is however consistent with the observed results: the authors expected a weaker relation between *domestic VC market saturation* and cross-border tie realization probability compared to the IVC case, but indeed the relation does not hold at all. This finding confirms the idea that in their few occasional international investment decisions, GVCs are incentivized by different factors. Concerning the domestic activity, oppositely, the interesting finding is that GVCs investment probability enhances when the domestic saturation level increases. This pattern may be interpreted, through GVCs' countercyclical nature, as an attempt to counterbalance the negative effect of saturation on private VCs' willingness to invest domestically: GVC intervention, providing *certification effect* and thus increasing the high-quality demand perceived, tries to keep the independent investors focused on the domestic market, rather than on opportunities coming from foreign countries.

This thesis sheds light on an unexplored topic and provides contributions to practitioners, scholars and policy makers.

As far as ventures are concerned, this work demonstrates that VC firms' willingness to invest abroad enhances when the *domestic VC market saturation* increases, thus suggesting that startups established in foreign countries may exploit this situation and try to seek for

financings coming from them. On VC side, this work is informative about the behaviour assumed on average by the players in the competitive arena.

The contribution for scholars is significant, since this work explicitly identified and dealt with a new perspective of study of the VC cross-border decisions (i.e. *home institutions perspective*), based on the analysis of the investors' home countries conditions rather than on the host countries ability to attract capital inflows. This opens space for several future avenues of research.

However, the category this work may be more relevant for, is that of policy makers. In fact, the study investigates a country condition that may incentivize home-based investors to employ their capital abroad, that is detrimental to the local and national economy. Unveiling the relation between saturation and domestic investors' behaviour, this thesis gives significant information to public entities and policy makers, whose interest might be to intervene in order to preserve the attractiveness of their home market and avoid a decrease of the investment activity within national borders. According to the interpretation provided to the observed domestic investment patterns when saturation rises, government-backed funds increasing propensity to invest represents a first attempt to limit these issues, but many other policies (both direct and indirect) may be put in place to stimulate the startup ecosystem or make conditions more favourable for VC firms.

9.2 LIMITATIONS AND FUTURE RESEARCH

This work is not free from limitations. First of all, the operationalization of the *domestic VC market saturation* measure has room for improvements. The data on funds raised the authors relied on, were organized in international macro-regions and required to allocate the amounts to the single countries being part of the regions; replicating the study with data directly exhibiting the overall capital available country by country would lead to more accurate results. Moreover, the funds raised reported in Pitchbook, although it is not specified, likely refer to the capital collected by IVCs only. However, IVCs represent the largest slice of the VC market, so the data used should proxy adequately the capital supply; CVCs show cyclical patterns of investments (Drover et al., 2017) coherent with the variations of the IVC activity level and thus should not modify the trend of capital collection this thesis is interested to; GVCs are instead countercyclical (they likely increase

their effort when the activity level of private VCs drops) and would potentially move oppositely to the observed capital collection trend, but their weight in the VC industry is marginal and thus the impact on the real supply is limited.
The demand, that is the other component used in the measure of the saturation level, due to external data unavailability, was computed based on the information present in the VICO dataset. This partially represents a limitation, since only the quality demand arising from ventures that were actually able to obtain financings, can be observed.
From an analytical and methodological point of view, some aspects might be improved. A limitation of this work is the inability to include in the analysis such a relevant variable in the VC cross-border discussion as geographical distance. This variable should be included among the control ones to improve the accuracy of the analysis and verify the robustness of the results. Finally, considering the fact that VC funds are typically specialized in investments on one (or few) industry (e.g. Fintech, Medtech), it might have sense to look at the domestic saturation of the specific industry on which each VC focuses its activities, rather than at the saturation of the domestic VC market as a whole. Given the absence of the information on the investment scope of the VC firms, and the already significant level of complexity of the model, the analysis was not conducted at this granularity level, but this represents a concrete avenue for future research.

The work paves the way for interesting future research the literature can focus on. The authors identified an almost unexplored research perspective within the cross-border VC activity determinants stream: the *home institutions perspective*. Starting from the evidence obtained in this work, it would be interesting to analyse the impact on cross-border investments likelihood of other contextual conditions of the VC investors' domestic country, and understand whether, as in the case of saturation, they result to have a different relevance for the different investor types. Focusing specifically on the topic investigated by this thesis, future research might replicate the study looking at the monetary flows from the home to the foreign countries, rather than at the number of international investments undertaken, as it may be even more informative on the size of the observed activities. Another interesting avenue could be studying the *domestic VC market saturation* impact adopting the *home-host institutions perspective*, to understand whether investment flows go from more saturated countries to less saturated countries. Additionally, it would be significant to test the impact of domestic saturation on BVCs likelihood to invest abroad as well, since they were excluded from the analysis. Finally, the insightful findings obtained

about *captive* VCs' behaviour could be deepened by more specific future research. In particular, for CVCs, since in their activity strategic and financial goals coexist (even though the formers are prevalent in most of the cases), it would be worth to discriminate the funds with a stronger strategic orientation from those with a more financial one, to understand whether the latters show patterns relative to saturation that are more similar to IVCs' ones; for GVCs, research may try to verify whether, in case of rising saturation level, they increase their willingness to invest to counterbalance the shift of attention of the private investors from the domestic to foreign markets.

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DATA SOURCES

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ANNEXES

Annex A: Cross-border investments per investor type, in the whole VICO dataset.

Cross-border investments per investor type, in the whole VICO			
		Domestic	*Cross-border*
BA	*Frequency*	2,965	702
	Percentage	89.86%	19.14%
BVC	*Frequency*	3,309	1,196
	Percentage	73.45%	26.55%
CVC	*Frequency*	4,236	3,317
	Percentage	56.08%	43.92%
GVC	*Frequency*	6,685	661
	Percentage	91.00%	9.00%
IVC	*Frequency*	34,884	18,770
	Percentage	65.02%	34.98%
UVC	*Frequency*	926	65
	Percentage	93.44%	6.56%
Crowdfunding	*Frequency*	5	0
	Percentage	100.00%	0.00%
Other	*Frequency*	1,603	656
	Percentage	70.96%	29.04%

Annex B: Breakdown of the investments received by startups of a country, to understand whether they come from within national borders or from outside.

Breakdown of investments received by startups, in the whole VICO			
		Domestic	*Cross-border*
Austria	*Frequency*	544	465
	Percentage	53.91%	46.09%
Belgium	*Frequency*	1,273	591
	Percentage	68.29%	31.71%
Bulgaria	*Frequency*	103	239
	Percentage	30.12%	69.88%
Croatia	*Frequency*	22	55
	Percentage	28.57%	71.43%
Cyprus	*Frequency*	7	107
	Percentage	6.14%	93.86%
Czech Republic	*Frequency*	150	129
	Percentage	53.76%	46.24%
Denmark	*Frequency*	1,295	717
	Percentage	64.36%	35.64%
Estonia	*Frequency*	154	129
	Percentage	54.42%	45.58%
Finland	*Frequency*	2,056	800
	Percentage	71.99%	28.01%
France	*Frequency*	12,105	2,460
	Percentage	83.11%	1689%
Germany	*Frequency*	7,232	3,452
	Percentage	67.69%	32.31%
Greece	*Frequency*	126	30
	Percentage	80.77%	19.23%
Hungary	*Frequency*	520	113
	Percentage	82.15%	17.85%
Ireland	*Frequency*	1,322	1,070
	Percentage	55.27%	44.73%
Israel	*Frequency*	2,936	3,324
	Percentage	46.90%	53.10%
Italy	*Frequency*	1,433	436
	Percentage	76.67%	23.33%
Latvia	*Frequency*	89	126
	Percentage	41.40%	58.60%
Lithuania	*Frequency*	98	92
	Percentage	51.58%	48.42%

Annex B: continues.

Breakdown of investments received by startups, in the whole VICO			
		Domestic	*Cross-border*
Luxembourg	*Frequency*	31	142
	Percentage	17.92%	82.08%
Malta	*Frequency*	1	49
	Percentage	2.00%	98.00%
Netherlands	*Frequency*	1,817	1,051
	Percentage	63.35%	36.65%
Poland	*Frequency*	808	248
	Percentage	76.52%	23.48%
Portugal	*Frequency*	700	147
	Percentage	82.64%	17.36%
Romania	*Frequency*	61	117
	Percentage	34.27%	65.73%
Slovakia	*Frequency*	46	70
	Percentage	39.66%	60.34%
Slovenia	*Frequency*	14	38
	Percentage	26.92%	73.08%
Spain	*Frequency*	3,173	976
	Percentage	76.48%	23.52%
Sweden	*Frequency*	3,192	1,481
	Percentage	68.31%	31.69%
United Kingdom	*Frequency*	14,149	7,033
	Percentage	66.80%	33.20%

Annex C: Breakdown of the investments performed by the VCs of a country, to understand whether they are addressed to local or foreign ventures.

Breakdown of investments performed by investors of a country, in the whole VICO			
		Domestic	*CB*
Austria	*Frequency*	544	239
	Percentage	69.48%	30.52%
Belgium	*Frequency*	1,273	595
	Percentage	68.15%	31.85%
Bulgaria	*Frequency*	103	38
	Percentage	73.05%	26.95%
Croatia	*Frequency*	22	0
	Percentage	100.00%	0.00%
Cyprus	*Frequency*	7	20
	Percentage	25.93%	74.07%
Czech Republic	*Frequency*	150	114
	Percentage	56.82%	43.18%
Denmark	*Frequency*	1,295	493
	Percentage	72.43%	27.57%
Estonia	*Frequency*	154	134
	Percentage	53.47%	46.53%
Finland	*Frequency*	2,056	363
	Percentage	84.99%	15.01%
France	*Frequency*	12,105	1,316
	Percentage	90.19%	9.81%
Germany	*Frequency*	7,232	1,432
	Percentage	83.47%	16.53%
Greece	*Frequency*	126	52
	Percentage	70.79%	29.21%
Hungary	*Frequency*	520	46
	Percentage	91.87%	8.13%
Ireland	*Frequency*	1,322	333
	Percentage	79.88%	20.12%
Israel	*Frequency*	2,936	190
	Percentage	93.92%	6.08%
Italy	*Frequency*	1,433	246
	Percentage	85.35%	14.65%
Latvia	*Frequency*	89	26
	Percentage	77.39%	22.61%
Lithuania	*Frequency*	98	28
	Percentage	77.78%	22.22%

Annex C: continues.

Breakdown of investments performed by investors of a country, in the whole VICO			
		Domestic	*CB*
Luxembourg	*Frequency*	31	423
	Percentage	6.83%	93.17%
Malta	*Frequency*	1	17
	Percentage	5.56%	94.44%
Netherlands	*Frequency*	1,817	1,098
	Percentage	62.33%	37.67%
Poland	*Frequency*	808	155
	Percentage	83.90%	16.10%
Portugal	*Frequency*	700	79
	Percentage	89.86%	10.14%
Romania	*Frequency*	61	6
	Percentage	91.04%	8.96%
Slovakia	*Frequency*	46	14
	Percentage	76.67%	23.33%
Slovenia	*Frequency*	14	7
	Percentage	66.67%	33.33%
Spain	*Frequency*	3,173	258
	Percentage	92.48%	7.52%
Sweden	*Frequency*	3,192	511
	Percentage	86.20%	13.80%
United Kingdom	*Frequency*	14,149	3,368
	Percentage	80.77%	19.23%

Annex D: Breakdown of investments performed by investors of a country, in the restricted sample of 16,869 deals.

Breakdown of investments performed by investors of a country, in the restricted sample			
	Domestic	*Cross-border*	*Ratio (Cross-border/Domestic)*
Austria	107	81	76%
Belgium	306	129	42%
Bulgaria	17	12	71%
Croatia	5	0	0%
Cyprus	0	3	-
Czech Republic	30	33	110%
Denmark	289	130	45%
Estonia	46	42	91%
Finland	462	54	12%
France	2,989	381	13%
Germany	2,458	366	15%
Greece	6	18	300%
Hungary	115	10	9%
Ireland	229	40	17%
Israel	594	34	6%
Italy	348	58	17%
Latvia	38	7	18%
Lithuania	14	8	57%
Luxembourg	5	133	2660%
Malta	1	1	100%
Netherlands	488	275	56%
Poland	231	43	19%
Portugal	123	11	9%
Romania	5	0	0%
Slovakia	18	3	17%
Slovenia	5	2	40%
Spain	731	70	10%
Sweden	589	140	24%
United Kingdom	3,829	707	18%

Annex E: Cross-border versus domestic investments per NACE category, in the restricted sample of 16,869 deals.

Cross-border versus domestic investments per NACE category, in the restricted sample			
	Domestic	*Cross-border*	*Cross-border/Total investments (%)*
A	26	4	13,33%
B	14	0	0,00%
C	1857	313	14,42%
D	86	13	13,13%
E	46	2	4,17%
F	96	12	11,11%
G	1143	212	15,65%
H	117	22	15,83%
I	99	14	12,39%
J	5583	1207	17,78%
K	467	142	23,32%
L	83	20	19,42%
M	3173	569	15,21%
N	721	159	18,07%
O	5	1	16,67%
P	82	11	11,83%
Q	198	38	16,10%
R	82	12	12,77%
S	199	39	16,39%
T	1	0	0,00%
U	0	1	100,00%

A. Agriculture, Forestry and Fishing
B. Mining and Quarrying
C. Manufacturing
D. Electricity, Gas, Steam and Air Conditioning Supply
E. Water Supply; Sewerage, Waste Management and Remediation Activities
F. Construction
G. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
H. Transportation and Storage
I. Accommodation and Food Service Activities
J. Information and Communication
K. Financial and Insurance Activities
L. Real Estate Activities
M. Professional, Scientific and Technical Activities
N. Administrative and Support Service Activities
O. Public Administration and Defence; Compulsory Social Security
P. Education
Q. Human Health and Social Work Activities
R. Arts, Entertainment and Recreation
S. Other Service Activities
T. Activities of Households as Employers; Undifferentiated Goods and Services Producing Activities of Households for Own Use
U. Activities of Extraterritorial Organisations and Bodies

Annex F: WGI index categories description (Source: World Bank).

WGI index categories	
Voice and Accountability	Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
Political Stability and Absence of Violence/Terrorism	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.
Government Effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Regulatory Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
Rule of Law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.