

VENTURE CAPITAL IN EUROPE: SOCIAL CAPITAL, FORMAL INSTITUTIONS AND MEDIATION EFFECTS

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ABSTRACT

Venture Capital (VC) as an industry exists for more than 50 years. While VC has flourished in the United States, it has only moderately developed in other geographical areas, despite numerous trials of governments to foster it. Vast research endeavors have been carried out to understand the antecedents, barriers and facilitators of the industry, and the variations of degree of development and performance across different geographical regions. However, the focus has been rather limited and accounted almost exclusively for formal features of institutional environments, leaving the informal dimensions unexplored. This paper tries to close that gap, and by drawing on the institutional theory, posits that informal institutions may represent relevant determinants of VC activity. On the basis of longitudinal country-level data on 18 European countries, we first explore if the “usual suspects” mostly embodied in *changeable formal institutions* (investors protection laws, taxation regulations, labour market regulations) do really play a role in the European context. Besides, we investigate whether or not these drivers are exhaustive determinants of VC activity, or conversely, if also informal institutions, and in particular social capital, may exert a prominent effect. In this respect, we found that the impact of social capital on VC activity is mainly indirect, by shaping the formation of *structural formal institutions*, which in turn affect VC activity. These findings are intended to contribute to the literature on venture capital and to inform European policy makers on the most promising channels for creating a prosperous institutional environment for VC in the short and long terms.

Keywords:

Venture capital, institutional theory, formal institutions, informal institutions, social capital, mediation effect

Acknowledgements:

The authors gratefully acknowledge the financial support of the European Union’s Horizon 2020 research and innovation programme under grant agreement No 649378 (FIRES project). They would also like to extend their thanks to the consortium of the FIRES project for their valuable comments and suggestions which have improved the quality of this paper. Nevertheless, this paper reflects only the author’s view and the Agency is not responsible for any use that may be made of the information it contains.

1. INTRODUCTION

Entrepreneurship has been documented to contribute to the real economy (Audretsch 1995; Audretsch and Keilbach 2007), as new ventures are considered to be an engine of both the static and the dynamic efficiency of economic systems (e.g. Kirzner 1997; Schumpeter 1934). One of the critical aspects of entrepreneurial success is access to financial resources. However, startups (particularly the high-tech ones) are capital constrained as they lack a track record of past success (and hence reputation and credibility), they often do not have tangible resources to use as collateral, and they typically face the so-called “Valley of Death” (Ghosh and Nanda 2010; Murphy and Edwards 2003). The information asymmetry and uncertainty tightly coupled with entrepreneurship represent extensive barriers for debt providers, which has led to the establishment of specialized financial intermediaries called Venture Capital (VC) firms, more capable to overcome the hurdles and more prone to provide these inherently risky investments (B. H. Hall and Lerner 2010).

Despite the proven importance of VC, there have been evident spatial variations in VC activity across the World (Groh et al. 2010; Jeng and Wells 2000). The differences are stark even among developed countries. For instance, the United States (U.S.) is the pioneer and the leader by far, and only a handful of other countries such as the United Kingdom or Sweden have strong VC markets. On the contrary, continental European countries have shown relatively little activity (e.g. France, Italy, Spain), or even close to none (Greece, Poland, Czech Republic, Romania). Developing countries are typically even more laggard in the development of VC markets. This significant variation has been primarily explained by the differences in the stock market conditions, specific regulations (labour and tax laws, investors and intellectual property protection, etc.), or other individual features of the environment where the VC takes place (e.g. Black and Gilson 1998; Jeng and Wells 2000). That is, most of the studies have devoted major attention to macroeconomic conditions or an array of regulations. Nevertheless, general economic literature has criticized this one-dimensional approach, as it has been shown that both formal and informal institutional characteristics of a country matter for economic activities (North 1990; Peng et al. 2009). As

a matter of fact, both types of institutions have already been shown to impact entrepreneurship (e.g. Stenholm et al. 2013) and innovation activities (e.g. Shane 1993). Hence, they seem to be important to account for when studying VC activity across different geographical areas—a perspective that has been overlooked by the extant literature (Zacharakis et al. 2007).

In this respect, we complement the recent work of Li and Zahra (2012), who empirically test the determinants of VC activities across countries by deploying an institutional perspective, which comprises the two broad components of institutions, coherent with the work of North (1990) on institutional theory. In that case authors test the impact of the formal component that covers “a set of political, economic and contractual rules that influence individual behavior and shape human interactions” (Li and Zahra 2012, page 96), as well as two informal institutional features of the countries, i.e. uncertainty avoidance and the level of collectivism characterizing different national communities. Similarly to Li and Zahra (2012), we also rely on the institutional theory to examine the impact of formal and informal institutions on VC activity, as well as study how both institutional dimensions interact in terms of their impact on VC activity.

In doing so, we aim at making several steps forward from the existing literature. First, we investigate in more depth the role of informal institutions as a significant source of the differences in VC activity levels across geographical areas, by focusing on social capital theory to explain the mechanisms through which the informal institutions manifest their effect (Putnam 1993). The literature already emphasized the relevance of social capital for entrepreneurship and innovation (Brüderl and Preisendörfer 1998; Dakhli and De Clercq 2004), while only a few authors have focused on the impact they have on VC activity (see the work of Hain et al. 2016 on the determinants of cross-border VC investments). We account for the fundamental building blocks of the social capital – networks, trust and civic norms (Pollitt 2002; Putnam 1993), and rely on the argument of the institutional theory that social capital determines the range and the sorts of available entrepreneurial opportunities and empowers their exploitation through facilitation of resources and capabilities (Gedajlovic et al. 2013). Particularly, social capital facilitates coordination

activities in a society and impact transaction costs and information asymmetries, two of the key market features for VC activity (Petersen and Rajan 1995). Social capital (i.e. “weak” ties mainly) enables novel information flows to individuals through their networks (Granovetter 2005; Wu 2008). By putting the impact of social capital on VC activity to test, we try to extend the literature on entrepreneurship (e.g. George and Zahra 2002), and in particular, some still not conclusive evidence in the literature on VC related to its institutional determinants (Aggarwal and Goodell 2014; Antonczyk and Salzman 2012; Cumming et al. 2016; Hain et al. 2016; Li and Zahra 2012).

Second, instead of including only general formal components aggregated in an index of formal institutions as done by Li and Zahra (2012), we additionally include in the model formal regulations which the literature considers most relevant for the VC industry (see the recent review of Grilli et al. 2017). In particular, we include measures of three of the key regulations for VC activity – rigidity of labour regulations, capital gain taxations and minority investor protection regulations. This addition is important not only for the sake of completeness of the model but also for the fact that the added regulatory instruments are controllable to a greater degree, at least in the short term, by the policy makers. In fact, the former group of general components comprises only the features that are harder to change in the short and medium term and usually exhibit important path dependence dynamics (Kingston and Caballero 2009; North 2005; Williamson 2000), such as the governmental effectiveness, political stability or the rule of law. While these structural aspects are of great importance, the additional measures integrate the regulations that may be relatively easy to implement, such as taxation regulations, ease of starting and doing business, investors and shareholders protection rights, which is considerably more informative for policy makers.

Third, we examine whether social capital has a dual role as a determinant of VC activity. Namely, as Hume (2000, page 526) argues, formal rules of a society are a result of what is already in “*hearts and minds of its citizens*”. Hence, informal institutions may additionally impact VC activity, as antecedents and foundation of structural formal institutions. We make theoretically founded propositions about how

the impact of social capital on VC could be mediated by formal institutions. In that manner, we hope to contribute to the literature on venture capital, and corroborate the intuition that the impact of informal institutions (i.e. social capital, in this case) is not significant *per se*, but it rather matters for VC activity as a predecessor of formal institutions, which are the ones critical for economic behavior in general (North 1990), as well as for VC activity.

Fourth, we conduct the analysis in the European context, which represents an interesting case due to the great variation in the degree of VC industry development despite active involvement of both European level authorities and national governments. The European context is particularly relevant for investigation as the formal, and most importantly, informal institutions are widely heterogeneous across the continent. Moreover, despite its worldwide relevance in economic and geopolitical terms, and the well-known deficiency in fuelling the birth of high-tech rapid-growth ventures and unicorns (European Commission 2010; Grilli and Murtinu 2014), studies that investigate the institutional determinants of VC activity and, at the same time, explicitly and solely focus on the old continent, are largely absent (Grilli et al. 2017). To this purpose, we collect country-level data from multiples sources on VC activity in Europe, formal and informal institutions as key explanatory variables, and an array of relevant control variables. We focus on the 1997-2015 period for an unbalanced panel dataset of 18 European countries.

The rest of the paper is organized as follows. We first overview the literature on the institutional determinants of venture capital. We cross-breed that with the literature on social capital, and based on those two, we develop a set of theoretical hypotheses. Then, we describe the methodology and data used to test them. We proceed with presenting and discussing the results, and conclude with implications for theory and public policy.

2. THEORETICAL DEVELOPMENT

In this section, we provide a definition of Venture Capital (VC), identify and present the state-of-the-art literature on institutional as well as other determinants of VC activity, and hypothesize about the understudied impact of social capital on it, in combination with formal institutions.

VC, as we consider it nowadays, is a relatively recent “invention” that has emerged in the U.S. following the end of the Second World War. After initial uncertainty and the adoption of different organizational models (see Gompers and Lerner 2001 for a review of the early history), the U.S. VC industry rapidly evolved towards a consolidated organizational model. Based on the sizeable success of the industry in the U.S., and the impact the VC industry had on the technological progress (e.g. Florida and Kenney 1988) and new firm creation and growth (e.g. Samila and Sorenson 2011), this typology of investments has been promptly reputed to represent a key financing ingredient for economic development overall (Gompers and Lerner 2004). This notwithstanding, the VC industry has not diffused as successfully as expected across the world, despite extensive efforts of governments to promote it. Moreover, despite globalization and diffusion of technologies that allow access to remote markets, which could in turn enable venture capitalists to relatively easily invest abroad, venture capital can still very much be considered a local and geographically bounded market (Bruton et al. 2005). This applies to both the U.S. (e.g. Chen et al. 2010; Gompers and Lerner 2004; Sorenson and Stuart 2001) as well as to Europe (e.g. Bertoni et al. 2015; Lutz et al. 2013).¹ Therefore, VC activity, which refers to the volume of successful transactions between equity capital providers (i.e. more precisely, general managers of VC funds) and entrepreneurs seeking for the financial resources, appears to be strongly contingent on the setting within which VC firms operate, similarly to any other economic transaction.

¹ Despite globalization and diffusion of technologies that allow access to remote markets, which in turn enables venture capitalists to relatively easily invest abroad, they still choose to work nationally, or even locally (Bruton et al. 2005). Some VC firms do decide to invest internationally, but the proportion of them is still relatively small. For recent studies on cross-border VC investments, see for instance Bottazzi, Da Rin, and Hellmann (2011), Groh and Liechtenstein (2011), Groh and von Liechtenstein (2011), and Hain et al. (2016).

There have been vast attempts in the literature to understand why VC activity has failed to widely grow in some countries. Most of the studies have tested the usual suspects – formal institutions such as regulations and contractual rules, governmental quality and political conditions of the environment, the structure and development of financial markets and macroeconomic conditions. What most of these studies have, however, missed out to do is to account for the informal group of institutions, which are intangible features embedded in the society (e.g. conventions, codes of conduct, and social norms) and stem from the cultural heritage (North 1990). The general economic literature has shown that both formal and informal institutional characteristics of a country define the “rules of the game” that are met by the economic agents (Peng et al. 2009).² To this extent, both groups of institutions have already been shown to impact entrepreneurship (e.g. Stenholm et al. 2013) and innovation activities (e.g. Shane 1993), and hence they appear to be critical to consider when comprehensively studying VC activity across different geographical areas—an approach that has been fairly neglected by the extant literature on VC (Zacharakis et al. 2007).

Indeed, there have been only few exceptions that did take into account (only to a certain degree) informal institutions in this domain. Aggarwal and Goodell (2014) study 82 countries and find that access to start-up financing is negatively associated with uncertainty avoidance and masculinity of a country. Antonczyk and Salzmann (2012) take a behavioral perspective and show evidence of a negative correlation between both collectivism and uncertainty avoidance, and VC activity. Li and Zahra (2012) find symmetric results and provide additional evidence that these two informal institutions also dampen the positive impact of developed formal institutions. Cumming et al. (2013) confirm the negative impact of uncertainty avoidance on, in their case, Cleantech VC activity. Hain et al. (2016) focus on cross-border VC investments, yet find that another informal institution—trust plays a significant role for VC. Namely, they provide evidence that high levels of relational and institutional trust decrease transaction costs and thus

² The need for considering informal institutions together with formal ones in analyzing the occurrence and the efficiency of economic transactions was already made clear by North (1990, page 35): ‘Thus, it should be readily apparent that to develop a model of institutions, we must explore in depth the structural characteristics of informal constraints, formal rules, and enforcement’.

increase the probability of VC investments by foreign VC funds. However, trust is a key yet only one component of social capital, which is also described through civic norms and social networks (Arrow 1972; Glaeser et al. 2002). Surprisingly, none of the studies comprehensively included these other two important aspects of informal institutions, while social capital as a whole has already been shown to be a prominent determinant of closely related phenomena: entrepreneurial opportunity recognition (e.g. De Carolis and Saporito 2006), entrepreneurial success (Bosma et al. 2004; Brüderl and Preisendörfer 1998), and even access of entrepreneurial ventures to external financial capital, as the amount of time and investment required to gather information, as well as willingness to share the information, are expected to be lower in the case of high social capital (Florin et al. 2003). To that end, social capital is believed to alleviate transaction costs and informal asymmetries, two of the most significant impediments of VC activity that yield adverse selection and moral hazard issues (e.g. Amit et al. 1993; MacIntoch 1994).

While the definition of social capital has not been fully consolidated yet (Wu 2008), it may be widely defined as the capacity of agents to obtain benefits from their social structures (Davidsson and Honig 2003). It thus describes more than a structure or a network. Social capital also embraces social interactions, ties, trust, and value systems that facilitate the activities of individuals located in a particular context (Liao and Welsch 2005; Nahapiet and Ghoshal 1998). Social capital theory is valid on both a micro level, as the ability of single agents such as individuals or organizations to take advantage of their social networks and ties, and on a macro level, as the capacity of communities to leverage the extent to which social exchange takes place (Nahapiet and Ghoshal 1998).

High levels of social capital in a society can be expected to abate information asymmetries, and by that, have a positive influence on VC activity (Davidsson and Honig 2003; Leff 1979). Namely, social capital may assist entrepreneurs by facilitating access to novel and original information (e.g. Aldrich and Zimmer 1986). By that, the prospective entrepreneurs will be able to discover more innovative and promising ideas (Laursen et al. 2012), which have a higher potential of being VC financed. Furthermore, being diversely connected enhances information sharing, which principally improves the adverse selection issue

and matching (Shane and Cable 2002). As proposed by Burt (1992), referrals are more common in communities with highly developed social capital, and they help having “your name mentioned at the right time in the right place” (page 63), which leads to more opportunities. Entrepreneurs and venture capitalists, who do not have to be necessarily members of the same networks, can increase the probability of meeting each other and sharing the right information that will facilitate a match between them. A social system that relies extensively on ties will reduce the time and investment needed to gather the relevant information (Florin et al. 2003).

In a nutshell, social capital is expected to propel information flow (Adler and Kwon 2002; Putnam 2000), and in turn VC activity. Both bridging social capital based on weak ties and bonding social capital based on strong ties should facilitate the information flow and economic transactions (Wu 2008). On the one hand, the weak ties social capital refers to the extent to which the community is relying on social interactions between socially heterogeneous groups (e.g. supporters or members of the same business, sport or book club, non-governmental organization, political party, etc.), and it enables novel and extensive information exchange between individuals through their broader networks (see "the strength of weak ties" argument put forward by Granovetter 1973). The so-called acquaintances, i.e. the individuals who share mutual interests or values but are not engaged in highly intimate relationships, typically bridge to more numerous and more diverse networks, thus enabling access to novel information and resources, i.e. they represent links to a broader world. The strong ties social capital, on the other hand, relies upon strong interpersonal connections between the actors that improve internal trust and increase conformity (Ruef 2002). The high inter-relational trust plays a major role in post-investment process that should lessen moral hazard issues, and alleviate transaction costs. Once a match takes place between VC investor(s) and an entrepreneurial venture, having the society relying on extended networks also creates disciplinary measures to behave ethically. In the latter case, the moral hazard of misbehaving and taking advantage of the investment by the entrepreneurs or VCs (see de Bettignies and Brander 2007 for the ‘double-sided moral hazard’ problem in VC financing) is dampened by the high risk of consequent

negative reputation widely diffusing among the wide networks. Relatedly, individuals in societies with high social capital are more commonly prone to rely on professional relationships, as they trust more their acquaintances (Davidsson and Honig 2003). Moreover, the trust is likewise positively correlated with increased information sharing (Dyer and Chu 2003).

All these reasons related to the positive impact of social capital in reducing informational voids and transaction costs in an economic system lead us to hypothesize the following:

***Hypothesis 1:** More developed social capital leads to more VC activity in a country.*

As previously mentioned, the extant studies have theorized and empirically confirmed the role of formal institutions in VC activity. In particular, entrepreneurial finance literature has examined four broad features of the institutional environment that define formal boundaries for entrepreneurial and financial activities as determinants of VC activity. First, regulations and contractual rules that cover a large range of legislations such as low taxations levels (Bonini and Alkan 2012; Da Rin et al. 2006; Gompers and Lerner 1999; Romain and van Pottelsberghe 2004; Schroeder 2011), advantageous accounting standards (Jeng and Wells 2000), flexible labour market regulations (Félix et al. 2013; Jeng and Wells 2000; Romain and van Pottelsberghe 2004), bankruptcy laws (Armour and Cumming 2006), and investors protection legislations (Aggarwal and Goodell 2014; Bedu and Montalban 2014; Groh and Wallmeroth 2016). Second, governmental quality and political conditions of the environment appear to have a noteworthy influence on VC activity too (Li and Zahra 2012). Among others, the following are found to be relevant: governmental effectiveness, quality of bureaucracy, political stability, rule of law, voice and accountability (Cherif and Gazdar 2009), corruption (Groh and Wallmeroth 2016), and structure of the legal system (Bonini and Alkan 2012). Third, the structure and development of financial market occur as an additional set of relevant determinants of VC, particularly on the supply side. The development level of equity markets such as stock market capitalization (Armour and Cumming 2006; Guler and Guillén 2010), stock market turnover (Schroeder 2011), financial architecture (i.e. ratio of the size of the stock market to the size of banking, see for instance Aggarwal and Goodell 2014), Initial Public Offering (IPO)

rate (Black and Gilson 1998; Bonini and Alkan 2012; Ning et al. 2015) Mergers and Acquisitions (M&A) activity (Groh and Wallmeroth 2016), as well as previous successful VC investments (Chen et al. 2010; Li and Zahra 2012) are found to be important drivers of VC activity. Fourth, macroeconomic conditions are proven to play a relevant part in determining VC activity also, including Gross Domestic Product (GDP) level (Carvell et al. 2013; Félix et al. 2013; Li and Zahra 2012), GDP growth rate and industry production index (Ning et al. 2015), short and long term interest rates (Romain and van Pottelsberghe 2004), trends like financial crisis or early 2000s' Internet bubble (Cumming and MacIntosh 2006; Li and Zahra 2012; Ning et al. 2015; Schertler 2003), and unemployment rate (Groh and Wallmeroth 2016).

What is missing in these studies is a holistic framework that provides a classification of the formal institutions accordingly to the degree to which they can be influenced or modified. Not all formal institutions are the same in this respect. For instance, what is referred to as governmental quality and political conditions is a feature that cannot be directly impacted nor changed (i.e. improved) in the short-term. These characteristics of formal institutions usually exhibit important path dependence dynamics, and require decades, if not even centuries, to be altered (Kingston and Caballero 2009; North 1990, 2005; Williamson 2000). They are rather structural in their nature. Moreover, their improvement would clearly benefit a much wider scope of economic activities that date back much further than VC, yet some countries are still considerably laggard in their development. On the positive note, there are formal institutions that are indeed changeable in the short-term too. Mainly, these are legislation and regulations (taxation regulations, administrative procedures for starting a new business, investors and shareholders protection rights, etc.) put in place by governmental bodies, and they can be modified and enforced virtually instantaneously (North 1990, perhaps too optimistically, literally sustains 'overnight', page 6). In turn, understanding their impact on VC activity separately from the other formal institutions appears to be critical for drawing useful implications for policy makers, whose goals are to spur high-potential entrepreneurs (Levie et al. 2014). Therefore, we make a distinction between formal institutions that are

changeable and the structural ones that are not easy to impact, at least not in the short term, and posit the following two related hypotheses:

Hypothesis 2a: *More developed structural formal institutions lead to more VC activity in a country.*

Hypothesis 2b: *More developed changeable formal institutions lead to more VC activity in a country.*

Apart from formal and informal institutions having the direct effects on VC activity, it is reasonable to ponder the mutual relationship of the former two in relation to the VC activity. To shed more light on that issue, it is worthwhile to explore more complex theoretical models using mediators, as suggested by Dubin (1978) and Sutton and Staw (1995). In particular, following the mainstream literature on the determinants of VC activity, we posit that social capital impacts VC activity through formal institutions. Grounding on the evidence put forward by Djankov et al. (2003) that long lasting social capital structures have been able to explain institution's design and performance, we can expect that *structural formal institutions* are the product of social capital structures (Arrow 1972; Glaeser et al. 2002). North (1989) suggests that the transaction costs related to monitoring and enforcement increase in the absence of social networks, but can be replaced and/or complemented by formal organizations and institutions (see also North 1990, page 47). Moreover, there is empirical evidence that there is a substitution effect between social capital and other institutions (e.g. Guiso et al. 2004). While formal institutions may not fully solve the transaction costs and information asymmetries, they may create an appropriate incentive structure for VC activity that can offset the adverse selection and moral hazard issues (e.g. Sahlman 1990). That is, once the *structural formal institutions* are present and strong, they are sufficient to elevate the information asymmetries and substitute the role of social capital. Furthermore, social capital is argued to be an antecedent of *structural formal institutions*. While being only one of many determinants, social capital has historically shown to be paramount for *structural formal institutions*' development, due to the path dependence and slow change in the structural institutions. On the contrary, social capital should not, by

definition, be expected to significantly impact *changeable formal institutions*, which can be reformed virtually at (political) will. Moreover, there should be no reverse causality between social capital and *structural formal institutions* in the short-term, as social capital has been proven to be even more consistent over time (e.g. Becker et al. 2016; Grosjean 2011; Putnam 1993).³ Hence, we hypothesize the following:

Hypothesis 3: The relationship between social capital and venture capital activity is mediated by structural formal institutions.

Figure 1 summarizes the proposed conceptual framework.

<< Figure 1 around here >>

3. DATA AND METHODOLOGY

Our analysis is based on a longitudinal European cross-country dataset composed of information from multiple secondary sources. We focus on the 1997-2015 period, so that we can compare VC activity over a period that covers the years during which VC became “institutionalized” and gained significance in Europe (Da Rin et al. 2006; Li and Zahra 2012). Overall, we have an unbalanced panel dataset of 18 European countries that are extensively heterogeneous in financial market conditions, economic development, and technological opportunities, as well as in the levels of informal institutions development.⁴ For example, looking at one of the most important exit mechanisms for VC investors – Mergers & Acquisitions (M&As), this activity was on average high in volume in Ireland and UK in the period under consideration (around 15 per cent of GDP), medium in Spain, France and Italy (around 7 per

³ Multiple studies, such as Guiso et al.'s (2008) and Putnam's (1993) works on the Northern and Southern Italy, have shown that social capital is path dependent and that it has barely changed over centuries across a range of regions. And also the circumstance that informal institutions may rapidly evolve in response to changes in formal institutions is unlikely to occur. Again North (1990) was amongst the firsts to make this point (p. 45): ‘Equally important is the fact the informal constraints that are culturally derived will not change immediately in reaction to changes in the formal rules.’

⁴ The countries included in the study are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

cent), and relatively low in Austria (around 4 per cent) and Czech Republic (around 2 per cent). Or considering private R&D spending, that is generally high in Finland and Sweden (more than two per cent of GDP), at a relatively medium level in Ireland and the Netherlands (one per cent), and low in Italy and Portugal (less than 0.5 per cent). Even more importantly, the European context is an attractive test bed due to the significant variation in the degree of VC industry development. Only a few countries have managed to cultivate a vibrant VC industry to date. For instance, VC investments in Sweden and the United Kingdom have reached more than six per cent of GDP on average. The rest of the countries, and in particular in the Southern Europe (Italy, Portugal, Spain, Greece) have mostly failed to spark the VC activity, with barely one per cent of GDP invested in VC.⁵

3.1. Variables

3.1.1. Dependent variables

The dependent variable (*VC activity*) is sourced from the Invest Europe (former European Venture Capital Association), whose yearbooks are compiled from an elaborate yearly survey of member and non-member VC firms.⁶ The variable is constructed as an aggregate amount of total investments in companies headquartered in the country in a given year, as reported in the Invest Europe yearbooks. The variable includes the following three groups of investments: seed, start-up and expansion,⁷ and in the further analyses, we additionally estimate the model with each of the investment categories separately, for the sake of understanding better the VC activity dynamics, and for robustness of our results. We normalized the aggregate amount of VC investments per GDP (collected from the World Bank database) to facilitate

⁵ See the descriptive statistics below for a more detailed overview of VC activity across the sampled countries.

⁶ For a detailed overview of the methodology used for the creation of the database refer to the official website of Invest Europe (<http://www.investeurope.eu/>).

⁷ We exclude the replacement capital and buyouts from the analysis and focus only on the narrow definition of Venture Capital (Jeng and Wells 2000), in order to avoid mixing VC activity with total Private Equity (PE) activity.

a valid comparison among the countries of various size classes, as the majority of related works do too (e.g. Da Rin et al. 2006; Li and Zahra 2012).⁸

3.1.2. Explanatory variables

As for the explanatory variables, information on social capital was collected from the European Values Survey (EVS), which represents the most comprehensive research project on human values in Europe. EVS is a large-scale, cross-national, and longitudinal survey research program on how Europeans think about family, work, religion, politics and society. As the survey has been periodically carried out (every nine years), but on a varying sample of countries in each of the iterations, and given the fact that this type of indicators are fairly inert and require decades or even centuries to evolve (see *supra*), they have been considered constant over the examined period. In particular, an index (*Social Capital*) has been created based on an array of available indicators: (1) active membership in a range of organizations and associations (political, professional, religious and leisure related) proxying the extent of social networks development in a society; (2) degree to which the people can be trusted as a measure of trust within the society; and (3) voluntary activity for various causes (similar to the associations related to membership) accounting for the civic norms in a society. Factorization grounded on the principal component analysis was carried out to generate the index, with Cronbach's alpha of the constructed index equal to 0.678.

The variable approximating the level of development of *structural formal institutions (FI Index)* is also built using factorization (again based on the principal component analysis, with Cronbach's alpha of 0.956) of indicators related to the general institutional characteristics of a country, as well as the institutional dimensions that are key to entrepreneurial and VC activity. Analogously to Li and Zahra (2012), this group of indicators is sourced from the widely used World Bank's Worldwide Governance

⁸ Using an alternative normalization, i.e. VC investments amount per capita does not essentially change the obtained results.

Indicators and include measures of *Political Stability, Government Effectiveness, Voice and Accountability, Regulatory Quality, Rule of Law* and *Control of Corruption*.⁹

Equally important, we include as explanatory variables also the measures of legislations that more specifically define the formal boundaries for entrepreneurial and financial activities (Antonczyk and Salzman 2012; Jeng and Wells 2000) and that are (in principle) modifiable in the short-run by policy makers (Coenen et al. 2008; Nickell and Layard 1999). We refer to these as *changeable formal institutions*. In particular, we employ three variables sourced from the World Bank database. First, we use the strictness of *Employment protection* legislations, which has been previously found to be a significant driver of VC activity (Félix et al. 2013; Jeng and Wells 2000), especially on the demand-side as rigid employment regulations can act as a barrier to entrepreneurship by increasing the cost of human capital (Fonseca et al. 2001; Lerner and Tåg 2013). Second, we include the levels of capital gains and other-related taxes that are found to influence the incentive system for VC in the variable *Taxations* (Da Rin et al. 2006; Gompers and Lerner 1999). As explained by Poterba (1989), the argument for the importance of taxations for VC activity are the facts that high taxes could decrease incentives for both the supply of venture capital funds (investors' payoff will be decreased) and the demand for VC investments (new venture founders will also be penalized for potential extra-profits). Third, we add to the model a measure of *Investor Protection* rights accounting for the strength of minority shareholder protections against misuse of corporate assets by directors. The protection of investors is intended to prevent opportunistic

⁹ From the World Bank website source: “*Voice and Accountability* captures 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* captures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism; *Government Effectiveness* captures 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* captures 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* captures 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* captures 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.” For further methodological details on how indicators are built see Kaufmann et al. (2011).

behavior by the entrepreneurs following the investment, and by that induce the supply of VC (Bedu and Montalban 2014; Cumming et al. 2016).

3.1.3. Control variables

The control variables are collected from a broad list of secondary data sources. First, we include in the model a set of measures to account for the level of development of financial markets, as a relevant determinant of VC activity, particularly on the supply side, according to an array of empirical studies (e.g. Black and Gilson 1998; Bonini and Alkan 2012; Guler and Guillén 2010; Ning et al. 2015). The more the equity markets are developed, the more the incentive for institutional investors and VCs to invest. We include the volume of Initial Public Offerings (*IPO volume*) and Mergers & Acquisitions (*M&A Volume*), both as percentages of total GDP in a given year. We source them from the Bureau van Dijk's Zephyr database and World Bank database. Furthermore, we control for macroeconomic conditions that are proven to have a relevant part in determining VC activity; *GDP growth* and *Inflation* rates (Ning et al. 2015) sourced from the World Bank database, business enterprise expenditure on R&D as a percentage of GDP (*Technological Opportunity*) as a proxy of innovative potential of a country in a given year sourced from the OECD, trends such as *Financial crisis* and *Internet bubble* (Cumming and MacIntosh 2006; Li and Zahra 2012; Ning et al. 2015; Schertler 2003), as well as legal system structure as divided by (La Porta et al. 1998) in four categories: *Common*, *French*, *German* and *Scandinavian* (Bonini and Alkan 2012; Hain et al. 2016; Leleux and Surlemont 2003).

The full list of variables including also the used control variables is presented in Table 1, while their correlation is shown in Table 2. Summary statistics on the key variable of interest, VC activity, is presented in Table 3.

<< Tables 1, 2 and 3 around here >>

3.2. Methodology

Our baseline estimation model is random effects generalized least squares (GLS), which allows the variances to differ across countries, while it controls for unobservable country characteristics. The random effects GLS model also permits inclusion of time-invariant variables in our estimation, such as legal system structure and informal institutions. In order to test the hypotheses 1, 2a and 2b we include the direct effects of the key explanatory variables, step by step. We first estimate a model with the social capital variables (*Social Capital*) as an explanatory one (Model 1). Second, we run a model with a measure of structural formal institutions (*FI Index*) in Model 2, as well as add the three *changeable formal institutions* (*Employment protection, Taxations, Investor Protections*) in Model 3. In order to test the mediation effect and hypothesis 3, we closely follow the instructions provided by Baron and Kenny (1986). We use Model 1 as the first step of the recommended procedure, which should support the hypothesis that social capital does have an effect on VC activity. Second, and as a middle step necessary to establish a mediation effect, we test whether the social capital variable (*Social Capital*) is also a determinant of the level of development of *structural formal institutions*, and we use the same model specification with *FI Index* as the dependent variable (Model 4). Third, we estimate the original model, with *VC activity* as the dependent variable, in which both social capital variable (*Social Capital*) and the potential mediator (*FI Index*) are included, in order to test if the effect of the former disappears once the latter is added to the model (Model 5). Finally, we estimate the full specification of the model with all the variables included (Model 6).

4. RESULTS AND DISCUSSION

The main results are presented in Table 4. The estimates of Model 1 suggest confirmation of *hypothesis 1*. Namely, social capital yields to be a significant determinant of VC activity. These findings are in line with those put forward by Bottazzi et al. (2016), who prove that trust is a critical feature of the environment for investments in general and for VC in particular, and Hain et al. (2016) who show how

countries with high levels of trust attract more cross-border VC investments. We complement this view by providing evidence that not only trust but also the other features of social capital (social networks and civic norms) facilitate VC transactions.

Based on further analysis, *structural formal institutions* are found to have a significant positive impact on VC activity too (see Model 2), in line with *hypothesis 2a* and corroborate the findings of Li and Zahra (2012), by verifying them also when one looks at the sole European context. On the contrary, *hypothesis 2b* is only partially confirmed. Out of the three *changeable formal institutions* added in Model 3, only the level of taxations appears to be a significant determinant of VC activity in our sample. High tax rates negatively influence VC activity in Europe and represent a major obstacle for the development of the VC industry. This result confirms the findings of Da Rin et al. (2006) and Schroeder (2011) on similar samples of European countries. The result is not only significant in statistical but also economic terms. For instance, based on our estimates, *ceteris paribus*, decreasing the total taxation level from 50 to 40 per cent would lead a country to a stable 10.11 per cent more of VC activity in 15 years. Nevertheless, it is worth noting that the effect of the taxation level change is relatively lower than what would be the effect of changing the *structural formal institutions*. If the *structural formal institutions* were improved to the same degree as the taxation level in the example above (from 37th to 71st percentile in our sample), the VC surge after 5 years would be 8.96 per cent; after 10 years 18.72 per cent; and after 15 years 29.36 per cent. While the impact of the *structural formal institutions* on VC activity is, in principle, greater than the one exerted by the overall taxation level, changing the former is by far more demanding and uncertain than the latter. Furthermore, we do not find clear support for *hypothesis 2b* related to the other two measures of regulations. Unlike the majority of the existing studies (e.g. Bonini and Alkan 2012; Jeng and Wells 2000), though we also find an adverse effect of the rigidity of labour regulations on VC activity, they yield to be non-significant. Bedu and Montalban (2014) reach the same conclusion, even though they focus on leveraged buyouts and not narrowly defined VC investments. Similarly, the coefficient of the strength of minority investors protection is positive and non-significant in our analysis, coherent with the

results of Cumming et al. (2016) and Jeng and Wells (2000). While these two policies seem to push the VC activity in the right direction, they do not appear to be capable of providing a strong effect.

Finally, based on the estimations of Models 4-6, the relationship between social capital and VC activity appears to be mediated by *structural formal institutions*, as *hypothesis 3* predicts. Social capital is a significant driver of *structural formal institutions* (Model 4), which is the necessary condition for the mediation to hold (Baron and Kenny 1986). Then, when both the variables related to social capital and *structural formal institutions* are included in the same model (Models 5), the significance of the direct effect of social capital disappears. The same result holds when the *changeable formal institutions* are introduced (Model 6), speaking in favor of the robustness of the model. This finding, in fact, provides a mechanism through which social capital impacts VC – social capital *per se* is not crucial for the volume of VC investment, but the fact that it determines the level of development of *structural formal institutions* makes it relevant as an indirect driver of VC activity. This finding represents another original contribution of this work and highlights that even if social capital is ‘in the back seat’, its role cannot be neglected when VC activity is studied.

The results related to the control variables also provide interesting insights. We confirm the empirical findings of the previous studies that exit markets play a significant role for VC activity (e.g. Bonini and Alkan 2012; Guler and Guillén 2010; Ning et al. 2015). In particular, similarly to Félix et al. (2013), we find that rich M&A markets represent a substantial driver in Europe, where start-ups typically get acquired and IPO markets are not as vibrant. The results also confirm that the exogenous worldwide trends play a major role. The Internet bubble has brought more VC activity across the old continent, while the latest financial crisis has hindered the industry. Additionally, we find that GDP growth is positively correlated with VC activity, in line with the extant literature (e.g. Gompers and Lerner 1999; Ning et al. 2015). The surprising result is found for technological opportunities, as unlike the existing studies, we find a negative correlation with VC activity. The negative relationship could also depend on the particular measure we use, i.e. the volume of private R&D investments (analogously to many others in the field, e.g.

Da Rin et al. 2006; Félix et al. 2013; Groh and Wallmeroth 2016). Namely, the more capital private companies invest in R&D, the less they might rely on start-ups as a source of technological innovation and they might have less money available for acquisitions, which is one of the key exit mechanisms for start-up. That, in turn, could result in less (innovative) new firms and hence decrease the demand for VC, but also the supply of VC funds (if the investors have fewer opportunities to exit and cash out on their investments).

<< Table 4 around here >>

4.1. Robustness analysis

We run several robustness analyses to corroborate the findings. First, we deploy Structural Equation Modeling (SEM) technique, which should offer a reliable alternative method for estimating mediation effect. SEM allows for relatively easier interpretation and estimation of mediation hypotheses because it can yield results based on longitudinal data in a single step of analysis (MacKinnon 2008). We estimate the full model with social capital, structural and changeable formal institutions variables, as well as all controls. The results presented in Table 5 (Models 7a and 7b) are almost completely coherent with the mainline analysis. Social capital's impact on VC activity is fully mediated by *structural formal institutions*, while high taxation levels impact VC activity negatively. In this case, the minority investor protection yields to be not only a positive driver of VC like in the baseline analysis, but also a significant one.

Furthermore, as our primary dependent variable is highly correlated through time, we use a dynamic panel data estimator to additional corroborate the findings. We opt for system generalized method of moments (GMM-SYS) approach given that some of our independent variables are time-invariant. The results of this additional robustness check, which are presented also in Table 5 (Model 8), are virtually the same as the results of the main analysis.

<< Table 5 around here >>

4.2. Additional evidence

Then, in order to provide additional insights into the dynamics of VC industry, we repeat the main analysis (full model) for three subgroups of VC – investments in start-up and expansion phase of new ventures.¹⁰ The results presented in Table 5 (Models 9-10) are coherent with the results of the estimates with the aggregate measure of VC activity. However, there are a few differences worth remarking. First, neither the fiscal policy nor inflation rate appear to have an impact on the VC investments in the start-up stage, while the Scandinavian legal system seems to be favorable for these early stage investments (see Models 9a and 9b). As for the VC investments in the expansion stage, the most notable difference is that the coefficient of the social capital variable seems to lose significance level in Model 10a. That is, the direct effect of social capital on the VC investment in the expansion stage is not as significant. This could be possibly explained by the fact that later stage investments are done between professional and mature ventures with a track record of success and more tangible assets, meaning the information asymmetries are not as severe as in the initial rounds of funding and strong country-level social capital does not add much of value to it. Another interesting difference is that minority investor protection regulation appears to be a significant factor (see Model 10b). The later stage investments require higher capital commitment leading to higher risk, and investor protection regulation could be an effective formal mechanism to abate some portion of that hazard.

Finally, in unreported regressions (available upon request), we also analyzed further and deeper the role of social capital. Specifically, we searched for the possible presence of significant moderating and super-additive effects on VC activity arising between this construct and the *structural* and *changeable formal institutions*. No relevant interaction terms were found, suggesting interestingly that the impact of social capital on VC flows not only exclusively but also rather uniformly through *structural formal institutions*. Then, we also decomposed *Social Capital* into its three underlying constructs (proxying the extent of

¹⁰ We do not provide analysis regarding VC investments in the seed stage, as they are virtually negligible in the sample, and as such do not provide sufficient heterogeneity for econometric analysis.

social networks, trust and civic norms) and introduced the three related variables (separately) into the models' specifications. Results confirm the role of social capital in all the three components in the terms exposed in the main analysis, albeit revealing a (slight) loss of statistical significance of the variable related to civic norms. Lastly, we also tried to reconstruct a time-varying index of social capital by accounting for three waves of the EVS conducted in years 1990, 1999 and 2008, though on a variable number of countries. The alternative longitudinal measure was, as expected, highly correlated with the original cross-sectional one ($r=0.930$), and produced similar results regarding the impact of social capital on VC activity.

5. CONCLUSIONS

Venture capital is widely argued to provide a solution to funding difficulties faced by young and innovative companies, the drivers of economic growth, yet what a suitable institutional environment for well-functioning VC industry is and how it can be adjusted, is still unclear (e.g. Lerner 2010). Additionally, understanding these dynamics in the European context, one of the regions with the highest potential for the creation of fast growing high-tech firms, is largely absent. Hence, in this study, we complement the existing studies of VC, which put forward the mixed evidence and provide inconclusive implications regarding the institutional environment that favors VC activity, especially in Europe (Grilli et al. 2017). We propose an additional and to-date neglected institutional determinant, i.e. we argue and put to the test the role of social capital as a relevant driver of VC activity on a country level. We posit the reasoning behind the hypothesized relationship based on information sharing and trust that impacts new venture creation, empowers their exploitation, incentivizes the supply of VC and eventually facilitates the matching and post-investment relationship (Gedajlovic et al. 2013). We further explain another mechanism through which social capital influence VC activity – we show that the social capital impact is fully mediated by formal institutions, which are developed as a consequence of social capital structures (Arrow 1972; Glaeser et al. 2002). In doing so, we make an important distinction between *structural* and

changeable formal institutions, which allows for more tangible policy inferences (Kingston and Caballero 2009). Specifically, we confirm the importance of advanced *structural formal institutions* for VC activity (e.g. Li and Zahra 2012), but also test the role of *changeable formal institutions* concerning VC activity. We find robust evidence of the negative impact of high taxations, only a moderately positive impact of minority investor protection regulations, and no evidence for the relevance of labour regulations for VC activity. We do all that using a longitudinal sample of 18 European countries (during the 1997-2015 period) that exhibit heterogeneous levels of development of social capital, formal institutions and VC industry.

The present work is not free from limitations, which also represent appealing opportunities for future research. First, our analysis is constrained by the availability of data, and we would ideally have preferred to include the other European countries in the sample too. Moreover, the concepts of formal and informal institutions are multifaceted, and measuring them is fairly challenging and calls for further refinements. Then, the measure of social capital we could obtain is constant. While informal institutions show high degrees of inertia and rather slowly change (Kingston and Caballero 2009; North 1990), it would be worthy to collect longitudinal data on social networks, trust, civic norms and participation. The time varying measures could shed additional light on the role social capital has on VC activity, and more importantly, how social capital interacts with formal institutions to foster VC activity. Second, we did not take into account in the design of our study whether different institutional dimensions have disparate effects on the supply-side and demand-side of VC. Isolating the two sides of VC is appealing from a policy perspective (Armour and Cumming 2006), and ranks high on our research agenda. Likewise, another avenue for future analysis would be how direct governmental involvement via public VC funds impacts the VC dynamics in different institutional contexts, and how it combines with indirect VC- and entrepreneurship-oriented policy measures. Finally, our study focuses on the institutional framework of countries. Nevertheless, as VC is a highly localized phenomenon (Bruton et al. 2005), and institutions, and most importantly social capital (Westlund and Bolton 2003), vary greatly across regions within the

same country, future research should elaborately emulate the extant analysis on a regional level and perhaps incorporate an entrepreneurial ecosystem approach (Acs et al. 2017). This issue would be particularly appropriate to account for in Europe, where the regions have strong idiosyncrasies due to their historical mutual independence. The regional differences could be reflected on both supply and demand side of VC. The latter due to the wealth differences across regions, while the former due to the differences in ambitions, resources and actions of individuals.

Despite these limitations, our findings provide both theoretical and practical implications. We add to the literature on determinants of VC activity (e.g. Jeng and Wells 2000), and more particularly, on the institutional determinants of it. We find confirmation that the general key finding of Li and Zahra (2012) on the relevance of the development of governmental efficiency, rule of law, control of corruption and similar *structural formal institutions* for VC, as an economic transaction, still applies once the focus is narrowed only on the European landscape. Additionally, we augment the literature on informal institutions as determinants of VC by examining social capital as a possible impetus of VC activity (e.g. Aggarwal and Goodell 2014; Bottazzi et al. 2016). We find that social capital is, in principle, significant for VC activity as a facilitator of information flow and trust formation, and thus could diminish the inevitable consequences of information asymmetries (e.g. Shane and Cable 2002). Nonetheless, we further show that this effect is fully mediated by developed *structural formal institutions*, which are typically a consequence of social capital structures but do not necessarily have to be. Therefore, and most importantly, while social capital could be of great importance, it does not appear to be a critical enabler or bottleneck for the development of VC activity in Europe. These findings also shed more light on the interaction of informal and formal institutions, and their complementarity, in general (P. A. Hall and Soskice 2001).

The findings of our study are valuable for policy makers too. First, policy makers should be mindful about the features of informal institutions within which they operate, as social capital (among others) can also be a mechanism for fostering smoother entrepreneurial finance dynamics in the long-term.

Nevertheless, our study also offers neat evidence that they can be surpassed by the development of *structural formal institutions*, which might be relatively easier to change, at least in the mid-term. But our study also provides policy guidance in the short-term regarding formal institutions as determinants of VC activity. The conceptual distinction between *structural* and *changeable* institutions is particularly relevant, as the latter are by definition under governments' control and their change can be implemented more easily. In this respect, our study provides rather prescriptive policy implications, by setting a sort of order of priorities for the European policy makers. On the one hand, public policy measures such as fiscal policies (i.e. taxations) are shown to have a significant impact on VC activity, and regulators should bear that in mind when proposing new wide-ranging instruments. In the same vein, all those policy acts which aim at removing tax obstacles for VCs across EU countries (see the recent EU Commission's initiative on the pan-European passport for VCs, EU Regulation No. 345/2013, which will be further amended and strengthened in the near future as prospected by the European Commission, see the relative plan of actions published in 2016) and to offer specific tax deductions to specific typologies of equity investors and innovative investee start-ups (as embodied in many recent national Start-up Acts, for a review see the European Digital Forum 2016) should be particularly welcome. On the other hand, other (often more difficult to implement) reforms like those aiming at introducing flexibility in labour markets, whether of course could have other purposes, but as long as VC activity is concerned, they do not appear to provide an effective stimulus. In this picture, more specific and targeted instruments, such as investor protection regulations, seem also to be important, yet their impact seems to be less relevant in the European context.

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FIGURES AND TABLES

Figure 1. The conceptual model

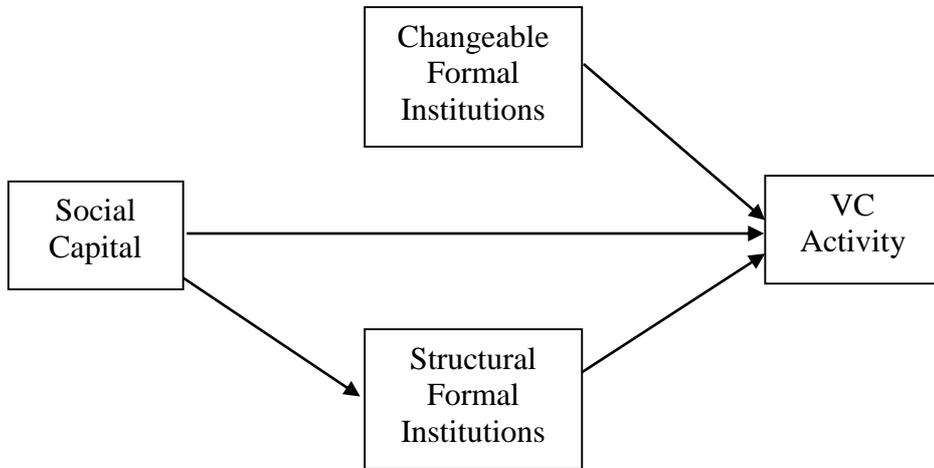


Table 1. List of variables.

Variable	Description	Source (available period)
VC Activity	Total amount of VC investments per GDP PPP.	Invest Europe, World Bank (1997-2015)
Social Capital	Proxy of the level of social capital development; The composite index is generated by factorization from the following indicators related to the extent of social networks, trust and civic norms: Membership in labour unions, political parties or organizations, professional associations, religious organizations, sports, educational, art, music or cultural organizations; People can be trusted; Voluntary work for in labour unions, political parties or organizations, professional associations, religious organizations, sports, educational, art, music or cultural organizations.	European Value Survey (time-invariant)
FI Index	Proxy of the level of structural formal institutional development; The composite index is generated by factorization from the following six indicators: Governmental Effectiveness, Rule of Law, Political Stability, Voice and Accountability, Regulatory Quality, Control of Corruption.	World Governance Index (1998-2014)
Employment Protection	Index that captures strictness of employment protection legislation in terms of individual and collective dismissals (regular contracts).	OECD (1997-2013)
Taxations	Taxes on income, profits and capital gains as a percentage of total taxes.	World Bank (1997-2013)
Investor Protection	Strength of minority investor protection index (0-10).	World Bank (time-invariant)
IPO Volume	Total value of IPO as a percentage of GDP.	Zephyr Database (1997-2015)
M&A Volume	Total value of M&A deals as a percentage of GDP.	Zephyr Database (1997-2015)
GDP Growth	Annual percentage GDP PPP growth.	World Bank (1997-2015)
Inflation	Annual growth rate of the GDP implicit deflator.	World Bank (1997-2015)
Technological Opportunity	Business enterprise expenditure on research and development (BERD) as a percentage of GDP.	OECD (1998-2014)
Internet Bubble	Dummy variable that equals 1 for the years of the Internet Bubble (1999-2000), and 0 otherwise.	-
Financial Crisis	Dummy variable that equals 1 for the years of the Financial Crisis (2007-2008), and 0 otherwise.	-
Legal System dummies	Dummy indicators that capture the effect of legal institutions and classifies countries according to legal tradition by taking into account several characteristics of the legal system; The legal systems are clustered in four groups: Common (English), French, German and Scandinavian.	6. La Porta et al. (1998) (time-invariant)

Table 2. Correlation matrix.

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>	<i>16</i>	<i>17</i>
1 VC Activity	1																
2 Social Capital	0.4774	1															
3 FI Index	0.5436	0.7508	1														
4 Employment Protection	-0.1670	-0.0866	-0.2726	1													
5 Taxations	-0.0393	-0.0879	-0.0666	-0.1990	1												
6 Investor Protection	0.3168	0.2143	0.2386	-0.2106	0.1833	1											
7 IPO Volume	0.2783	0.1046	0.2037	-0.2001	0.0995	0.1100	1										
8 M&A Volume	0.3993	0.2490	0.2802	-0.2176	0.1007	0.2074	0.5130	1									
9 GDP Growth	0.1810	0.0410	0.1740	-0.0606	-0.0238	0.0901	0.0344	0.2051	1								
10 Inflation	0.0742	-0.1241	-0.0859	0.0985	-0.0089	0.0387	-0.0167	0.0194	0.2776	1							
11 Technological Opportunity	0.3997	0.5204	0.6919	-0.2937	-0.2940	0.0461	0.1176	0.1327	-0.0442	-0.2962	1						
12 Internet Bubble	0.1769	-0.0065	0.0238	0.0861	-0.0345	0.0110	0.0743	0.1626	0.2821	0.1351	-0.0661	1					
13 Financial Crisis	-0.0194	-0.0019	-0.0125	0.0528	0.0543	-0.0079	0.1151	0.1352	-0.0158	0.0984	0.0086	-0.1190	1				
14 Common Legal System	0.1493	-0.0102	0.1439	-0.4428	0.2123	0.5568	0.2647	0.3445	0.2022	0.0003	-0.0980	0.0006	-0.0032	1			
15 French Legal System	-0.2600	-0.2938	-0.4823	0.3805	0.3571	-0.3178	-0.0094	-0.0889	-0.1599	-0.0852	-0.4658	0.0058	-0.0029	-0.3125	1		
16 German Legal System	-0.2404	-0.2652	-0.1434	-0.0290	-0.2650	-0.4389	-0.1394	-0.1875	0.0307	0.0704	0.0439	-0.0083	0.0109	-0.1980	-0.4510	1	
17 Scandinavian Legal System	0.4194	0.6040	0.5854	-0.0731	-0.3154	0.3687	-0.0552	0.0223	0.0005	0.0295	0.5684	0.0009	-0.0049	-0.2089	-0.4758	-0.3014	1

Table 3. Summary of country-level venture capital activity.

Country	Mean annual VC activity: VC investments as a portion of GDP [%]	Mean annual VC activity: VC investments per capita [Euro]	Mean annual VC activity: Total amount [Mil. Euro]
Austria	0.224	11.1163	61.5517
Belgium	0.669	31.7894	218.9635
Czech Republic	0.073	1.8866	13.5587
Denmark	0.074	58.7760	211.3741
Finland	0.834	38.6939	135.1269
France	0.627	28.8312	1173.3640
Germany	0.487	22.0462	1220.0690
Greece	0.113	3.4676	25.4425
Hungary	0.160	4.0850	28.0795
Ireland	0.519	27.5164	77.4037
Italy	0.253	10.6141	408.5370
Netherlands	0.839	42.1471	460.1069
Norway	0.887	59.6494	182.2057
Portugal	0.340	10.9076	76.3198
Spain	0.418	15.6522	458.8827
Sweden	1.259	66.5008	391.6044
Switzerland	0.751	48.2713	248.0176
United Kingdom	1.265	61.5254	2434.2730

Notes: Top three values in each category (i.e. column) are highlighted.

Table 4. Determinants of venture capital activity on a country level (unbalanced panel data, 1997-2015).

Model	1	2	3	4	5	6
Dependent variable	VC Activity	VC Activity	VC Activity	FI Index	VC Activity	VC Activity
<i>Social Capital</i>	0.007 ** (0.030)			0.671 *** (0.000)	-0.003 (0.572)	-0.002 (0.592)
<i>FI Index</i>		0.016 *** (0.000)	0.018 *** (0.000)		0.017 *** (0.002)	0.020 *** (0.001)
<i>Employment Protection</i>			-0.000 (0.703)			-0.000 (0.969)
<i>Taxations</i>			-0.001 ** (0.014)			-0.001 ** (0.014)
<i>Investor Protection</i>			0.011 (0.106)			0.011 (0.109)
<i>IPO Volume</i>	0.861 (0.106)	0.699 (0.191)	0.725 (0.177)	-1.010 (0.543)	0.688 (0.195)	0.697 (0.188)
<i>M&A Volume</i>	0.329 *** (0.003)	0.312 *** (0.004)	0.320 *** (0.003)	-0.382 (0.282)	0.313 *** (0.004)	0.314 *** (0.004)
<i>GDP Growth</i>	0.005 *** (0.000)	0.005 *** (0.000)	0.004 *** (0.000)	0.034 *** (0.001)	0.005 *** (0.000)	0.004 *** (0.000)
<i>Inflation</i>	0.001 (0.516)	0.001 (0.326)	0.001 (0.220)	0.019 (0.286)	0.001 (0.339)	0.001 (0.240)
<i>Technological Opportunity</i>	-0.000 *** (0.003)	-0.000 *** (0.002)	-0.000 *** (0.003)	-0.000 (0.519)	-0.000 *** (0.002)	-0.000 *** (0.003)
<i>Internet Bubble</i>	0.044 *** (0.001)	0.044 *** (0.001)	0.043 *** (0.001)	0.036 (0.527)	0.044 *** (0.001)	0.043 *** (0.001)
<i>Financial Crisis</i>	-0.047 *** (0.000)	-0.044 *** (0.000)	-0.043 *** (0.000)	-0.071 * (0.082)	-0.044 *** (0.000)	-0.043 *** (0.000)
<i>French Legal System</i>	-0.007 (0.758)	0.003 (0.903)	0.022 (0.370)	-0.734 *** (0.003)	0.003 (0.876)	0.020 (0.424)
<i>German Legal System</i>	-0.012 (0.603)	-0.010 (0.634)	0.005 (0.852)	-0.207 (0.565)	-0.011 (0.617)	0.002 (0.936)
<i>Scandinavian Legal System</i>	0.033 (0.197)	0.028 (0.297)	0.028 (0.229)	-0.005 (0.982)	0.030 (0.252)	0.028 (0.226)
<i>Constant</i>	0.015 (0.455)	0.018 (0.375)	-0.039 (0.537)	0.019 (0.879)	0.019 (0.352)	-0.035 (0.599)
Observations	318	318	318	318	318	318
Number of countries	18	18	18	18	18	18
Wald chi2	533.44	374.54	612.91	97.08	674.61	709.31
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Models 1-6 are estimated using GLS (random effects). Errors (in parenthesis) are clustered with respect to country ID.

* p<0.1, ** p<0.05, *** p<0.01.

Table 5. Determinants of venture capital activity on a country level (unbalanced panel data, 1997-2015): Robustness analyses and additional evidence.

Model	7a	7b	8	9a	9b	10a	10b
Method	SEM	SEM	GMM-SYS	RE	RE	RE	RE
Dependent	FI Index	VC Activity	VC Activity	Start-up VC	Start-up VC	Expansion VC	Expansion VC
<i>Social Capital</i>	0.517 *** (0.000)	-0.001 (0.755)	-0.009 (0.209)	0.003** (0.028)	-0.000 (0.883)	0.004 (0.200)	-0.001 (0.865)
<i>FI Index</i>		0.018 *** (0.000)	0.020 ** (0.034)		0.005 *** (0.000)		0.012 *** (0.002)
<i>Employment Protection</i>	0.001 (0.604)	-0.000 (0.593)	-0.000 (0.109)		-0.000 (0.502)		-0.000 (0.714)
<i>Taxations</i>	0.017 *** (0.000)	-0.001 ** (0.046)	-0.002 ** (0.045)		-0.001 (0.705)		-0.001 *** (0.001)
<i>Investor Protection</i>	-0.287 *** (0.000)	0.011 * (0.064)	0.016 (0.119)		0.002 (0.451)		0.015 *** (0.004)
<i>IPO Volume</i>	14.449 *** (0.001)	0.706 (0.059)	0.076 (0.816)	0.153 (0.204)	0.124 (0.306)	0.693 (0.109)	0.570 (0.187)
<i>M&A Volume</i>	1.099 * (0.080)	0.331 *** (0.000)	0.226 *** (0.004)	0.104 *** (0.003)	0.104 *** (0.002)	0.227 *** (0.005)	0.211 *** (0.006)
<i>GDP Growth</i>	0.055 *** (0.000)	0.004 *** (0.000)	0.002 * (0.068)	0.001 *** (0.001)	0.001 ** (0.038)	0.003 *** (0.001)	0.003 *** (0.006)
<i>Inflation</i>	-0.037 ** (0.024)	0.001 (0.415)	0.002 (0.369)	-0.001 (0.888)	-0.001 (0.663)	0.001 (0.262)	0.002 ** (0.048)
<i>Technological Opportunity</i>	-0.000 (0.909)	-0.000 ** (0.020)	-0.000 ** (0.023)	-0.000 (0.760)	-0.000 (0.716)	-0.000 *** (0.000)	-0.000 *** (0.000)
<i>Internet Bubble</i>	0.036 (0.729)	0.044 *** (0.000)	0.052 *** (0.000)	0.014 *** (0.002)	0.014 *** (0.002)	0.027 *** (0.004)	0.027 *** (0.003)
<i>Financial Crisis</i>	-0.271 ** (0.013)	-0.043 *** (0.000)	-0.033 *** (0.000)	-0.007 *** (0.009)	-0.006 ** (0.026)	-0.039 *** (0.000)	-0.035 *** (0.000)
<i>French Legal System</i>	-1.013 *** (0.000)	-0.024 (0.134)	0.041 (0.182)	-0.007 * (0.055)	-0.005 (0.409)	-0.001 (0.951)	0.028 (0.151)
<i>German Legal System</i>	-0.342 * (0.061)	-0.005 (0.729)	0.014 (0.548)	-0.006 (0.141)	-0.009 (0.210)	-0.007 (0.713)	0.013 (0.542)
<i>Scandinavian Legal System</i>	0.359 ** (0.013)	0.030 ** (0.018)	0.013 (0.518)	0.012 ** (0.017)	0.010 * (0.070)	0.017 (0.451)	0.014 (0.451)
<i>VC Activity (t-1)</i>			0.382 *** (0.000)				
<i>Constant</i>			0.001 (0.991)	0.030 (0.213)	0.030 (0.213)	-0.006 (0.736)	-0.071 * (0.083)
Observations	318	318	318	318	318	318	318
No. of countries	18	18	18	18	18	18	18
Wald chi2				371.68	739.34	1010.17	633.69
Prob > chi2				0.000	0.000	0.000	0.000
Log likelihood	-5332.958						
AR (1)			-2.13 (0.033) **				
AR (2)			1.23 (0.219)				
Hansen test (p-value)	6.08 [135] (1.000)						

Notes: Models 7a and 7b are estimated using SEM procedure in STATA.

Model 8 is estimated using GMM-SYS with moment conditions of endogenous variables restricted to the interval $t - 2$ ($t - 3$) to $t - 5$ ($t - 4$) for instruments in levels (differences) with finite-sample correction for the two-step covariance matrix developed by Windmeijer (2005); The time-varying independent variables are lagged one time period in the GMM-SYS estimation. Standard errors and p-values of Hansen statistics are reported in round brackets. Degrees of freedom are in square brackets.

Models 9 and 10 are estimated using GLS (random effects). Errors (in parenthesis) are clustered with respect to country ID;

* p<0.1, ** p<0.05, *** p<0.01.