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## Article

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## BANKING & FINANCE | RESEARCH ARTICLE

# Venture capital as innovative source of financing equity capital after the financial crisis in Spain

Fauna Atta Frimpong<sup>1</sup>, Ellis Kofi Akwaa-Sekyi<sup>2\*</sup>, Frank Gyimah Sackey<sup>3</sup> and Ramon Saladrigues Solé<sup>1</sup>

**Abstract:** The global financial crisis affected the supply of funds to finance equity capital, thus calling for innovative risk capital financing methods. The paper explores the sources of venture capital (VC henceforth) fundraising and determines the relationship between VC fundraising, stock market returns, and market capitalization in Spain. The study uses time-series data of VC fundraising and stock market variables from 1989 to 2020 in a vector error correction model analysis after performing cointegration. The paper reports short-run and long-run causal relations between VC fundraising, stock market returns, and market capitalization when VC fundraising and stock market returns are used as dependent variables. However, such relations do not exist when the model is dependent on market capitalization. Our results show that the VC market raises funds from diversified (geographical and institutional) sources. Our findings support the risk diversification theory of VC financing. The paper provides implications for using alternative innovative ways of financing equity risk capital to spur economic growth.

**Subjects:** Banking & Finance; Social Sciences; Economics, Finance, Business Industry; Business, Management and Accounting; Entrepreneurship and Small Business Management; Entrepreneurship; Entrepreneurial Finance; Economics; Finance

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**Keywords: Venture capital; Fundraising activities; Stock market returns; Spanish economy; Equity financing**

## 1. Introduction

The debate on the relation between private and public equity markets continues to produce interesting outcomes in various study settings. Black and Gilson (1998) provide evidence of a relationship between the US stock market and the VC market. Their study reveals such relationship in the Anglo-Saxon stock-based market of the USA and the bank-centered capital markets of Japan and Germany. Lin (2017) provides similar evidence on the relation between the stock market and VC market in China. However, it is not enough to understand the relation between the stock market and the VC market by relying only on data from the USA and Asia without considering data from Europe, a continent that is making huge strides in VC activities. We fill this gap by using data from Spain, which is the fifth largest economy in Europe but was severely affected by the 2007 financial crisis thereby constraining liquidity of its capital market (Banco De España, 2017). In the event of financial crisis, capital markets face liquidity problems but VC activities provide innovative liquidity options and significantly contribute to the creation, sustenance and survival of start-ups, high-tech industries and other risky investments (Frimpong et al., 2022; World Bank Group: Trade and Competitiveness, 2014).

Even though there is some research on VC activities in Europe, the concentration is on VC investment and exit activities (Frimpong et al., 2022; Harris et al., 2018; Proksch et al., 2017). There is little research to show on VC fundraising as a means of providing liquidity for the equity market. Whilst some authors believe that the success of VC fundraising is not traceable to the financial system, others maintain that vibrant stock markets propels the VC industry or vice versa. The objectives of this paper is to address these lacunas by exploring the sources of fundraising of the VC industry in Spain within the pre-crisis, crisis, and post-crisis periods. The study also determines the relationship between VC fundraising and the stock market. Specifically, the paper tests the following hypotheses: Venture capital uses diversified funding sources to finance equity risk capital; VCs rely on internal sources to finance businesses in Spain; there is a long-run causality between VC fundraising (private equity financing) and the stock market (public equity financing). The study is relevant because it shows alternative ways of raising equity capital to fund liquidity gaps. This paper provides evidence that the VC market complements the stock market in raising equity capital. Therefore, policy formulation and regulation of the capital market should be guided by this long-run relation. The paper informs the Spanish government, VC firms, investors, investee firms, regulators and potential investors on the sources of VC funds for entrepreneurial development.

The work of Burdekin and Siklos (2012) on financial market integration motivates this study. They report short and long-run relationship between stock markets in the USA and Asia-Pacific. Our paper differs from their cross-sectional study of various stock markets across countries and focus on private and public equity finance markets within an economy. Casey and O'Toole (2014) study SMEs bank-lending constraints and alternative financing during the financial crisis and conclude that the crisis constrained SMEs financing and that using alternative financing reduces the possibility of fixed investment. Our study aligns with the argument to seek alternative financing during financial crisis. We extend the argument to propose VC as alternative innovative equity finance mechanism to revive and sustain economic growth. Another motivation for this paper is the work by Lin (2017). He confirms that VC market flourishes when they exit successfully through IPOs. This suggests that understanding the exact relationship between the VC and stock market will expand knowledge in capital market research. Our study however, differs from that of Lin (2017) by examining whether there is a causal relation between the VC and the stock market.

The paper examines the sources of VC fundraising and determines the relationship between VC fundraising and stock markets. The paper employs Johansen cointegration and vector error

correction models (VECM) to analyze time series data on VC and stock market activities in periods before, during and after the global financial crisis. We find that, VC fundraising has diversified sources which absorb perceived risks. The sources of funds come from institutions, governments, and internal and external sources. The study also reports significant short and long-run causality between VC fundraising, stock market returns, and market capitalization. However, such relation does not exist when the study uses market capitalization as outcome variable.

The paper makes the following contributions. First, most research on the relationship between VC markets and stock markets have used data from the USA and Asia to the neglect of Europe. We provide evidence from Europe using a country that was severely hit by the 2007 global financial crisis. The evidence shows from our study that the crisis-led financing gap in Spain was somehow cushioned by VC fundraising which helped in financing risk capital to address a market failure resulting from financial crisis. Therefore, VC fundraising provides alternative equity risk financing. Second, in a bank-centred capital economy, there is a long-run relation between the VC and stock markets. This relation implies that the markets complement each other to support financial intermediation. Third, we provide evidence that the VC market in Spain uses diversified sources of fundraising. We confirm that during the crisis, the VC market relied on domestic or internal sources of funds. Finally, we provide a framework for understanding the sources of VC fundraising. Institutional sources comprise government institutions and private institutions whilst geographical sources emanate from domestic and foreign markets. To the best of our knowledge, this is the first study to cointegration and VECM approach to study the equity capital market funding in Spain. The next sections of the paper cover the literature review, methodology, analysis of results, discussion, and conclusions.

## 2. Literature review and hypothesis development

### 2.1. The venture capital industry in Spain

The VC industry in Spain dates back in the early 1980s (Oehler et al., 2007), but it is still young and at the development stage (Jenkinson, 2008) as compared to the counterparts in continental Europe such as France, Germany, and UK. Spain is the fifth largest economy in Europe (Eurostat, 2017) and very key in the development of continental Europe. The Spanish VC industry has undergone tremendous growth for over 30 years of its existence. There have been increasing levels of activities with respect to fundraising, investing and exiting after the financial crisis and this has been possible as a result sustained investment growth and increasing number of successful exits that have characterized the industry after the crisis (ASCRI, 2018). It is not for nothing that Madrid and Barcelona are among the top European cities in terms of VC investments. Government institutions are also playing an important role in the VC process through the fund of funds, **FONDICO**<sup>1</sup> Global and through other grants and debt financing instruments such as **ENISA**.<sup>2</sup> Nevertheless, the levels of growth are still below those in France, Germany, and UK. The VC investments account for only 0.22% of Spanish GDP whereas those in France, Germany, and UK account for 0.68%, 0.29%, and 1.28%, respectively (Eurostat, 2017). VC is an important form of equity financing for firms that have growth potential in the Spanish Economy (OECD, 2015).

The development of the sector could be an important driver of innovation and long-term success as well as sustained growth for Spain in her efforts to completely come out of the crisis (Gompers & Lerner, 2001; Samila & Sorenson, 2010). The revival of the Spanish economy from the financial crisis largely depend on the country's ability to support and grow businesses (Lee et al., 2015). Hence, the need to encourage fundraising activities in the VC industry to make funds available to grow and develop businesses. However, research on how VC fundraising activities complement the capital market remain insufficient. It is therefore important to understand the theoretical explanations to VC fund raising activities.

### 3. Theory of diversification

The study employs modern portfolio theory of diversification proffered by Markowitz in 1959 as theoretical underpinning. Modern portfolio theory of diversification traditionally explains the investment decisions but our study approaches it from a financing perspective. The theory encourages the spread of risk by distributing expectation so that the associated risks cancels out by their unique characteristics. A diversified investment portfolio is superior to any individual investment in terms of risk-return ratio no matter how well the individual investment may be selected (Ilmanen & Kizer, 2012). Our study examines VC fundraising from different institutional and geographical sources to advance the argument for reliable funds to finance equity risk capital. There is little to report from VC fundraising research that have relied on the theory of diversification for theoretical support. In a study, which focuses on investor activities, Bonnet and Wirtz (2012) employ the agency theory to explain agency costs external financiers might incur in the intermediation process. Our study adopts a different theory because we do not investigate the detailed activities of the supplier and provider of funds.

#### 3.1. Sources of venture capital fundraising

The difficulty in raising public equity funds makes VCs an important source of equity finance for firms (Wong et al., 2009) because VCs not only provide funding, monitoring, and useful connections but also add value to their portfolio firms (Metrick & Yasuda, 2011). VCs have not been able to meet firms' demand for funds especially after the financial crisis (Vermeulen & Nunes, 2012). Research underscore the effect of the 2007 global financial crisis on the supply of equity capital for businesses (Burdekin & Siklos, 2012; Orduna & Pasquier, 2013). Banks are the main source of firms funding in Europe including Spain (European Commission, 2013). However, bank finance to firms in Spain has reduced after the 2007 financial crisis (Brown & Lee, 2016; OECD, 2014). Albeit, there is limited research to show how bank-based economies such as Spain addressed this crisis-led financing gap through VC fundraising. The question that begs for answer is "what are the sources of VC funds?" Some sources of VC funds come from informal sources such as business angels and entrepreneurs (Lumme et al., 2013) but the complex financing needs of firms calls for the involvement of formalized institutional sources to complement the increasing funding gaps perturbing the sector.

Studying the sources of VC fundraising, Gompers and Lerner (1999) underscore the relevance of pension funds which account for 40% of VC fundraising in the USA between 1993 and 1997. They attribute the growth of the VC industry in the USA in the 1980s to the relaxation of the regulation governing pension funds' investments. According to Hellmann et al. (2004), banks provide VC funds and syndicate VC fundraising deals to support entrepreneurs but are reluctant to originate or participate in early stage deals. Again, good partnership relationship of VC firm with investee firm trigger follow-on funds and larger funds (Kaplan & Schoar, 2005). Mayer et al. (2005) contend that, in Germany and Japan, banks are the main providers of VC funds but in the UK and Israel, VC funds come from pension funds and corporations respectively. The situation in Spain however still remains unknown.

In a book chapter on VC fundraising, Caselli (2010) outlines that, based on the business idea, business angels, private pool of funds, corporate funds, and mutual investment funds provide VC funds. The author adds that public venture companies, financial intermediaries such as insurance companies and public funds to promote innovative research are popular sources of VC fundraising. The major determinants of the size of institutional funds could be attributable to the venture capitalist's networks gained through previous experience in the public sector as well as elite education networks (Milosevic, 2018). In the opinion of Larh and Trombley (2020), investment characteristics tend to lower VC fundraising especially funds from institutional sources. The sources of funds described above could be summed up as institutional sources of VC funds.

Another institutional source of VC fund worthy of mention is the funds provided by the government or the State. The USA started this as a strategy to finance new technology-based small businesses to grow the VC industry (Fisher, 1988). However, such state-funded VC firms make little economic impact since the focus is not for profit but addressing employment gaps. In most



European countries, there is common policy initiative where government serves as a source of VC fundraising purposely to address funding gaps plaguing the sector (Luukkonen et al., 2013). Usually, the target of such policy intervention is the early stage ventures. There are arguments that government-funded VCs in Europe have crowded private equity funds but Cumming (2011) challenges such reports with data on 13 countries for the period 1989–2011. Government participation in entrepreneurial ventures follows a model of other hybrid forms of financing which the Spanish government employed to boost employment and sales during the global financial crisis (Bertoni et al., 2019). Acevedo (2016) reports that government agencies in Spain contribute more than a quarter of the total VC funds raised. Observing critically, it is seen that VCs ensure diversification of fundraising by complementing institutional sources of funds with geographical sources.

Studies on geographical sources of VC fundraising indicate that competition arising from domestic markets triggers increases in fundraising from international sources (Madhavan & Iriyama, 2009; Martin et al., 2002; Mayer et al., 2005). This compels local VC firms to look for VC funds in foreign markets (Wright et al., 2005). But Brush et al. (2012) caution against sourcing for funds outside the local area. The authors explain that the perceptions of fund providers and the venture capitalists may be at variance with each other. Kenney et al. (2013) claim that the establishment of European Enterprise Development Company by US private equity and VC firms was instrumental in encouraging the flow of international funds. The origin of VC fundraising activities in most developed economies comes from domestic sources (Kenney et al., 2013). Countries that attract more foreign VC funds may not necessarily have great institutional environment but rather well-developed stock market that facilitates successful IPO exits of VC investments (Aizenman & Kendall, 2012). Kang et al. (2022) find evidence that firms with geographically concentrated VC investors are more likely to exit successfully than other firms. They further contend that geographically proximate VC investors are also more likely to form syndicates in follow-up rounds and to use less intensive staged financing and fewer convertible securities. However, international sources of VC funds can be problematic because the global financial crisis began from one geographical location, but the interconnectedness of the financial system led to its spread to trade partners making VC fundraising challenging.

From the deliberations above, VC fundraising comes from different sources such as governments, institutions, and different geographical locations. Raising funds from eclectic sources is confirmatory to the diversification theory which means that VCs attract funds from internal and external sources. We anticipate that financial crisis constrain VC fundraising especially from foreign markets thereby compelling the reliance on internally-generated VC funds. We, therefore, formulate two hypotheses that:

Hypothesis 1: Significant proportion of VC funds originate from domestic (internal) than external sources.

Hypothesis 2: VCs rely on diversified sources of fundraising to finance equity risk capital.

### **3.2. The relationship between VC market and the Stock market**

#### **3.2.1. Venture Capital fundraising and IPO financing through the stock market**

VCs are pivotal in the provision of equity capital to businesses. A strong relationship exists between a vibrant VC market and an active stock market (Black & Gilson, 1999; Carvell et al, 2013; Lin, 2017). Efficient stock markets facilitate IPO issuance and exit of investee firms in the VC market (Black & Gilson, 1999). They maintain that in the USA, the VC market is a strong force to the stock market-based capital market. However, Black and Gilson (1999) use data from the USA instead of covering other parts of the world. Carvell et al, (2013) using data from the US report interrelation between VC flows,

economic development, capital market fundraising activities, and capital market valuation, even though the relation is short-lived in most instances. They maintain that VC commitment correlates with GDP and capital market valuation. Lerner and Tåg (2013) report that institutions such as financial markets correlate with VC markets activities. As a reliable supplier of innovative finance, the VC market has transformed the USA and Israel economies through economic and technological developments. The evidence from the authors cited is skewed towards only countries where VC activities is very advanced (the USA and Israel) thereby not covering economies that are developing the VC industry. Lin (2017) reports that in China, strong and sustained law reforms and government policies aimed at improving the institutional structure and regulatory environment of the stock market can facilitate VC-backed exits, which leads to an increase in new VC availability. Even though the stock market-VC market relationship is known in the USA and China, that of Spain (the fifth largest economy in Europe) remains unknown. From the studies above, two gaps remain unresolved. First, the relationship between the VC and the stock markets relies only on data from the USA and Asia, with little to be said about Europe in spite of the successes being achieved in VC activities in the continent. Second, the relationship between VC and the stock market emphasizes the exit activities of VC to the neglect of fundraising activities. Thus, the need to address these lacuna motivates researches in Europe.

Otchere and Vong (2016) reveal that the presence of VC tends to lower the cost of going public thereby helping to maximize the proceeds to the offering firm and the VC. Pezeshkan et al. (2020) see capital markets (stock market) as an institution that provides investment information, exit and merger and acquisition opportunities as end-games for VCs (both domestic and international). The deliberations above suggest a good relation between the VC and the stock market. What is not known is whether there is a causal relation, which this study seeks to address. In spite of the findings on the relationship between the VC and stock market variables, there are few contrary findings worth mentioning.

Despite significant relationship existing between VC market and stock market, some studies find no significant relationship between IPO and VC activity. For example, Gompers and Lerner (1999) report nonsignificant impact of IPO activities on VC fundraising. Their findings further suggest that while it is difficult to rule out the role for IPOs in creating liquidity in the VC industry, once other factors, such as real GDP growth, equity market return, and capital gains tax rate are included, the relationship does not appear significant. Megginson (2004) maintains that even in the IPO-oriented stock markets in Europe and Asia, it is still difficult to develop an active VC sector. Thus the reported relationship between VC and stock market is not applicable in his case. These contrasting opinions make the relationship between VC and stock market inconclusive because whilst some report complementary roles for the two markets, others find no such significant relation between them. VCs provide steering and support services to their companies besides making funds available. Sometimes, VCs prepare and graduate firms for IPO financing and such firms have higher post-IPO survival rate (Tian, 2011). The author reports that VCs positively stimulate firms' propensity to go public through IPOs but fails to report on how VC fundraising affect stock market variables. We conjecture that, VC-backed firms exit through IPOs, but the relation might not be always proportional. There is paucity of research on the relationship between VC fundraising and stock market variables. We expect a long-run relation and therefore hypothesize that:

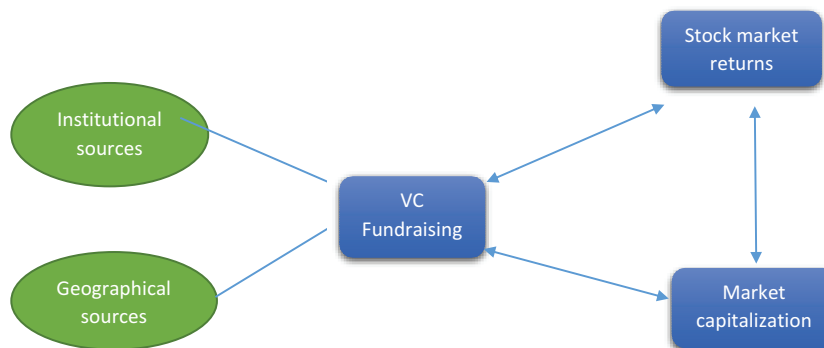
H<sub>3</sub>: There is long-run relation between VC fundraising (private equity financing) and the stock market (public equity financing).

Figure 1 shows the conceptual framework for the study. The paper proposes two main sources of VC fundraising namely institutional and geographical sources. These sources suggest diversified forms of mobilizing VC funds. We show the relationship between VC fundraising, stock market returns and market capitalization.



**Figure 1. Conceptual framework.**

Source: Authors' construct



#### 4. Data

The study uses stock market data from the official website of Madrid Stock Exchange (BME) because it is the largest and most internationally recognised stock market in Spain and VC data from Invest Europe, Bank of Spain, EUROSTAT, and Global Financial Development databases covering the period 1989 to 2020. The reason for choosing this period is to compare fundraising activities and stock market developments for the periods before, during and after the global financial crisis.

#### 5. Methodology

The choice of cointegration is occasioned by the need to identify the variables that move with VC fundraising in the long-run. This is to ensure in-depth understanding of related factors, which affect capital available in the equity market in order to maintain reliable and stable supply of funds for the growth of firms. The higher the degree of cointegration among variables, the greater the probability of sustaining a stable distance. The precondition for the Johansen test of cointegration states that, variables are non-stationary at level but when converted into first difference, they become stationary.

Given a vector of  $X_t$  of  $n$  potentially endogenous variables, it is possible to specify the following data generating process and model  $X_t$  as an unrestricted vector auto regression (VAR) involving up to  $k$ -lags of  $X_t$ . Thus;

$$X_t = A_1X_{t-1} + A_2X_{t-2} + \dots + A_kX_{t-k} + U_t \quad (1)$$

$$U_t \sim N(0, \sigma^2)$$

Reformulating equation (1) into a vector error correction (VEC) model;

$$\Delta X_t = \sum_{i=1}^{k-1} \tau_i \Delta X_{t-i} + \pi X_{t-k} + U_t$$

Where  $\tau_i = -(I - A_1 - \dots - A_i)$ ;  $(i = 1, 2, 3 \dots k - 1)$

and  $\pi = -(I - A_1 - \dots - A_k)$  and comprises both short-run and long-run aspects. We are interested in the long-run aspect to determine our cointegration,

$\pi = \alpha\beta'$ ;  $\alpha$  is a vector of speed of adjustment;  $\beta'$  is the number of cointegrated vectors. The focus is on  $\pi X_{t-k} = \alpha\beta' X_{t-k}$ , meaning that we are interested in  $\beta' X_{t-k}$ . The aim is to find out if  $\pi X_{t-k} \sim I(0)$  in order to conclude that the variables are cointegrated.

##### 5.1. Vector error-correction (VEC) model

For the purpose of this study, we apply the vector error-correction (VEC) model as it is the most efficient and appropriate. Granger and Wess (2001) has also demonstrated an equivalent characterization or representation of time-series which are cointegrated, namely; if  $X_t$  and  $Y_t$  are both

$I(1)$  and are cointegrated with a cointegrated vector  $A$ , then there always exist an error correction representation.  $Y_t = AX_t =$  cointegrated series.

The error representation:

$$\Delta Y_t = \alpha(Y_{t-1} - AX_{t-1}) + \beta\Delta X_t + \text{Lagged}(\Delta Y_{ts}, \Delta X_{ts})\varepsilon_t$$

This representation of the cointegrated time series in an error correction characterization forms an integral part of the Granger representation theory.

Note the dynamic equation;

$$Y_t = \alpha_0 + \gamma_0 X_t + \gamma_1 X_{t-1} + \alpha_0 Y_{t-1} + \varepsilon_t \tag{2}$$

The long run counterpart of this model is;  $Y_t = \beta_0 + \beta_1 X_t$ . Thus, every short-run model has its long-run counterpart. This is the long-run;

$$Y_t = Y_{t-1}; X_t = X_{t-1}, \text{ thus, } Y_t = \alpha_0 + \gamma_0 X_t + \gamma_1 X_t + \alpha_1 Y_t + U_t$$

$$= (1 - \alpha_1)Y_t = \alpha_0 + (\gamma_0 + \gamma_1)X_t + U_t, \text{ thus, } Y_t = \frac{\alpha_0}{1 - \alpha_1} + \frac{\gamma_0 + \gamma_1}{1 - \alpha_1} X_t + \frac{U_t}{1 - \alpha_1}, \text{ thus,}$$

$$Y_t = \beta_0 + \beta_1 X_t + V_t \text{ (long-run). Thus, } \Delta Y_t = \beta_1 \Delta X_t + \beta_2 (Y_{t-1} - \hat{\beta}_0 - \hat{\beta}_1 X_t) + \varepsilon_t$$

We employ three equations for our variables of interest in the cointegration and VECM analyses:

$$VCFund/GDP = f(\text{StockMktReturns}, \text{MktCap}/GDP) \tag{3}$$

$$\text{MktCap}/GDP = f(\text{StockMktReturns}, VCFund/GDP) \tag{4}$$

$$\text{StockMkt Returns} = f(VCFund/GDP, \text{MktCap}/GDP) \tag{5}$$

Where  $VCFund/GDP$  represents Venture Capital fundraising to GDP ratio

$MktCap/GDP$  represents Market Capitalization to GDP ratio and

$StockMkt Returns$  represents Stock Market Returns

To address the hypotheses on the sources of VC fundraising, we compute the percentages of VC fundraising from institutional and geographical sources. For the third hypothesis which addresses the long-run causality between private and public equity capital and standardize the respective values (VC fundraising and market capitalization). The study is very relevant to the economy of our study area so we adjust these figures by GDP in order to capture economic growth. In VECM analysis, all the variables can be used as dependent and independent variables. In order to focus

Table 1. Description of variables		
Variable	Description	Measurement
VC fundraising	Amount of VC funds raised during the year for investee firms	Total amount VC funds raised divided by GDP
Market capitalization	Total capital raised from the stock market	Total amount of market capitalization divided by GDP
Stock market returns	The returns from invested shares on the stock exchange	As obtained from global Financial Development database
Gross Domestic Product (GDP)	Total Gross Domestic Product of Spain	As provided by Eurostat database

attention on whether or not there is a long-run relationship between the variables, we do not include any control variables in the study.

## 6. Results and discussion

This section covers the presentation, analysis and discussion of results. It covers the sources of VC fundraising, summary statistics, cointegration and VECM analyses of VC fundraising and stock market variables.

### 6.1. Sources of VC fundraising

The sources of VC fundraising are geographical and institutional sources. [Table 1](#) shows the description and measurement of variables used in the study. [Table 2](#) shows the geographical sources of VC fundraising.

The study adopts three distinctive timeframes covering the pre-crisis (1989–2006), crisis (2007–2010) and post-crisis (2011–2020) periods for this section of the analysis. During the pre-crisis period, VCs obtained a significant proportion of funds (about 97% in 1989) from Spain. From [Table 2](#), it is during the pre-crisis period that funds were received from outside Europe (which includes the US). Perhaps, this might account for the huge negative effect of the global financial crisis on Spain because there is the perception that the 2007/2008 global financial crisis originated from the US.

We perform further analysis of the geographical sources of VC funds in [Table 3](#) using descriptive statistics for Spain, Europe, Outside Europe and other unclassified sources. During the period before the crisis, Spain provided 59% of total VC funds with Europe, and the rest of the world almost providing 28% and 13% respectively. The most reliable geographical source of VC fundraising (even though low) during the crisis came from outside Spain (predominantly Outside Europe with standard deviations 8.7%). The spread across the sources of VC funds was somehow even with less variability. The crisis periods saw heavy reliance on Spain for most of VC funds with a minimum and mean contributions being 40.5% and 57% of total funds raised for VC activities respectively. The Unclassified sources provided the next higher source of VC funds during the crisis period (35.7%). It is expected that during the crisis, VC fundraising should decrease tremendously. However, funds raised from Spain during the crisis period was averagely closer to that of the period before the crisis. Perhaps, this explains the notion that the VC industry provided alternative innovative source of equity capital for Spain during the financial crisis.

In the post-crisis period, Spain continued to provide the main source of VC funds but there was a drop in value (mean =53%, still above 50%) as compared to the crisis period. Europe and the rest of the world increased their supply of funds to the VC market in Spain after the crisis. These are positive signals for the industry to seek external funds to provide liquidity for the equity market. The most inconsistent period within which Spain supplied VC funds was after the crisis. Could it be attributed to measures put in place to revive the economy after the financial crisis?

[Table 4](#) shows the institutional sources of VC fundraising. The table reveals that institutional sources of VC funds before the financial crisis came from unclassified sources, banks, government agencies corporate investors and pension funds. During the crisis, VCs obtained institutional funds from banks, corporate investors and fund of funds. Perhaps these institutions had better management of the crisis hence their ability to supply funds for VCs. During the period after the crisis, institutional sources of VC funds were corporate investors, government agencies, banks, private individuals, fund of funds, etc. Thus VC fundraising after the crisis has been more diversified than previously.

### 6.2. Cointegration analysis

We perform Johansen test of cointegration in [Table 5](#). First, we use the maximum rank to test the hypothesis that there is no cointegration. At maximum rank zero (0), the trace statistic of 45.45 exceeds the critical value of 29.68, therefore, we reject the null hypothesis and accept the

**Table 2. Geographical sources of VC fundraising in percentages**

Year	Source of VC Fund				
	Spain (Domestic)	Europe	Outside Europe	Unclassified	Total Outside Europe
1989	96.7	3.3	0.0	.	0.0
1990	41.1	33.9	25	.	25
1991	32.8	51.2	16	.	16
1992	49	21.5	29.5	.	29.5
1993	79.3	15.4	5.3	.	5.3
1994	47.9	41.8	10.3	.	10.3
1995	48.4	42.9	8.7	.	8.7
1996	66	24.4	9.6	.	9.6
1997	51.6	32.6	15.8	.	15.8
1998	41.1	33.3	25.6	.	25.6
1999	53.3	27.5	19.2	.	19.2
2000	46.6	33.1	20.3	.	20.3
2001	65.7	31.7	2.6	.	2.6
2002	56.9	29	14.1	.	14.1
2003	75.2	19.8	5	.	5
2004	69.5	20.5	10	.	10
2005	90.9	8.1	1	.	1
2006	55.5	34.0	10.5	.	10.5
2007	40.5	17.5	0.5	41.5	42
2008	54.2	2.9	0.0	42.9	42.9
2009	65	3.1	0.0	31.9	31.9
2010	69.8	2.7	1.1	26.4	27.5
2011	72.3	1.3	0.0	26.4	26.4
2012	86.3	0.0	0.0	13.7	13.7
2013	58.3	0.5	0.0	41.2	41.2
2014	25.6	14.7	0.0	59.6	59.6
2015	15.2	10.3	3.0	71.6	74.6
2016	64.1	30.1	5.2	0.5	5.7
2017	46.9	39.9	6.4	6.8	13.2
2018	13.7	44.8	15.5	2.0	17.5
2019	71.1	26.1	2.0	0.8	2.8
2020	76.6	21.4	2.0	0	2.0

Table 2 shows the percentage contribution of geographical sources of VC fundraising activities for the period 1989–2020. The sources in geographical terms include Spain, Europe, Outside Europe and unclassified sources (from high net-worth individuals and angel investors). The table also shows the total contributions from outside Europe. The Table shows that the VC industry in Spain raises most of its funds from internal sources, with Europe being the next major supplier of funds to finance risk capital.

alternate that VC fundraising, stock market return and market capitalization are cointegrated. For maximum rank 1, the null hypothesis indicates that there is cointegration of equation (1). A trace statistic of 15.36 which is smaller than the critical value of 15.41 implies there is cointegration of equation (1).

For maximum rank 2, we test the null hypothesis that there is cointegration in equation 2. A trace statistic of 2.07 which is smaller than the critical value of 3.76 implies that we accept the

**Table 3. Summary statistics for geographical sources of VC fundraising**

Period/ Source of funds	Obs	Mean	Std. Dev.	Min	Max
<b>Before crisis (1989–2006)</b>					
Spain	18	59.30556	17.55058	32.8	96.7
Europe	18	28	12.01778	3.3	51.2
Outside Europe	18	12.69444	8.677725	0	29.5
Unclassified	0				
Total outside Europe	18	12.69444	8.677725	0	29.5
<b>During crisis (2007–2010)</b>					
Spain	4	57.375	13.00471	40.5	69.8
Europe	4	6.55	7.301826	2.7	17.5
Outside Europe	4	.4	.5228129	0	1.1
Unclassified	4	35.675	7.882629	26.4	42.9
Total outside Europe	4	36.075	7.586117	27.5	42.9
<b>Post-crisis (2011–2020)</b>					
Spain	10	53.01	26.41243	13.7	86.3
Europe	10	18.91	16.30429	0	44.8
Outside Europe	10	3.41	4.818587	0	15.5
Unclassified	10	22.26	26.57665	0	71.6
Total outside Europe	10	25.67	25.02164	2	74.6

Table 3 shows the summary statistics for the geographical sources of funds from Spain, Europe, Outside Europe (USA and rest of the world) of VC fundraising for the periods before, during and after the financial crisis in Spain. In the periods during and after the crisis, there were occasions where no funds came from Europe and outside Europe. However, average figures show that funds from outside Spain and Europe increased in the post-crisis periods.

null hypothesis. Per maximum rank 2, VC fundraising, stock market return and market capitalization are cointegrated. Having satisfied this major requirement, we perform the VECM since all the three variables are cointegrated.

Table 6 reports the VECM results for all the three variables used. It must be noted that VECM takes difference of these variables such that they are represented as  $D\_VCFund/GDP$ ,  $D\_StockMktReturns$ , and  $D\_MktCap/GDP$ . We also observe that apart from  $D\_MktCap/GDP$  with R-square 40.4% (not significant), the other two variables have very high R-square with p-values close to zero indicating high significance levels. This is a justification for causality.

Table 6 shows the VECM for the three variables under consideration. We use capital flows injected into the VC and stock markets. We measure these by total VC fundraising and market capitalization respectively. We use the natural logs of these figures and further adjust by GDP. For stock market returns for the period under review, we rely on figures as provided by the Spanish Stock market.

In the second panel we report results of our regression with  $D\_VCFund/GDP$  as dependent variable in Table 7. To determine the long-run causality we resort to  $\_ce1$  and  $\_ce2$ , representing the two equations. A negative coefficient and significant p-value of  $\_ce1$  shows that there is a long-run causality between  $D\_VCFund/GDP$  and the two other variables being,  $D\_StockMktReturns$ , and  $D\_MktCap/GDP$ . To examine the short-run causality we resort to the individual lag coefficients and

**Table 4. Institutional sources of VC funds in Spain (in Percentages)**

Year	Acad Inst (%)	Banks (%)	Capital Mkts (%)	Corp Inv (%)	Endow & Found (%)	Family Off (%)	Fund of Funds (%)	Govt Agencies (%)	Insurance Com (%)	Other Assets (%)	Pension Funds (%)	Private Ind (%)	Sovereign Funds (%)	Unclassified (%)	Total (Euros)
1989	0	1.948119	0	1.120405	0	0	0	2.930353	0.081348	0	0.014029	0.330742	0	93.575	990,802
1990	0	24.67507	0	11.67365	0	0	0	0	11.83713	0	0	2.159697	0	49.65446	296,060
1991	0	26.35703	0	0.579809	0	0	0	4.103541	8.751107	0	38.47964	4.5293	0	17.19957	164,882
1992	0	38.13495	0	20.62818	0	0	0	17.15995	7.941209	0	2.449844	1.224922	0	12.46095	153,969
1993	0	8.451956	0	15.24803	0	0	0	52.53877	0.611661	0	2.495745	7.734143	0	12.9197	213,844
1994	0	5.31652	0	3.110027	0	0	0	3.099531	0	0	4.341499	0	0	84.13242	352,505
1995	0	46.79773	0	6.616953	0	0	0	10.29573	0	0	10.44053	0.137149	0	25.7119	156,764
1996	0	5.75835	0	2.374534	0	0	0	2.999515	0.013745	0	0.047126	0.442928	0	88.3638	356,491
1997	0	11.14993	0	3.129511	0	0	0	2.161955	1.88506	0	0.553057	1.085344	0	80.03514	1,362,609
1998	0.064854	23.15986	0	2.932004	0	0	0	1.274367	2.654248	0	3.924947	6.917669	0	59.07205	1,281,342
1999	0	16.90509	3.384466	4.334135	0	0	0.027373	5.42224	0.952114	0	4.677287	0.599177	0	63.69811	1,717,021
2000	0.055374	32.52057	0	9.279207	0	0	13.98118	4.330343	4.712082	0	5.274632	4.566577	0	25.28003	2,008,178
2001	0.052266	26.69337	0	1.048055	0	0	9.002273	1.710857	4.728889	0	0.123183	10.6316	0	46.00951	1,356,513
2002	0	27.19247	0	5.904919	0	0	2.09462	11.51029	1.392976	0	4.217732	4.580364	0	43.10663	1,066,924
2003	0.001641	11.50184	0	4.538205	0	0	2.302402	4.104124	0.979796	0	0.880615	0.824095	0	74.86728	3,412,957
2004	0	37.28677	1.030902	2.364887	0	0	6.148158	8.377233	1.949317	0	8.697528	4.785546	0	29.35966	2,225,138
2005	0	8.013784	0.897796	7.844326	0	0	0.363709	1.62805	0.184477	0	0.730602	0.844683	0	79.49257	4,900,893
2006	0.133501	31.59987	0.877345	4.860225	0	0	24.15194	9.226934	1.56927	0	10.68378	16.89713	0	0	2,632,944
2007	0	19.91081	0	16.32303	0	6.327946	14.42579	7.707324	3.230391	5.741273	14.32009	14.89941	0	0	3,697,107
2008	0	31.83939	0	11.18115	0.024864	0	11.10685	8.869568	3.59313	0.96503	9.006769	19.08688	0	4.326376	2,010,921
2009	0	33.8039	0	4.615893	0	1.291477	10.18071	32.08965	0.598165	0.547692	7.058033	6.800988	0	2.880095	705,324
2010	0.003855	7.490565	0	5.716166	0.265106	2.890573	1.734819	51.79747	5.654226	2.166982	7.228414	9.719872	0	6.744721	778,179
2011	0	8.073255	0	17.0496	0	1.578422	0.301625	47.58989	1.266825	5.668288	2.714625	15.57441	0	0	397,845
2012	0	10.56099	0	13.57555	0	1.986064	1.80391	60.05466	1.127444	1.254394	0	7.789736	0	0.901955	443,481

(Continued)



**Table 4. (Continued)**

Year	Acad Inst (%)	Banks (%)	Capital Mkts (%)	Corp Inv (%)	Endow & Found (%)	Family Off (%)	Fund of Funds (%)	Govt Agencies (%)	Insurance Com (%)	Other Assets (%)	Pension Funds (%)	Private Ind (%)	Sovereign Funds (%)	Unclassified (%)	Total (Euros)
2013	0.109234	17.28502	0	14.70543	0.643485	2.369727	9.520885	31.4067	0.662581	0.181801	5.814126	8.187472	0	3.844561	654,561
2014	1.055287	7.134963	0.105595	12.90558	0.173559	0.060367	17.56588	29.0764	5.463357	3.535111	16.65652	6.169678	0	0.063272	2,109,948
2015	2.486759	4.265474	0	3.649187	0	1.431453	11.2021	8.624154	6.53962	2.635594	5.012757	53.22404	0	1.305195	3,313,067
2016	0.556906	8.60174	0	3.414448	1.320604	18.24104	10.53617	30.8062	7.243872	11.62058	3.923607	5.768481	0.11261	0.486719	2,442,064
2017	0.047857	8.080905	0	2.960229	0.075374	8.147195	20.69863	23.32094	5.466728	2.877533	17.8234	5.091962	0	3.801216	2,089,568
2018	0	6.1808	0	2.802249	4.160888	21.38678	19.59312	16.59779	8.50563	2.438659	10.08957	7.601149	3.996819	2.019393	2,501,990
2019	0	3.504956	0	11.00488	0.201128	21.59944	9.964808	30.0252	5.678612	1.863424	5.048646	10.30824	0	0.800669	1,873,433
2020	0	3.901429	0	7.09571	0.915988	26.1625	4.366146	25.66828	2.450468	6.369288	4.428509	18.64168	0	0	2,179,176

Source: Invest Europe

**Table 5. Johansen test of co-integration results**

Maximum Rank	Parms	LL	Eigenvalue	Trace Statistics	5% Critical Value
0	12	-192.7376		45.4480	29.68
1	17	-177.69202	0.82968	15.3568*	15.41
2	20	-171.05052	0.54221	2.0738	3.76
3	21	-170.0136	0.11484		

**Table 6. Vector error correction model (VECM)**

Equations	Parms	RMSE	R-sq	Chi2	P>chi2
D_VCFund/GPD	6	.528705	0.7111	27.07123	0.0001
D_StockMktReturns	6	11.5819	0.7594	34.72611	0.0000
D_MktCap/GDP	6	183.926	0.4036	7.444208	0.2817

the p-values of the independent variables. The results show that only the lag of MktCap/GDP has a short-run causality with D\_VCFund/GDP. Similarly, in panel 3 we report the regression results using D\_StockMktReturns as the dependent variable whilst D\_VCFund/GDP and D\_MktCap/GDP are the independent variables. The results show a negative and significant long-run causality between D\_StockMktReturns and the independent variables. We also observe a short-run causality between D\_StockMktReturns and D\_VCFund/GDP but not for D\_MktCap/GDP. In panel 4 there is no long-run and short-run relationships between D\_MktCap/GDP as dependent variable and the independent variables (D\_VCFund/GDP and D\_StockMktReturns).

Table 8 reports the LM test for residual autocorrelation and diagnoses of the VECM. The null hypothesis is that there is no autocorrelation. An insignificant prob >Chi<sup>2</sup> for both lag 1 and 2 indicates that we accept the null hypothesis. We also test for normality using the Jarque-Bera test. The null hypothesis is that residuals of variables are normally distributed. We observe an insignificant prob > Chi<sup>2</sup> in all the three panels, signifying that all the residuals of the variables are normally distributed. This is an indication that our tests of hypotheses are valid.

### 6.3. Discussion

The results support all the three hypotheses; 1. reliance on internal sources of VC fundraising, 2. diversified sources of funds and 3. long-run relation between VC market and stock market variables. The empirical results on the sources of VC fundraising shows that most funds required for financing equity risk capital come from within Spain (internal). The VC market complements the stock market by supplying alternative equity capital to finance the crisis-led liquidity gap. These funds come from diversified sources such as private institutions, governments, Spain (internal), Europe, the United States and other parts of the world. The institutional sources of VC funds include financial and non-financial institutions, pension funds, fund of funds, individual and public investors. This finding is in tandem with Caselli (2010) who reports that VCs obtain funds from institutional sources because they provide convincing business ideas that persuades potential investors. The VC market in Spain seeks funding from fund of funds which is increasingly growing up to 22%. Unlike other VC markets that rely informal sources such as business angels and wealthy entrepreneurs (Lumme et al., 2013), the VC market in Spain mobilize capital from formalized institutional sources. Fund of fund creates a second level of intermediation and the performance of fund of funds is almost at par with portfolios of VC direct investments (Harris et al., 2018). The results show that, from internal sources, Spain is able to mobilize internal funds for VC activities.

**Table 7. Regression results**

Equation	Coef	Std. Err.	Z	p> z	[95% conf. Interval]
<b>D_VCFund/GDP</b>					
_cel Li.	-.4781255	.1625084	-2.94	0.003	-.7966361 -.1596149
_ce2 Li.	.035372	.0193261	1.83	0.067	-.0025064 .0732505
VC Fund/GDP LD.	-.0520864	.1777908	-0.29	0.770	-.40055 .2963772
StockMktReturns LD.	-.0006214	0.0128391	-0.05	0.961	-.0257856 .0245428
MktCap/GDP LD.	.002867	.0011104	2.58	0.010	0.006906 .0050433
_cons	.1346742	-.1384252	-0.97	0.331	-.4059826 .1366341
<b>D_StockMktReturns</b>					
_cel Li.	2.307307	3.559936	0.65	0.517	-4.670038 9.284653
_ce2 Li.	-1.182975	.4233604	-2.79	0.005	-2.012746 -.3532034
VCFund/GDP LD.	8.195656	3.894715	2.10	0.035	.5621551 15.82916
StockMktReturns LD.	.2293894	.2812561	0.82	0.415	-.3218625 .7806413
MktCap/GDP LD.	.0449903	.024325	1.85	0.064	-.0026859 .0926665
_cons	-.0023247	3.032365	-0.00	0.999	-5.94565 5.941001
<b>D_MktCap/GDP</b>					
_cel Li.	-56.5075	56.53345	-1.00	0.318	-167.311 54.29604
_ce2 Li.	1.927705	6.723162	0.29	0.774	-11.24945 15.10486

(Continued)

**Table 7. (Continued)**

<b>Equation</b>	<b>Coef</b>	<b>Std. Err.</b>	<b>Z</b>	<b>p&gt; z </b>	<b>[95% conf. Interval]</b>	
VCFund/GDP LD.	61.2063	61.8499	0.99	0.322	-60.01728	182.4299
StockMktReturns LD.	-1,597,344	4.46648	-0.36	0.721	-10.35148	7.156795
Market Cap/GDP LD.	-.0709213	.3862931	-0.18	0.854	-.8280419	.6861994
_cons	.0010446	48.15538	0.00	1.000	-94.38176	94.38385

**Table 8. Autocorrelation, model diagnosis and normality tests**

Tests	Equation	Skewness/ Kurtosis	Chi-2	df	Prob>Chi <sup>2</sup>
<b>Autocorrelation/ VECM Diagnosis</b>					
Lagrange-Multiplier test	LAG 1		10.5205	9	0.31001
	LAG 2		5.1268	9	0.82312
Jarque-Bera test	D_VCFund/GDP		1.088	2	0.58032
	D_StockMktReturns		0.503	2	0.77755
	D_MktCap/GDP		0.797	2	0.67118
	All		2.389	6	0.88068
<b>Normality tests</b>		<i>Skewness</i>			
Skewness	D_VCFund/GDP	.08764	0.022	1	0.88272
	D_StockMktReturns	-.03467	0.003	1	0.95347
	D_MktCap/GDP	-.0546	0.008	1	0.92677
	All		0.034	3	0.99838
		<i>Kurtosis</i>			
Kurtosis	D_VCFund/GDP	1.7729	1.067	1	0.30172
	D_StockMktReturns	2.16	0.500	1	0.47958
	D_MktCap/GDP	1.9446	0.789	1	0.37441
	All		2.355	3	0.50200

The ability of the Spanish VC industry to attract significant funding tend to suggest that investors feel convinced of VC investment opportunities in that market. Perhaps, the VCs uniqueness such as higher human resource acumen and value addition to investee firms could be the reason behind the industry’s attractiveness. In spite of the value-adding opportunities the VC brings to investee firms, there is also the tendency for over-indulgence of the VC in the activities of investee firms, which might result in frictions. Such misunderstandings impair the value created thereby increasing the agency cost (Luukkonen et al., 2013). The enactment of new Spanish venture capital and private equity entities regulation (Law 22/2014) coupled with the Alternative Investment Fund Managers (AFIM) directive by the European Union in 2011 have promoted fundraising activities thereby increasing the liquidity of the VC market after the crisis. The law introduced by the government has provided industry players with solid legal framework needed to grow and develop the VC industry. The tax reforms have stimulated the growth and development of the VC industry in Spain. The government’s approval of a waiver for Spanish private equity funds from the hitherto obligation to make payments of corporate income tax even if they were exempted from payment has also been helpful. It was a requirement for the firms to make advance tax payment and recover later, even if they had exemptions. This waver creates opportunity for firms to channel such monies into investments. Again, the exemption on the sale of shares in subsidiaries has also had impact on the industry.

The cointegration results show short and long run relations between equity risk capital variables thus confirming prior research that vibrant stock markets serve as impetus for the VC industry since most venture capitalists prefer exiting through the IPO (Black & Gilson, 1998). From the empirical results, there is a short-run causality between VC fundraising and market capitalization when the equation uses VC fundraising as dependent variable. This implies that, it is difficult for VCs fundraising (private equity) and stock market funds (public equity) to adjust in the short-run. When stock market return is used as outcome variable, the results show a short-run relation with VC fundraising. However, the study reports no short-run causality when the model uses market capitalization as dependent variable.

We report significant long-run causal relationship between VC fundraising (outcome variable) and stock market variables (market capitalization and stock market returns). This suggests that private and public equity variables converge with time. Our finding confirms earlier research which shows that, in economies where capital markets (especially IPOs) tend to be inefficient, returns to VC investors tend to be low (Bygrave & Timmons, 1992). The long-run relationship between the stock market and the VC market corroborates Black and Gilson (1998) whose study on VC and the structure of the capital market indicated that the relationship could be better understood on contracting arrangements between the entrepreneurs and the VC providers. Most VC firms prefer exiting through IPOs from the stock market thus fostering a strong relationship. It is however contrary to Mayer et al. (2005) who finds no such relation. Our results show that, during the period of the crisis, funds from the stock markets was unstable but the VC fundraising especially from Spain was relatively stable and even more stable in the post-crisis period. This suggests an alternative financing option for equity risk capital. This is in line with previous study by Schmid (2001) that entrepreneurial firms with low initial wealth prefer VC financing to IPO financing.

The empirical results do not show short- and long-run relations between the variables when the model uses market capitalization as dependent variable. Even though market capitalization and stock market returns are both public equity variables, the results show that investors are interested in the returns and not necessarily how much capital the stock market raises. Perhaps, it will be exciting to investigate the determinants of stock market returns in future research.

VC fundraising activities have significant implications on the functioning of the economy. Increasing VC fundraising increases start-ups, jobs, and incomes (Samila & Sorenson, 2010). VCs add value to the investee firms, which translates into higher performance, creates employment and improves other macroeconomic indicators (Cumming et al., 2005). Our findings support the financial intermediation function of VCs as suppliers of funds thereby improving the allocation function for the benefit of economic units. VCs provide alternative equity financing option to the stock market.

## 7. Conclusion

The study examines VC as alternative source of financing equity capital in a period where traditional sources had funding gaps. The paper explores the sources of VC fundraising and the relationship between VC and stock markets as providers of equity capital. Using time series data from 1989–2020, the paper employs cointegration and VECM to establish causal relationship between VC fundraising and stock market.

We report a framework for examining the sources of VC funds (i.e. institutional and geographical). The institutional sources come from private institutions and the government whilst the geographical sources are classified into domestic and foreign or international. The main institutional sources of VC fundraising are financial institutions, pension funds, insurance and non-financial institutions. Geographically, VC funds come from Spain, Europe, the USA, and other parts of the world. External sources of VC funds have increased after the financial crisis, which indicates some confidence in the Spanish VC industry by international investors. VC firms use diversification models in raising funds to finance equity risk capital. We conclude that the Spanish VC market use diversified sources of funds to complement the stock market in financing equity risk capital. Our study confirms long run causal relation between VC fundraising and stock market returns. A vibrant VC market with diversified source of funds provide vitality for entrepreneurial development, which translates into economic growth. The debilitating effect of the financial crisis on the stock market was somehow absorbed (even though not substantially) by the VC market.

On the practical implications of the study, the Spanish government can rely on the VC market as alternative suppliers of funds to finance equity risk capital. The study addresses the issue of how to raise VC funds. This will inform the policy that encourages unlimited flow of funds into the VC pool for sustained growth. The study informs policies targeted at harmonizing the equity markets for better investment decision-making. A better understanding of the VC fundraising sources can assist in the development of



policy and regulation that promotes increased and sustained fundraising. VC firms can rely on information in this study to explore other sustainable sources to meet the capital requirements of firms in the country. Again our study deepens understanding of equity investment climate to enable VC firms employ reliable capital-acquisition strategies in the fundraising activities. Information in this study is helpful to companies that are looking to scale up their business to consider VC as alternative business finance. Theoretically, we show that the diversification theory is employed in raising funds in the VC market. Thus liquidity funding gaps in the capital market can be minimized by looking at complementary sources such as the VC and stock markets.

We recommend that, policy makers and industry players should be wary of institutional factors that affect cost of equity capital since most internal funds are mobilized from institutions.

As a limitation, this study uses data from the largest and most international stock exchange which is Bolsa de Madrid even though there are four stock markets in Spain (Madrid, Barcelona, Valencia, and Bilbao). Single country study like this, may suffer limitations in scope so we suggest that future research may consider several countries.

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#### Notes

1. **FOND ICO Global**—The Instituto de Crédito Oficial
2. **ENISA**—European Union Agency for Network and Information Security

#### References

- Acevedo, M. F. (2016). Building Momentum in Venture Capital across Europe. In G. Metzger (Ed.), *Instituto de Crédito Oficial (ICO)*. Madrid Spain.
- Aizenman, J., & Kendall, J. (2012). The internationalization of venture capital. *Journal of Economic Studies*, 39(5), 488–511. <https://doi.org/10.1108/01443581211259446>
- ASCRI. (2018). *Spanish association of capital, growth in investment*. ASCRI/webcapitalriesgo.
- Banco de España.(2017). *Report on the financial and banking crisis in Spain, 2008-2014*. Banco de España, Madrid. <http://www.ssrn.com/abstract=2016027>
- Bertoni, F., Martí, J., & Reverte, C. (2019). The impact of government-supported participative loans on the growth of entrepreneurial ventures. *Research Policy*, 48(1), 371–384. <https://doi.org/10.1016/j.respol.2018.09.006>
- Black, B. S., & Gilson, R. J. (1998). Venture Capital and the structure of capital markets: banks versus stock markets. *Journal of Financial Economics*, 47 (3), 243–277. [https://kopernio.com/viewer?doi=10.1016/S0304-405X\(97\)00045-7&route=1](https://kopernio.com/viewer?doi=10.1016/S0304-405X(97)00045-7&route=1)
- Black, B. S., & Gilson, R. J. (1999). Does venture capital require an active stock market? *Journal of Applied Corporate Finance*, 11 (4), 36–48. <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1745-6622.1999.tb00512.x>
- Bonnet, C., & Wirtz, P. (2012). Raising capital for rapid growth in young technology ventures: When business angels and venture capitalists coinvest. *Venture Capital*, 14(2–3), 91–110. <https://doi.org/10.1080/13691066.2012.654603>
- Brown, R., & Lee, N. (2016). *The future of funding for small and medium-sized enterprises in the UK*. Centre for Responsible Banking & Finance. <https://www.fca.org.uk/publication/research/future-funding-sme-uk.pdf>
- Brush, C. G., Edelman, L. F., & Manolova, T. S. (2012). Ready for funding? Entrepreneurial ventures and the pursuit of angel financing. *Venture Capital: An International Journal of Entrepreneurial Finance*, 14(2–3), 111–129. <https://doi.org/10.1080/13691066.2012.654604>
- Burdekin, R. C. K., & Siklos, P. L. (2012). Enter the dragon: Interactions between Chinese, US and Asia-Pacific equity markets, 1995–2010. *Pacific Basin Finance Journal*, 20(3), 521–541. <https://doi.org/10.1016/j.pacfin.2011.12.004>
- Bygrave, W. D., & Timmons, J. (1992). *Venture capital at the crossroads*. Harvard Business School Press.
- Carvell, S. A., Kim, J. Y., Ma, Q., & Ukhov, A. D. (2013). Economic and capital market antecedents of venture capital commitments (1960–2010). *International Entrepreneurship and Management Journal*, 9(2), 167–182.
- Caselli, S. (2010). *Private equity and venture capital in Europe (Markets, techniques, and deals)* (1st ed.). Academic Press.
- Casey, E., & O'Toole, C. M. (2014). Bank lending constraints, trade credit and alternative financing during the financial crisis: Evidence from European SMEs. *Journal of Corporate Finance*, 27, 173–193. <https://doi.org/10.1016/j.jcorpfin.2014.05.001>

- Cumming, D., Fleming, G., & Suchard, J. A. (2005). Venture capitalist value-added activities, fundraising and drawdowns. *Journal of Banking and Finance*, 29(2), 295–331. <https://doi.org/10.1016/j.jbankfin.2004.05.007>
- Cumming, D. (2011). Public policy and the creation of active venture capital markets. *An International Journal of Entrepreneurial Finance*, 13(1), 75–94. <https://doi.org/10.1080/13691066.2010.492989>
- European Commission. (2013). *Innovation Union Competitiveness report 2013*. Eur 25650 En. <https://doi.org/10.2777/44320>
- Eurostat. 2017. *Eurostat annual report*.
- Fisher, P. S. (1988). State venture capital funds as an economic development strategy. *Journal of the American Planning Association*, 54(2), 166–177. <https://doi.org/10.1080/01944368808976471>
- Frimpong, F. A., Akwa-Sekyi, E. K., & Saladrignes, R. (2022). Venture capital healthcare investments and health care sector growth: A panel data analysis of Europe. *Borsa Istanbul Review*, 22(2), 388–399. <https://doi.org/10.1016/j.bir.2021.06.008>
- Gompers, P., & Lerner, J. (1999). What drives venture capital fundraising? *Microeconomics*. <https://doi.org/10.3386/w6906>
- Gompers, P., & Lerner, J. (2001). The venture capital revolution. *Journal of Economic Perspective*, 15(2), 145–168. <https://doi.org/10.1257/jep.15.2.145>
- Granger, C. W. J., & Wess, A. A. (2001). *Studies in econometrics, time series and multivariate statistics: Time series analysis of error-correction models*. Academic Press.
- Harris, R. S., Jenkinson, T., Kaplan, S. N., & Stucke, R. (2018). Financial intermediation in private equity: How well do funds of funds perform? *Journal of Financial Economics*, 129(2), 287–305. <https://doi.org/10.1016/j.jfineco.2018.04.013>
- Hellmann, T., Lindsey, L., & Puri, M. (2004). Building relationship early: Banks in venture capital. *Review of Financial Studies*, 21(2), 513–541. <https://doi.org/10.1093/rfs/hhm080>
- Ilmanen, A., & Kizer, J. (2012). The death of diversification has been greatly exaggerated. *The Journal of Portfolio Management*, 38(3), 15–27. <https://doi.org/10.3905/jpm.2012.38.3.015>
- Jenkinson, T. (2008). *The development and performance of European private equity*. OFRC Working Papers Series 2008fe17, Oxford Financial Research Centre. <http://www.nuffield.ox.ac.uk/economics/papers/ofrc/PrivateEquityinEurope3.pdf>
- Kang, J., Li, Y., & Oh, S. (2022). Venture capital coordination in syndicates, corporate monitoring, and firm performance. *Journal of Financial Intermediation*, 50, 100948. <https://doi.org/10.1016/j.jfi.2022.100948>
- Kaplan, S., & Schoar, A. (2005). Private equity performance: Returns, persistence and capital flows. *Journal of Finance*, 60(4), 1791–1823. <https://doi.org/10.3386/w9807>
- Kenney, M., Han, K., & Tanaka, S. (2013). The globalization of venture capital: The cases of Taiwan and Japan. *Financial Systems, Corporate Investment in Innovation, and Venture Capital*, 52–84. <https://doi.org/10.4337/9781845420642.00008>
- Lahr, H., & Trombley, T. E. (2020). Early indicators of fundraising success by venture capital firms. *Journal of Corporate Finance*, 65, 101672.
- Lee, N., Sameen, H., & Cowling, M. (2015). Access to finance for innovative SMEs since the financial crisis article (Accepted version) (Refereed) access to finance for innovative SMEs since the financial crisis. *LSE Research Online*, 2, 370–380. <https://doi.org/10.1016/j.respol.2014.09.008>
- Lerner, J., & Tåg, J. (2013). Institutions and venture capital. *Industrial and Corporate Change*, 22(1), 153–182. <https://doi.org/10.1093/icc/dts050>
- Lin, L. I. N. (2017). Venture capital exits and the structure of stock markets: Lessons from China. *Asian Journal of Comparative Law*, 12(1), 1–40. <https://doi.org/10.1017/asjcl.2016.15>
- Lumme, A., Mason, C., & Suomi, M. (2013). *Informal venture capital: Investors, investments and policy issues in Finland*. Springer Science & Business Media.
- Luukkonen, T., Deschryvere, M., & Berton, F. (2013). The value added by government venture capital funds compared with independent venture capital funds. *Technovation*, 33(4–5), 154–162. <https://doi.org/10.1016/j.technovation.2012.11.007>
- Madhavan, R., & Iriyama, A. (2009). Understanding global flows of venture capital: Human networks as the “carrier wave” of globalization. *Journal of International Business Studies*, 40(8), 1241–1259. <https://doi.org/10.1057/jibs.2009.6>
- Martin, R., Sunley, P., & Turner, D. (2002). Taking risks in regions: The geographical anatomy of Europe’s emerging venture capital market. *Journal of Economic Geography*, 2(2), 121–150. <https://doi.org/10.1093/jeg/2.2.121>
- Mayer, C., Schoors, K., & Yafeh, Y. (2005). Sources of funds and investment activities of venture capital funds: Evidence from Germany, Israel, Japan and the United Kingdom. *Journal of Corporate Finance*, 11(3), 586–608. <https://doi.org/10.1016/j.jcorpfin.2004.02.003>
- Meggison, W. L. (2004). Toward a global model of venture capital?. *Journal of applied corporate finance*, 16(1), 89–107.
- Metrick, A., & Yasuda, A. (2011). Venture capital and other private equity: A survey. *Journal of European Financial Management*, 17(4), 619–654. <https://doi.org/10.1111/j.1468-036X.2011.00606.x>
- Milosevic, M. (2018). Skills or networks? Success and fundraising determinants in a low performing venture capital market. *Research Policy*, 47(1), 49–60. <https://doi.org/10.1016/j.respol.2017.09.009>
- OECD. (2014). *Perspectives on global development*. OECD iLibrary. [https://doi.org/10.1787/persp\\_glob\\_dev-2012-en](https://doi.org/10.1787/persp_glob_dev-2012-en)
- OECD. (2015). *Innovation strategy - An agenda for policy action*. *OECD Reviews of Innovation Policy*, <https://doi.org/10.1787/9789264039827-en>
- Oehler, A., Pukthuanthong, K., Rummer, M., & Walker, T. (2007). Venture capital in Europe: Closing the gap to the U.S. In G. N. Gregoriou, M. Kooli, & R. Kraeusel (Eds.), *Venture capital in Europe*. *Quantitative finance* (pp. 3–17). Elsevier.
- Orduna, C. C., & Pasquier, D. (2013). An approach on the financing of French and Spanish midsize companies. *Análisis Financiero*, 122, 55–62. *Innovation Policy*. <https://doi.org/10.1787/9789264039827-en>
- Otchere, I., & Vong, A. P. (2016). Venture capitalist participation and the performance of Chinese IPOs. *Emerging Markets Review*, 29, 226–245.
- Pezeshkan, A., Smith, A., Fainshmidt, S., & Nair, A. (2020). A neo-configurational institutional analysis of international venture capital attractiveness and performance: Insights for Asia-Pacific. *Asia Pacific Journal of Management*, 1–29.
- Proksch, D., Stranz, W., Röhr, N., Ernst, C., Pinkwart, A., & Schefczyk, M. (2017). Value-adding activities of venture capital companies: A content analysis of investor’s original documents in Germany. *Venture Capital*,

- 19(3), 129–146. <https://doi.org/10.1080/13691066.2016.1242573>
- Samila, S., & Sorenson, O. (2010). Venture capital as a catalyst to commercialization. *Journal of Research Policy*, 39(10), 1348–1360. <https://doi.org/10.1016/j.respol.2010.08.006>
- Schmid, F. A. (2001). Equity financing of the entrepreneurial firm. *Review*, 83(6), 15–28. <https://doi.org/10.20955/r.83.15-28>
- Tian, X. (2011). The causes and consequences of venture capital stage financing. *Journal of Financial Economics*, 101(1), 132–159. <https://doi.org/10.1016/j.jfineco.2011.02.011>
- Vermeulen, E. P. M., & Pereira, D.N. D. (2012). The evolution and regulation of venture capital funds. *Lex Research Topics in Corporate Law & Economics*, No. 2012-1, <http://dx.doi.org/10.2139/ssrn.2163193>
- Wong, A., Bhatia, M., & Freeman, Z. (2009). Angel finance: The other venture capital. *Online Wiley*, 18(7–8), 221–230. <https://doi.org/10.1002/jsc.849>
- World Bank Group: Trade and Competitiveness. (2014) *Financing business innovation: A review of external sources of funding for innovative businesses and public policies to support them.*
- Wright, M., Pruthi, S., & Lockett, A. (2005). International venture capital research: From cross-country comparisons to crossing borders. *International Journal of Management Reviews*, 7(3), 135–165. <https://doi.org/10.1111/j.1468-2370.2005.00113.x>



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