THE "DOUBLE MARKET" APPROACH IN VENTURE CAPITAL AND PRIVATE EQUITY ACTIVITY: THE CASE OF EUROPE

MARINA BALBOA
JOSÉ MARTÍ

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Marina Balboa[*]
José Martí[**]

Abstract

This paper aims to contribute to the understanding of the factors that determine fundraising and investment in the private equity market in Europe. These are analysed separately, since the lags faced in this activity determine the existence of two separate markets. As a result, private equity institutions deal with different agents, namely investors (fundraising) and firms (investment), whose link with the market is affected by different determinants. The results show that liquidity and the size of the local market are the main factors determining fundraising whereas liquidity and research and development expenditure determine investments in early stage firms.

Keywords: equilibrium, fundraising, investment, private equity, venture capital.

JEL Classification: G24, G32.

[*] Dep. Financial Economics. University of Alicante (03080), Spain. Phone: +34 965903621. Email: marina.balboa@ua.es

[**] Dep. Finance. University Complutense of Madrid (28223), Spain. Phone: +34 913942310. Email: jmartipe@ccee.ucm.es

1. Introduction

Venture Capital and Private Equity (VC/PE, henceforth) activity has shown a dramatic increase over the past decades. There is growing evidence of its impact on economic activity in different ways, particularly in innovation (Hellmann and Puri, 2000; Kortum and Lerner, 2000; Tykvova, 2000; Engel and Keilbach, 2002), management professionalisation (Davila, Foster and Gupta, 2003) and employment (Belke, Fehn and Foster, 2003; Alemany and Marti, 2005).

VC/PE institutions act as financial intermediaries that reduce the information asymmetry between investors and entrepreneurs (Chan, 1983). Nevertheless, VC/PE activity is very different from that of other financial intermediaries, where there is an automated allocation process of the money committed by investors into the final assets in which their money is going to be placed (i.e. mutual funds). In contrast with other financial markets, the role of the intermediary, namely the VC/PE institution, cannot be erased because of the existence of important lags in the process of raising funds and, more specifically, in the allocation of those funds to unlisted firms. As a result, in the long term the equilibrium in VC/PE markets largely depends on the matching between fundraising and investment figures. The evidence has shown a high variability of fundraising and investment figures over time (Gompers and Lerner, 1998; 2001; 2002; Balboa and Martí, 2006), stressing the need for further research on the determinants of VC/PE activity.

The main objective of this paper is to present a theoretical model that sheds light on the main drivers of VC/PE activity, namely, fundraising and investment. In order to do so, this paper discuses the drivers of supply and demand in two submarkets, focusing on the relevant variables for each agent in each submarket. The first one considers the interaction between investors (supply) and VC/PE organisations (demand), in which fundraising represents the equilibrium between both parties. The second one includes VC/PE organizations (supply) and entrepreneurs (demand) and determines the level of investment that represents the equilibrium between both sides of the market. This is a novel approach in the literature, since to our knowledge, the VC/PE market has not been theoretically analysed as being composed of two submarkets, where fundraising and investment figures would represent the equilibrium reached in each one.

This paper contributes to the literature in two ways. First, it provides a novel theoretical model to determine the level of fundraising and investment as the equilibrium result of two submarkets. This idea allows us to represent the particularities of the VC/PE market, which are caused by the lags in the fundraising and investment processes. Second, the determinants are analysed on the largest multi- country sample ever collected using homogeneous data, with results that are in line with partial approaches found in previous literature. The results show the importance of industry-specific liquidity measures, such as initial public offerings (IPO, hereafter) and trade sales, in both sides of the market, and also research and development (R&D) expenditures, in the investment side of the market. Also, the results show that the determinants of investments are different according to the stage of development of the firm in which the investment is done.

The rest of the paper is organised as follows. In the second section the determinants of VC/PE activity in the literature are revised and the 'double market' approach is developed to understand equilibrium in VC/PE markets. The third section includes a description of the data and the methodology applied. In the fourth there is an analysis of the results obtained and the fifth presents the conclusions and discusses the implications of the results.

2. Literature review and theoretical base

2.1. The determinants of VC/PE activity

New and recently-formed companies face many difficulties in accessing financial resources. This is an old problem highlighted as the 'equity gap' by the Macmillan Committee (1931). VC is a type of financing that reduces the gap in the case of innovative small firms, with an increasing activity in the United States (US) after World War II, which grew substantially after the change of the 'prudent man' rule implemented in the Employee Retirement Income Security Act (ERISA) in 1979. Its use was exported to Europe extensively in the early eighties. But soon the statistics compiled by the European Private Equity and Venture Capital Association (EVCA) showed that an increasing share of the invested money was allocated to larger and more mature firms. As a result a new concept, namely PE, emerged as a better way to explain the

investment activity carried out in Europe. The purpose is still to help cover the equity gap, which is larger in Europe, thus giving rise to the need of alternative sources, such as PE, to supply liquidity to unlisted firms at different stages of development.

Since the seminal works by Bygrave and Timmons (1985) and Bygrave and Shulman (1988), which are based on a limited number of observations, some papers have contributed to the understanding of the drivers of VC/PE markets. Although the first empirical papers on this issue focused on the US market, there is recent literature that provides evidence on the European markets. Regarding the US evidence, Gompers and Lerner (1998) study the determinants of VC fundraising from two perspectives, the industry aggregates and the commitments to individual funds. Regarding the former they find that only gross domestic product (GDP) growth is significant in all specifications, whereas ERISA regulation, interest rate and capital gains taxation are significant only in some specifications. They also find that, in addition to the impact of macroeconomic and environment-related variables, such as interest rates, and stock market returns, reputation and performance are important drivers of fundraising at the fund level. The importance of reputation at the fund level is also noted in Balboa and Marti (2007).

Jagwani (2000) notes, also for the US market, that the factors that influence VC activity usually do so via their influence on the expected profit. Using data from 1978 to 1995, he finds that the total amount of commitments made by the VC industry in a given year depends on the capital gains tax rate and the interest rates. He also states that the national R&D spending contributes to fundraising in the VC industry.

Messica and Agmon (2007) focus on the US VC industry over the period from 1980 to 2006. Although they do not analyse the empirical determinants of the supply and demand, they do analyse the shifts in supply and demand that have occurred during this period and state that the demand for and the supply of high-risk capital behave in a different way from the classic analysis of demand and supply. As a result, according to these authors, the VC market is determined by the supply side, due to the entrance of pension funds in the VC industry.

Regarding the evidence in the European markets, Manigart and Beuselinck (2001) focus only on the supply of VC by governments. They use data from the 10 European countries with most VC activity during the period from 1989 to 1999. Their results show that governments leave the initiative to the private sector and only intervene in cases

when the private sector is deficient. There is also some evidence of a direct government intervention in the VC industry when there is a bad economic climate, such as a decrease in GDP growth, the interest rates and the number of IPOs. However, contrary to expectations, they also find that high levels of seed and start-up investment lead to a higher supply of government VC funds.

The study of the role of VC by governments in the European context is also analysed by McGlue (2002). He points out that not all small companies will be better off with equity, so that VC is not the most appropriate form of finance for all small businesses. He adds that even improving the supply side of VC is just one side of the equation, since an appropriate framework should also exist on the demand side to support the growth of companies. Finally, he states that the most significant role the public sector can play in developing the informal VC is through the sensitive issues of tax policy.

Schertler (2003) discusses the determinants affecting VC demand and supply and estimates a reduced form combining both equations. The results according to the narrow definition of VC, defined as early stage investments, show that stock market capitalisation, human capital endowments and the rigidity of labour markets have an impact on these investments. The model proposed, however, does not yield interpretable results in the case of a broader definition of VC, which also includes expansion and late stage investments.

From a multi-country perspective, Jeng and Wells (2000) address the issue of the determinants of venture funding on a panel of 15 countries, including the US market. They introduce two models to represent supply and demand of venture activity as a function of returns, IPOs, accounting standards, GDP growth and market capitalisation growth. The equation representing the demand also includes a variable measuring labour market rigidities. They then solve for the equilibrium quantity considering both equations. Their estimation is performed across countries, which implies that the number of observations shrinks to the number of countries, and within countries. Regarding the former, the results show that IPOs and accounting standards significantly affect the total amounts invested in almost all specifications whereas labour market rigidity exerts a negative effect on early stage investments. Regarding the latter, the results show that

the IPO activity is also significant. The results are similar when the endogenous variable is the amount of new funds raised.

The separation of the VC/PE market is not evident in the literature. Just a few papers specifically concentrate on one side of the market, such as Gompers and Lerner (1998). Others implicitly cover only one side, by working with data either related to fundraising or, more frequently, to the investment activity. Jeng and Wells (2000) and Schertler (2003) rely on aggregate investment data of an unbalanced panel of several developed countries. Likewise, Romain and Van Pottelsberghe (2003) describe a model to determine the level of VC activity, but their data refer only to investments, thus omitting the fundraising side. Therefore, to our knowledge, there is no previous evidence on the analysis of two submarkets in the VC/PE activity, each one composed of its own supply and demand.

2.2. Theoretical model about the VC/PE market

VC/PE organisations act as financial intermediaries who reduce the information asymmetry between entrepreneurs/firms seeking funding and potential investors. For that purpose, they set up funds and allocate the resources to selected companies. The allocation process requires the connection between the supply of funds by investors and the demand for funds by firms. Gompers and Lerner (2002) explain the equilibrium of the VC market in aggregate terms. The supply of funds depends on the desire of investors to pledge funds to VC - the higher the return, the more inclined investors will be. The demand depends on the number of firms looking for VC - the higher the return required by investors, the fewer the number of companies able to meet that requirement.

There are some particular issues in this market, however, that could affect the self-regulation process between supply and demand. As regards fundraising, it takes on average 12 to 18 months to raise a new fund. Turning to the investment side, since each investment requires from three to six months to be completed (Sahlman, 1990; Fried and Hisrich, 1994), it usually requires between three to four years to allocate the commitments of a VC/PE fund. Gompers and Lerner (2002) indirectly highlight this problem when they describe that, when there is a shock in demand, the short term supply curve is perfectly inelastic, since it can not respond quickly to that change. Rigidity of supply is also mentioned by Balboa and Martí (2006), as they find evidence of fundraising overreaction produced by changes in demand. In their study they ponder the

changes in demand in the process of growth of the European VC/PE markets, at the peak of the New Economy.

This situation leads to an effective split of the market into two submarkets, each of them with its own supply and demand, with the level of PE activity being the result of the interaction between both submarkets. This idea is presented in Figure 1. In the first submarket the investors supply money to the VC/PE organisation and, in the second, the VC/PE organisation allocates the funds to firms in search of funding. The equilibrium of the first submarket is a function of the resources available to invest and the return that investors are willing to accept, but also of the amount of money that the VC/PE institutions are willing to take under management. The equilibrium is reached at an amount of funds raised by VC/PE organisations. The balance in the second submarket depends on the funds that VC/PE organisations have available for allocation and on the demand for funds by firms and entrepreneurs for developing their projects. The equilibrium is reached at the amount of investment committed in a given period. On aggregate, the level of VC/PE activity depends on the equilibrium between the two sides, fundraising and investment, while some variables affect either one or both of the sides.

Figure 1. The 'double market' approach in VC/PE activity
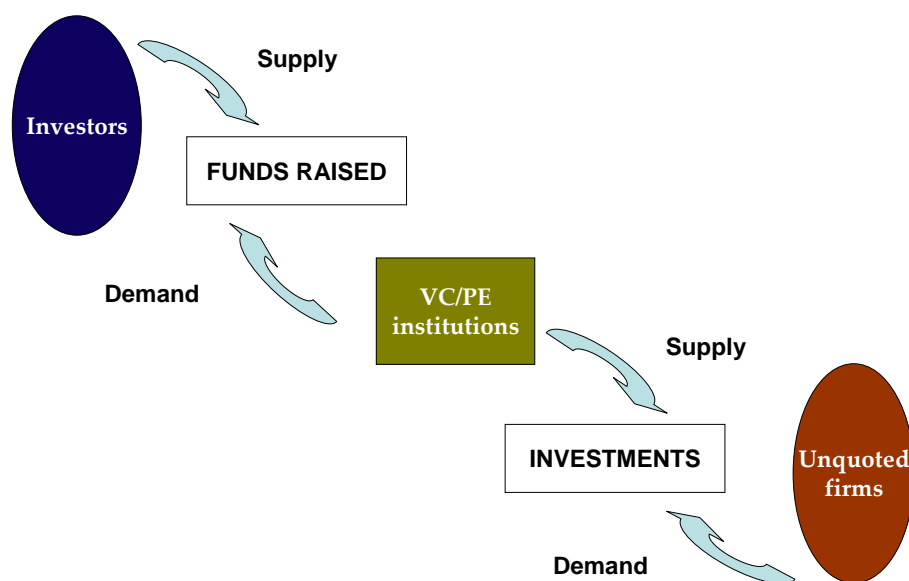
Source: Own elaboration.

Therefore, the analysis should consider the various determinants that affect the different players involved in the fundraising submarket (investors and VC/PE managers) when compared with those of the investment submarket (VC/PE managers and entrepreneurs/firms). Regarding the former, supply is represented by the amount of money that investors are willing to commit to VC/PE vehicles, whereas demand is the amount of funds that VC/PE managers are willing to take from investors, to be later allocated to unlisted firms. As regards supply, a positive slope between price (return) and quantity is expected, with the volume of new funds raised representing the quantity. The return of VC/PE investments would be a function of the amount of funds raised plus other determinants that are relevant for investors. Since this is a specialised market, most of the money comes from institutional investors who consider VC/PE to be like any other asset class. Therefore, an increase in the return on alternative assets, such as listed shares or long term bonds, could have a negative impact on VC/PE activity. Supply could then be represented through the following model:

$$VC/PE\ return^S = b_0^S + b_1^S FR^S + b_2^S IR + b_3^S SMR \qquad (1)$$

where

- $VC/PE\ return^S$: Return expected by investors from VC/PE funds.
- FR^S: Volume of funds that investors are willing to commit to VC/PE funds.
- IR: Long term interest rates.
- SMR: Stock market return.

The coefficient of FR^S would be positive, since suppliers are willing to increase the quantity if the price increases, whereas the coefficients or IR and SMR would be negatively correlated with the amount committed to VC/PE and, subsequently, with VC/PE returns.

Regarding demand, we would expect a negative relationship between return and quantity, since VC/PE managers would be less willing to launch more VC/PE funds if the returns expected by investors are too high to be met. Other determinants should be considered as well, such as the GDP growth, which should positively affect the expected returns on VC/PE funds. Similarly, since VC/PE funds invest in unlisted firms, any reference to the liquidity in the market and/or the industry should be important as well. In this respect, market capitalisation could be viewed as a proxy of the degree of

development of the capital markets, which is a condition, highlighted by Black and Gilson (1998), to the development of the VC/PE markets. The larger the size of capital markets the easier it is for VC/PE managers to exit their investments and return the proceeds to investors. In addition to this general reference of liquidity, sector-specific variables representing liquidity should be considered as well. The IPO activity has been extensively used in the literature, but any other sector-related reference of successful exits, such as trade sales or secondary buyouts in the case of Europe, could also be a useful proxy. As a result, demand could be modelled as follows:

$$VC / PE \, return^D = b_0^D + b_1^D FR^D + b_2^D MCAP + b_3^D EXITS + b_4^D GDPg \qquad (2)$$

where

- $PE \, return^D$: Return that VC/PE managers expect to earn on the VC/PE funds they launch.
- FR^D: Volume of funds that VC/PE managers are willing to raise.
- MCAP: Stock market capitalisation.
- EXITS: Volume of divestments by means of successful ways.
- GDPg: Real GDP growth.

In equilibrium both curves would intercept, determining the amount of new funds raised at a given expected VC/PE return, where $VC / PE \, return^S = VC / PE \, return^D$. Therefore,

$$b_0^S + b_1^S FR + b_2^S IR + b_3^S SMR = b_0^D + b_1^D FR + b_2^D MCAP + b_3^D EXITS + b_4^D GDPg \qquad (3)$$

and in equilibrium $FR^S = FR^D = FR$, thus allowing us to solve for the amount of funds raised, FR:

$$(b_1^S - b_1^D)FR = (b_0^D - b_0^S) - b_2^S IR - b_3^S SMR + b_2^D MCAP + b_3^D EXITS + b_4^D GDPg \qquad (4)$$

$$FR = \frac{(b_0^D - b_0^S)}{(b_1^S - b_1^D)} - \frac{b_2^S}{(b_1^S - b_1^D)} IR - \frac{b_3^S}{(b_1^S - b_1^D)} SMR + \frac{b_2^D}{(b_1^S - b_1^D)} MCAP + \frac{b_3^D}{(b_1^S - b_1^D)} EXITS + \frac{b_4^D}{(b_1^S - b_1^D)} GDPg$$

$$(5)$$

Since $b_1^S - b_1^D > 0$, due to the expected negative sign of fundraising in the demand curve, the signs of the resulting coefficients would remain unchanged. Therefore, to estimate the amount of funds raised in equilibrium, the model would stand as:

$$FR = b_0 + b_1 IR + b_2 SMR + b_3 MCAP + b_4 EXITS + b_5 GDPg \qquad (6)$$

All the coefficients in equation (6) are expected to be positive, since the ones related to IR and SMR would change their signs from equation (1) to equation (6).

In the same vein, the second submarket would relate VC/PE managers with entrepreneurs/firms seeking finance. On the supply side we would consider the relation between the returns that VC/PE managers may get from their investments and the amount invested. In this case, the larger the expected returns, the larger the amount VC/PE managers are willing to commit, with the rest of the determinants being the ones shown in equation (2). The supply would be represented as:

$$\text{INV return}^S = a_0^S + a_1^S \text{INV}^S + a_2^S \text{MCAP} + a_3^S \text{EXITS} + a_4^S \text{GDPg} \qquad (7)$$

where

- $INV\ return^S$: Return that VC/PE managers are expected to earn on their VC/PE investments.
- INV^S: Volume of funds that VC/PE managers are willing to commit to investee firms.

The coefficients of market capitalisation, exits and GDP growth should be positive. The higher the market capitalisation, the higher the chances of taking the investee firm public, thus, having access to both additional funding for further growth and a market reference to cash-out the shareholding at market prices. Also, the higher the volume of successful divestments (such as IPOs), the higher the expected returns on investments, since this would represent the most profitable way of exit. Finally, the higher the growth of GDP, the higher the expected returns on investments.

As regards demand, there would be an inverse relationship between price (returns) and quantity since the larger the return, the smaller the number of investments that would be able to match that return. But this relationship should also take into consideration other factors that may affect firm performance and/or the return from the

investee firm, such as interest rates, market capitalisation, successful divestments, GDP growth, R&D expenditures, taxes and labour market rigidities.

$$\mathrm{INV\,return}^{D} = a_0^D + a_1^D \mathrm{INV}^D + a_2^D \mathrm{IR} + a_3^D \mathrm{MCAP} + a_4^D \mathrm{EXITS} +$$
$$+ a_5^D \mathrm{GDPg} + a_6^D \mathrm{RD} + a_7^D \mathrm{TAX} + a_8^D \mathrm{LAB} \tag{8}$$

where

- o *INV return^D*: Expected return from investments on portfolio firms.
- o *INV^D*: Volume of funds demanded by entrepreneurs/ firms.
- o RD: R&D expenditures.
- o TAX: Taxes that affect the net income of shareholders (corporation tax).
- o LAB: Labour market rigidities.

The expected signs of the coefficients of the additional variables considered in this equation would be as follows. Interest rates, labour market rigidities and taxes should have a negative impact on returns. Higher interest rates would imply lower returns for the entrepreneur due to the lower earnings after interest and taxes reported. Labour market rigidities limit the chances of firms rapidly adapting to the changing market conditions, thus lowering the expected long term return on investments. In the case of taxes, the higher the taxes paid, the lower the after tax earnings of investee firms and the lower the expected return on VC/PE investments. Nevertheless, regarding buyout investments, since those require high volumes of debt, an increase in corporate taxes would imply larger tax credits for the firm. Finally, R&D spending should have a positive impact, since the higher this value, the higher the expected returns on investments via future profitable investments.

As in the case of fundraising, in equilibrium both curves would intercept, determining the amount of investments closed at a given expected investment return, where $\mathrm{INV\,return}^S = \mathrm{INV\,return}^D$. Then, equalling equations (7) and (8):

$$a_0^S + a_1^S INV^S + a_2^S MCAP + a_3^S EXITS + a_4^S GDPg =$$
$$= a_0^D + a_1^D INV^D + a_2^D IR + a_3^D MCAP + a_4^D EXITS + a_5^D GDPg + a_6^D RD + a_7^D TAX + a_8^D LAB \tag{9}$$

In equilibrium, we would also find that $\mathrm{INV}^S = \mathrm{INV}^D = \mathrm{INV}$, and the amount of funds could be estimated by solving for the amount invested (*INV*). Again, since

$a_1^S - a_1^D > 0$ due to the expected negative sign of the amount in the demand curve, the signs of the resulting coefficients would remain unchanged.

$$INV = \frac{(a_0^D - a_0^S)}{(a_1^S - a_1^D)} + \frac{a_2^D}{(a_1^S - a_1^D)}IR + \frac{(a_3^D - a_2^S)}{(a_1^S - a_1^D)}MCAP + \frac{(a_4^D - a_3^S)}{(a_1^S - a_1^D)}EXITS$$

$$+ \frac{(a_5^D - a_4^S)}{(a_1^S - a_1^D)}GDPg + \frac{a_6^D}{(a_1^S - a_1^D)}RD + \frac{a_7^D}{(a_1^S - a_1^D)}TAX + \frac{a_8^D}{(a_1^S - a_1^D)}LAB \qquad (10)$$

Therefore, to estimate the amount of funds raised in equilibrium, the model would stand as:

$$INV = a_0 + a_1 IR + a_2 MCAP + a_3 EXITS + a_4 GDPg + a_5 RD + a_6 TAX + a_7 LAB \qquad (11)$$

Based on the combination of the signs of the coefficients analysed in both curves, the coefficients of MCAP, EXITS and GDPg could be either positive or negative; the coefficient of RD should be positive, whereas the coefficients of IR and LAB should be negative. Regarding TAX, we would expect a negative coefficient on traditional VC investments, whereas a positive sign should be expected for buyouts, as previously commented.

The equilibrium in the VC/PE market as a whole would then depend on the skill that VC/PE managers possess in matching the amounts at the fundraising and investment levels over time, considering that raising additional funds would require twelve to eighteen months, whereas investing funds already raised would take from three to four years.

3. Data and methodology

3.1. Data

The sample analysed covers the period from 1987 to 2007, and the countries included are 19 European Union countries plus Iceland, Norway and Switzerland. For each country and year the data relative to the VC/PE activity refer to the annual volume of funds raised, the annual volume of investments and the annual volume of total divestments. Data on investments are split by stage of development of the investee firm, whereas divestments are broken down by type of divestment, including IPOs, trade

sales, secondary buyouts, write-offs and other means. The source of data is the European Venture Capital and Private Equity Association (EVCA) yearbooks and the corresponding reports from national VC Associations. Regarding the macroeconomic and other institutional variables, which are described in the following subsections, the sources of data are Eurostat, OECD, as well as domestic stock markets.

3.2. Methodology and models

Since the analysis is based on an unbalanced panel of 22 countries, the panel data methodology is employed. All figures are divided by the country's GDP for the corresponding year, so as to reduce the huge differences found in absolute values among countries, as in Jeng and Wells (2000).[1] Regarding the fundraising side, the endogenous variable in equation (6) is the amount of new funds raised per year and country, divided by the country's GDP in that year. All the independent variables are expected to have a positive impact. The independent variables are defined as follows:

- o Interest rates (IR): 10-year government bond yields, taken from the secondary market. Source: Eurostat.

- o Stock market return (SMR): Yearly change in the local All Share Price Index, except for Romania and the United Kingdom (UK), where we included the change in the BET-C Index and the FT100, respectively. Source: OECD, except for Romania (BVB) and the UK (LSE).

- o Market capitalisation (MCAP): Market capitalisation of the local market, divided by the country's GDP. Source: Eurostat, except for local markets belonging to OMX and Euronext.

- o Successful Divestments (EXITS): Amounts divested at cost per year and country through trade sales, IPOs and secondary buyouts, divided by the country's GDP. Source: EVCA.

- o GDP growth (GDPg): Yearly change in GDP in constant terms. Source: Eurostat.

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[1] These authors divide all figures, however, by the average GDP over the whole period considered in their analysis.

Along with all these variables, we have also included two control variables in the empirical estimation of equation (6). The first one aims to capture the cyclicality that is typical in the VC/PE markets. This is included through the consideration of year time dummies from 1987 to 2007[2]. The second one, namely EVCA INDEX, is added to control for institutional variables that are different among countries and that may affect the fundraising activity in the countries analysed. The EVCA index[3] reports the assessment of a country's tax and legal environment as more or less favourable to VC/PE activity. The most favourable value is 1 and the least favourable is 3. The source of this variable is the EVCA.

Regarding the investment side, and to empirically test equation (11), the dependent variable refers to the total amount invested, divided by the country's GDP in the same year. In addition to the independent variables IR, MCAP, EXITS and GDPg, which are described above, the model also includes R&D expenditures, taxes and labour market rigidities. Two measures on R&D are included in order to try to capture the different effect they may have on the dependent variable. Regarding labour market rigidities, two different measures are also included. On the one hand, unemployment rates indicate how rigid the labour market is and reveal unwillingness of firms to hire stable workers who would be expensive to sack when there is a downturn in the economy. Similarly, regarding job tenure, when the number of years that a person has been working in the same place is high, the reluctance to change job is reflecting a high protection of workers. The longer a worker stays in the same firm, the more expensive it would be for the firm to sack him and the less likely that worker would be fired. As a result, job tenure reflects labour market rigidity, which is a barrier for entrepreneurs/firms deciding about their growth projects.

These latter variables would be measured as follows:

o   R&D expenditure (RD):   Gross domestic expenditure on R&D divided by the country's GDP. Source: OECD.

o   R&D expenditure   Share of gross domestic expenditure on R&D financed
    financed by industry   by industry, divided by the country's GDP. Source:

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[2] These dummies take the value 1 in the corresponding year, and 0 otherwise. All these time year dummies have been included in the empirical analysis except one to avoid colinearity issues.
[3] Since this index was computed in 2001 for the first time, the values considered for this variable for the years before 2001 are those of the year 2001. From 2002 on, we take the corresponding value published by EVCA.

(RD_ind):	OECD.
o Corporate tax (TAX):	Measure of the central and sub-central (statutory) corporate income tax rate, which is composed of the adjusted central government rate plus the sub-central rate. Source: OECD, except for Iceland (KPMG).
o Unemployment rate (UR):	Harmonised unemployment rates per year. Source: OECD, except Romania (Eurostat).
o Average job tenure (JOB_TEN):	Average percentage of workers over the whole period that have been in their current or main job or with their current employer over 10 years. Source: OECD.

As in the case of fundraising, equation (11), which represents the volume of investments carried out, is empirically estimated by adding the same time year dummies.

Due to the aggregate nature of the total amount invested in Europe and to the fact that the determinants on investment might vary according to the stage of development of the firm, including early stage, expansion and buyouts in the same regression could lead to misleading results. Therefore, the regression on investments is also run considering as dependent variable: 1) VC investments, defined as early stage plus expansion, and 2) buyout investments. In both kind of investments, the anticipated signs of some variables, such as IR, MCAP, GDPg, UR and JOB_TEN are expected to remain unchanged, since these variables refer to the environment and do not vary across firms in the same country. In the case of the variable EXITS, and although it varies across firms, the literature has already given evidence of the significant positive impact of successful investments in VC but also in PE investments, so no significant differences are expected to be found according to the stage of development of the firm. On the contrary, the variables RD, RD_ind and TAX might change when investments are split by stage of development. Regarding the variable TAX, although it does not change across firms in the same country, differences may be encountered since there are larger tax credits on buyout investments.

3.3. Descriptive statistics

The literature has provided evidence of the existence of sharp movements of fundraising and investment figures that have taken place in the market over time as well

as the short term imbalances between those two variables in some years (Gompers and Lerner (2001). Figure 2 shows the volume of funds raised and invested over the sample period. The figures in circles represent an excess in the volume of funds raised, which should be allocated in the following years. These stylized facts highlight the need for a greater understanding of the main drivers of VC/PE activity.

Figure 2. Aggregate private equity flows in Europe
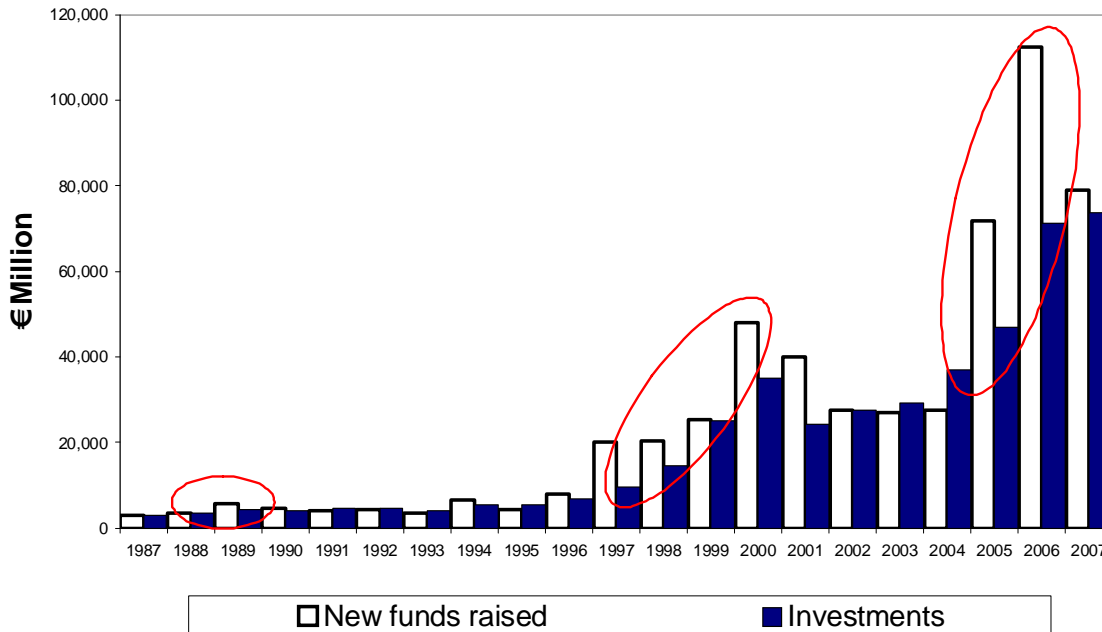
Source: EVCA 1988-2008 Yearbooks.

For each country, Tables 1 and 2 show some descriptive statistics (mean, median, standard deviation, minimum and maximum) of the volume of VC/PE funds raised and the amount invested, respectively, normalised by GDP. As can be observed, the highest percentage of funds raised and volume invested are, by far, those of Sweden and the United Kingdom. It is important to highlight the large difference between the minimum and maximum percentages in all countries, reflecting the growth of the industry but also the volatility of the values over time.

Table 1. Percentage of funds raised relative to gross domestic product

Country	Mean	Median	Standard Deviation	Minimum	Maximum
United Kingdom	0.924%	0.576%	0.924%	0.180%	3.921%
Sweden	0.579%	0.340%	0.729%	0.013%	2.999%
Switzerland	0.269%	0.240%	0.185%	0.060%	0.528%
The Netherlands	0.265%	0.253%	0.214%	0.037%	0.668%
France	0.234%	0.128%	0.194%	0.066%	0.663%
Iceland	0.219%	0.126%	0.332%	0.004%	1.341%
Greece	0.206%	0.035%	0.619%	0.003%	2.433%
Finland	0.197%	0.124%	0.194%	0.004%	0.564%
Europe as a whole	**0.196%**	**0.128%**	**0.194%**	**0.000%**	**3.921%**
Norway	0.149%	0.089%	0.142%	0.000%	0.548%
Poland	0.143%	0.162%	0.102%	0.013%	0.344%
Czech Republic	0.128%	0.074%	0.178%	0.003%	0.611%
Spain	0.128%	0.082%	0.138%	0.016%	0.499%
Denmark	0.127%	0.039%	0.153%	0.001%	0.491%
Ireland	0.126%	0.100%	0.108%	0.009%	0.405%
Belgium	0.120%	0.077%	0.096%	0.023%	0.324%
Germany	0.093%	0.060%	0.082%	0.010%	0.296%
Portugal	0.092%	0.062%	0.075%	0.008%	0.304%
Italy	0.089%	0.086%	0.066%	0.013%	0.246%
Hungary	0.084%	0.093%	0.056%	0.000%	0.152%
Romania	0.079%	0.040%	0.093%	0.016%	0.290%
Austria	0.051%	0.052%	0.048%	0.000%	0.159%
Slovakia	0.015%	0.014%	0.008%	0.003%	0.029%

Percentage of the annual volume of funds raised, normalised by GDP. EU-15 plus Iceland, Norway and Switzerland statistics consider the period starting from 1987, whereas Central and Eastern European Countries start in the late nineties.

Source: EVCA yearbooks (1988-2008).

Table 2. Percentage of investments relative to gross domestic product

Country	Mean	Median	Standard Deviation	Minimum	Maximum
United Kingdom	0.703%	0.429%	0.586%	0.237%	2.304%
Sweden	0.407%	0.180%	0.443%	0.017%	1.359%
The Netherlands	0.263%	0.224%	0.176%	0.074%	0.693%
France	0.213%	0.105%	0.176%	0.053%	0.663%
Iceland	0.204%	0.077%	0.375%	0.010%	1.513%
Switzerland	0.154%	0.114%	0.082%	0.077%	0.290%
Europe as a whole	**0.151%**	**0.110%**	**0.147%**	**0.000%**	**2.304%**
Finland	0.138%	0.124%	0.142%	0.006%	0.554%
Spain	0.117%	0.057%	0.113%	0.018%	0.412%
Denmark	0.116%	0.033%	0.153%	0.011%	0.532%
Belgium	0.114%	0.082%	0.086%	0.023%	0.297%
Norway	0.112%	0.115%	0.078%	0.001%	0.339%
Germany	0.108%	0.100%	0.089%	0.008%	0.308%
Italy	0.106%	0.057%	0.089%	0.013%	0.273%
Ireland	0.094%	0.081%	0.047%	0.039%	0.214%
Poland	0.091%	0.071%	0.040%	0.056%	0.185%
Romania	0.088%	0.063%	0.069%	0.035%	0.245%
Hungary	0.076%	0.050%	0.066%	0.016%	0.241%
Portugal	0.075%	0.068%	0.042%	0.005%	0.163%
Czech Republic	0.054%	0.035%	0.057%	0.011%	0.198%
Greece	0.040%	0.015%	0.057%	0.001%	0.199%
Austria	0.031%	0.010%	0.033%	0.000%	0.095%
Slovakia	0.012%	0.010%	0.010%	0.004%	0.036%

Percentage of the annual volume of investments committed, normalised by GDP. EU-15 plus Iceland, Norway and Switzerland statistics consider the period starting from 1987, whereas Central and Eastern European Countries start in the late nineties.
Source: EVCA yearbooks (1988-2008).

The growth of fundraising, investment and divestment figures over time, normalised by GDP, is shown in Table 3. Except for a few years, the VC/PE activity has registered positive growth in terms of these three variables. The fundraising activity experienced a higher growth in 2005 and 2007. In the case of investments, 1990 and 2007 are the years with the highest growth in activity. Regarding divestments, 1991 and 2005 record the highest growth.

Table 3. Growth of private equity activity relative to gross domestic product

Year	Fundraising		Investments		Divestments	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
1988	42.950%	99.806%	9.383%	41.751%	120.049%	176.273%
1989	61.093%	247.267%	49.714%	167.992%	-15.556%	63.177%
1990	34.438%	153.494%	392.864%	1333.152%	135.718%	327.234%
1991	8.444%	71.394%	10.484%	70.335%	140.234%	294.894%
1992	6.471%	70.264%	53.678%	253.963%	66.936%	208.674%
1993	80.090%	176.318%	-0.013%	57.307%	54.446%	121.265%
1994	110.209%	205.296%	53.027%	91.434%	-6.412%	66.788%
1995	126.103%	526.966%	-2.459%	40.049%	69.669%	241.149%
1996	117.588%	313.549%	36.468%	103.907%	54.113%	187.682%
1997	238.752%	463.822%	98.595%	194.894%	35.905%	62.501%
1998	184.048%	362.496%	48.125%	84.070%	97.148%	192.713%
1999	44.776%	77.100%	88.370%	110.764%	126.946%	251.059%
2000	103.482%	124.838%	95.539%	141.598%	25.024%	77.662%
2001	21.418%	212.865%	-3.054%	103.588%	48.450%	133.572%
2002	-12.547%	53.439%	-15.063%	41.301%	13.093%	93.095%
2003	14.141%	86.453%	19.196%	67.161%	38.078%	104.106%
2004	87.020%	233.923%	9.067%	54.212%	36.338%	88.799%
2005	245.765%	691.780%	22.509%	50.492%	185.969%	396.736%
2006	138.678%	332.390%	35.054%	89.720%	-5.956%	42.901%
2007	361.442%	859.719%	239.386%	617.645%	68.842%	133.046%

Growth of the annual volume of funds raised, investments and divestments, normalised by GDP.
Source: EVCA yearbooks (1988-2008).

Table 4 shows the main references of the variables related to the macroeconomic and financial environment regarding the first submarket. This includes the variables interest rates, stock market return, market capitalisation, successful divestments, GDP growth and the EVCA INDEX.

Table 4. Macroeconomic and financial environmental variables related to the fundraising submarket

Country	1) IR	2) SMR	3) MCAP	4) EXITS	5) GDPg	6) EVCA INDEX
Austria	5.882%	14.491%	0.201%	0.010%	2.682%	2.400
	(5.680%)	(12.060%)	(0.147%)	(0.002%)	(3.000%)	(2.530)
Belgium	6.296%	9.127%	0.538%	0.037%	2.907%	2.000
	(5.750%)	(7.625%)	(0.459%)	(0.019%)	(2.772%)	(2.140)
Czech Republic	5.100%	18.994%	0.321%	0.015%	7.327%	2.181
	(4.820%)	(20.030%)	(0.246%)	(0.015%)	(7.416%)	(2.120)
Denmark	6.766%	12.700%	0.485%	0.009%	2.454%	2.359
	(6.250%)	(13.485%)	(0.399%)	(0.003%)	(2.396%)	(2.480)
Finland	7.184%	16.275%	0.906%	0.034%	1.730%	2.196
	(5.720%)	(8.110%)	(0.751%)	(0.028%)	(4.101%)	(2.250)
France	6.301%	9.226%	0.545%	0.086%	2.274%	1.945
	(5.580%)	(12.195%)	(0.434%)	(0.076%)	(2.571%)	(2.090)
Germany	5.724%	8.024%	0.326%	0.025%	2.684%	2.366
	(5.640%)	(13.760%)	(0.243%)	(0.017%)	(2.810%)	(2.410)
Greece	6.378%	15.010%	0.481%	0.006%	1.480%	1.849
	(5.210%)	(10.565%)	(0.494%)	(0.003%)	(3.648%)	(1.960)
Hungary	7.663%	17.893%	0.259%	0.029%	3.371%	1.852
	(7.120%)	(15.820%)	(0.256%)	(0.026%)	(4.004%)	(1.860)
Iceland	5.511%	19.123%	0.005%	0.024%	2.511%	n.a.
	(5.300%)	(22.120%)	(0.005%)	(0.019%)	(2.295%)	n.a.
Ireland	6.694%	13.403%	0.606%	0.018%	6.814%	1.529
	(6.290%)	(16.810%)	(0.599%)	(0.012%)	(6.094%)	(1.580)
Italy	8.111%	7.838%	0.317%	0.036%	0.748%	1.930
	(6.860%)	(10.545%)	(0.300%)	(0.025%)	(1.817%)	(1.960)
Norway	7.009%	17.521%	0.378%	0.032%	4.529%	2.044
	(6.310%)	(21.490%)	(0.341%)	(0.023%)	(3.938%)	(2.040)
Poland	7.557%	18.636%	0.234%	0.029%	4.403%	2.110
	(6.920%)	(22.600%)	(0.170%)	(0.024%)	(7.141%)	(2.130)
Portugal	8.502%	11.171%	0.290%	0.022%	3.819%	2.176
	(6.360%)	(11.310%)	(0.274%)	(0.018%)	(2.410%)	(2.320)
Romania	18.463%	42.964%	0.113%	0.022%	3.136%	2.335
	(17.730%)	(37.380%)	(0.099%)	(0.023%)	(3.355%)	(2.350)
Slovakia	8.326%	19.964%	0.128%	0.001%	5.537%	2.402
	(5.965%)	(14.130%)	(0.106%)	(0.000%)	(6.623%)	(2.490)
Spain	8.007%	15.725%	0.539%	0.024%	3.194%	2.051
	(6.400%)	(11.770%)	(0.525%)	(0.012%)	(4.331%)	(2.170)
Sweden	7.316%	13.758%	0.911%	0.102%	1.237%	2.085
	(5.995%)	(20.530%)	(0.868%)	(0.048%)	(2.868%)	(2.090)
Switzerland	3.934%	10.220%	1.710%	0.032%	1.442%	1.925
	(3.380%)	(12.740%)	(1.850%)	(0.021%)	(1.228%)	(1.950)
The Netherlands	5.791%	9.758%	0.971%	0.075%	3.295%	1.759
	(5.580%)	(14.115%)	(0.918%)	(0.062%)	(3.276%)	(1.790)
U. Kingdom	7.073%	7.956%	1.260%	0.223%	3.396%	1.247
	(7.130%)	(12.625%	(1.200%	(0.170%	(2.945%)	(1.200)
Europe	**6.922%**	**13.400%**	**0.591%**	**0.044%**	**3.039%**	**2.014**
	(5.750%)	**(13.860%**	**(0.422%)**	**(0.021%)**	**(3.049%)**	**(2.090)**

Mean and median (in parenthesis) values of variables related to the macroeconomic and institutional environment in the first submarket. 1) IR_{it}: 10-year government bond yields. 2) SMR_{it}: Yearly change in the local Share Price Index.. 3) $MCAP_{it}$: Market capitalisation of the local market, divided by the local GDP. 4) $EXITS_{it}$: Amount divested at cost per year and per country through trade sale, IPO and secondary buyouts, divided by the local GDP. 5) $GDPg_{it}$: Growth of local GDP in constant currency; 6) $EVCA\ INDEX_{it}$: Index that reports the valuation of a country's tax and legal environment as more (1) or less favourable (3) to VC/PE activity.
Sources: Eurostat, OECD and EVCA.

The average interest rate has varied from 8.502% for Portugal to 3.934% for Switzerland, with an atopic value of 18.463% for Romania. The average return of the stock market for the period analysed has always been, for all countries except Italy, higher than the average interest rate, as should be expected. The average market capitalisation represents, in relation to the GDP, less than 1%, except for Switzerland and the United Kingdom, with the mean value for Europe as a whole being 0.591%. The country with the highest average percentage of divestments carried out in successful ways, in relation to the GDP, is the United Kingdom, with a value of 0.223%, with Slovakia being the country recording the lowest value at the 0.001% level. The average value for Europe is estimated at 0.044%. The average growth of GDP has varied from 0.748% for Italy to 7.327% for Romania during the period analysed. Finally, the average EVCA INDEX, which takes values from 1 to 3, records a maximum value of 2.400 for Austria, and a minimum value of 1.247 for the United Kingdom. The average value for Europe is 2.014.

Regarding the macroeconomic and financial environmental variables that affect the second VC/PE submarket, Table 5 shows the mean and median values (in parenthesis) of the additional variables, apart from those mentioned in the previous table, that affect the demand side of this market. These variables include total R&D expenditures, industry-financed R&D expenditures, corporate tax rates, unemployment rates and average job tenure.

The average value of the R&D spending for Europe as a whole is 1.677%, reaching a maximum of 2.744% for Finland and a minimum of 0.414% for Romania. The average value of the industrial R&D spending, which represents a fraction of the total R&D spending, is 0.913% for Europe. The average corporate tax is similar for almost all the countries analysed, with the highest differences being those of Germany and Italy, which register the highest values, and Hungary, which records the minimum value. Finally, and regarding the variables that capture market labour rigidities, the average unemployment rate for Europe is estimated at 7.726% during the period analysed, with atypical high values for Poland, Slovakia and Spain. The average percentage of people with more than 10 years in the same firm is 38.464% for Europe during the period analysed.

Table 5. Additional macroeconomic and financial environmental variables related to the investment submarket

Country	1) RD	2) RD_Ind	3) TAX	4) UR	5) JOB_TEN
Austria	1.796%	0.822%	33.762%	4.998%	41.400%
	(1.710%)	(0.738%)	(34.000%)	(4.800%)	(41.400%)
Belgium	1.793%	1.165%	39.045%	8.218%	45.520&
	(1.830%)	(1.152%)	(40.200%)	(8.380%)	(45.520%)
Czech Republic	1.290%	0.689%	28.600%	7.556%	30.650%
	(1.230%)	(0.652%)	(29.500%)	(7.870%)	(30.650%)
Denmark	2.013%	1.112%	34.810%	5.890%	31.580%
	(1.920%)	(1.025%)	(34.000%)	(5.410%)	(31.580%)
Finland	2.744%	1.793%	31.975%	9.742%	39.250%
	(2.780%)	(1.763%)	(28.500%)	(9.100%)	(39.250%)
France	2.215%	1.085%	37.838%	9.776%	44.170%
	(2.190%)	(1.106%)	(36.660%)	(9.300%)	(44.170%)
Germany	2.457%	1.566%	50.433%	7.826%	37.870%
	(2.470%)	(1.617%)	(54.500%)	(8.200%)	(37.870%)
Greece	0.549%	0.145%	36.206%	9.606%	52.090%
	(0.570%)	(0.162%)	(35.000%)	(9.700%)	(52.090%)
Hungary	0.889%	0.311%	17.200%	6.749%	33.990%
	(0.945%)	(0.317%)	(18.000%)	(6.680%)	(33.990%)
Iceland	1.718%	0.639%	36.281%	3.050%	31.070%
	(1.495%)	(0.496%)	(33.000%)	(2.600%)	(31.070%)
Ireland	1.129%	0.703%	30.262%	9.694%	34.310%
	(1.170%)	(0.747%)	(36.000%)	(9.860%)	(34.310%)
Italy	1.118%	0.489%	44.152%	9.359%	46.270%
	(1.110%)	(0.481%)	(52.200%)	(9.630%)	(46.270%)
Norway	1.647%	0.785%	32.348%	4.540%	33.270%
	(1.655%)	(0.766%)	(28.000%)	(4.465%)	(33.270%)
Poland	0.599%	0.180%	25.900%	15.764%	42.890%
	(0.570%)	(0.164%)	(27.500%)	(16.920%)	(42.890%)
Portugal	0.732%	0.192%	36.855%	5.929%	45.520%
	(0.710%)	(0.149%)	(39.600%)	(5.840%)	(45.520%)
Romania	0.414%	0.187%	21.625%	7.338%	n.a.
	(0.390%)	(0.183%)	(25.000%)	(7.250%)	n.a.
Slovakia	0.585%	0.282%	26.400%	16.230%	34.690%
	(0.570%)	(0.281%)	(25.000%)	(16.950%)	(34.690%)
Spain	0.902%	0.000%	34.881%	13.600%	37.500%
	(0.870%)	(0.409%)	(35.000%)	(13.000%)	(37.500%)
Sweden	3.395%	2.227%	32.585%	6.163%	40.570%
	(3.500%)	(2.373%)	(28.000%)	(6.225%)	(40.570%)
Switzerland	2.467%	1.718%	26.698%	2.982%	34.760%
	(2.600%)	(1.789%)	(27.800%)	(3.480%)	(34.760%)
The Netherlands	1.906%	0.938%	34.719%	4.926%	33.390%
	(1.930%)	(0.907%)	(35.000%)	(4.940%)	(33.390%)
United Kingdom	1.929%	0.923%	31.857%	6.968%	31.620%
	(1.860%)	(0.898%)	(31.000%)	(6.810%)	(31.620%)
Europe	**1.677%**	**0.913%**	**34.172%**	**7.726%**	**38.464%**
	(1.690%)	**(0.822%)**	**(34.000%)**	**(7.200%)**	**(37.870%)**

Mean and median (in parenthesis) values of variables related to the macroeconomic and institutional environment in the second submarket. 1) $RDI1_{it}$: Gross domestic expenditure on R&D divided by the country's GDP. 2) RD_indl1_{it}: Share of gross domestic expenditure on R&D financed by industry divided by the country's GDP. 3) TAX_{it}: Corporate tax rate. 4) $URI1_{it}$: Harmonised unemployment rate par year and per country, lagged one year. 5) JOB_TEN_i Percentage of workers that have been in their current or main job or with their current employer over 10 years.
Sources: Eurostat and OECD.

Finally, Table 6 shows the correlations among the variables included in the empirical analysis, which are related to the macroeconomic and financial environment. The correlations are not very high, except for the variable representing industry-financed R&D expenditures, which is highly correlated with total R&D expenditures, as expected, and also with market capitalisation. The former correlation does not allow us to include total R&D and industry-financed R&D in the same regressions, so they will be run considering one variable at a time. Regarding the second correlation, no concerns were found when including both variables in the same regressions.

Table 6. Correlations among the macroeconomic and institutional variables

	1	2	3	4	5	6	7	8	9	10	11
1	1										
2	-0.08	1									
	(0.11)										
3	**-0.42**	**0.12**	1								
	(0.00)	(0.03)									
4	**-0.20**	0.02	**0.44**	1							
	(0.00)	(0.76)	(0.00)								
5	**-0.24**	**0.19**	0.05	0.04	1						
	(0.00)	(0.00)	(0.33)	(0.53)							
6	**0.22**	-0.03	**-0.44**	**-0.44**	-0.05	1					
	(0.00)	(0.54)	(0.00)	(0.00)	(0.31)						
7	**-0.32**	-0.07	**0.47**	**0.25**	-0.08	0.01	1				
	(0.00)	(0.20)	(0.00)	(0.00)	(0.13)	(0.89)					
8	**-0.31**	-0.06	**0.52**	**0.21**	-0.06	0.04	**0.96**	1			
	(0.00)	(0.26)	(0.00)	(0.00)	(0.28)	(0.48)	(0.00)				
9	**0.29**	**-0.16**	**-0.26**	-0.08	**-0.17**	**0.23**	0.02	-0.01	1		
	(0.00)	(0.00)	(0.00)	(0.13)	(0.00)	(0.00)	(0.77)	(0.79)			
10	**0.20**	**0.11**	**-0.23**	**-0.17**	-0.02	0.07	**-0.34**	**-0.27**	0.03	1	
	(0.00)	(0.04)	(0.00)	(0.00)	(0.71)	(0.17)	(0.00)	(0.00)	(0.52)		
11	**0.11**	-0.03	**-0.21**	**-0.13**	**-0.13**	**0.15**	**-0.21**	**-0.17**	**0.26**	**0.26**	1
	(0.04)	(0.53)	(0.00)	(0.02)	(0.02)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	

Correlations among the independent variables included in the empirical analysis: 1) IR_{it}: 10-year government bond yields. 2) SMR_{it}: Yearly change in the local Share Price Index.. 3) $MCAP_{it}$: Market capitalisation of the local market, divided by the local GDP. 4) $EXITS_{it}$: Amount divested at cost per year and per country through trade sale, IPO and secondary buyouts, divided by the local GDP. 5) $GDPg_{it}$: Growth of local GDP in constant currency; 6) $EVCA\ INDEX_{it}$: Index that reports the valuation of a country's tax and legal environment as more (1) or less favourable (3) to VC/PE activity. 7) $RDI1_{it}$: Gross domestic expenditure on R&D divided by the country's, GDP lagged one year. 8) RD_indl1_{it}: Share of gross domestic expenditure on R&D financed by industry divided by the country's GDP, lagged one year. 9) TAX_{it}: Corporate tax rate. 10) $URI1_{it}$: Harmonised unemployment rate par year and per country, lagged one year. 11) JOB_TEN_i Average percentage of workers that have been in their current or main job or with their current employer over 10 years.
p-values in parenthesis.

4. Results

The results regarding both submarkets are presented in Tables 7 to 10. It should be noted that the variable EXITS is introduced in the model with one year lag, since all the participants in the market would consider the divestments carried out last year as a proxy of the returns obtained. Table 7 shows the results of the equilibrium in the first VC/PE submarket. The dependent variable represents the volume of funds raised, normalised by GDP. Regarding the variables that represent the return of other asset classes that are an alternative to VC/PE, the results show that both the interest rates and the stock market returns are not significant. That is, the volume of funds raised for the VC/PE activity is not significantly dependent on the return obtained on alternative assets. This result would be in the line of the existence of non correlation between VC/PE and other alternative asset classes, thus providing empirical evidence for this idea. This is one of the reasons for the interest of institutional investors in allocating part of their portfolio in VC/PE. This result is maintained even if these two variables are lagged one year (third and four models), as in the case of the EXITS variable. Regarding the two variables that may proxy liquidity, which are the stock market capitalisation and the successful divestments carried out, the results show that the coefficients of both variables are positive and significant. The stock market capitalisation may be taken as the level of development of the financial economy in a country, so that the more developed the financial market is, the more funds are raised for VC/PE. As already said, this variable can also be considered as a measure of liquidity of the markets, so that more funds would be raised as the market becomes more liquid. The liquidity that is specific to the VC/PE activity may be captured by the variable successful divestments. It accounts for divestments carried out through IPOs, secondary buyouts and trade sales, which are considered the best ways to exit an investment. The fact that the money is returning to investors by means of a successful way that is valuable for them, positively affects the volume of funds raised. Finally, neither the GDP growth nor the EVCA INDEX has a significant impact on the volume of funds raised. The regressions that include the EVCA INDEX include data only on 21 countries, since data for this variable in the case of Iceland are missing. The Hausman (1978) test indicates that the random effects approach is the adequate one, so a generalised least square estimation, robust to heteroskedasticity, is performed.

Table 7. Regression results of the fundraising side of the VC/PE market

Independent Variables	Dependent variable: New funds raised divided by GDP			
	Model 1	Model 2	Model 3	Model 4
IR_{it}	-0.000006	0.000018		
	(0.000058)	(0.000058)		
SMR_{it}	0.030420	0.001197		
	(0.085184)	(0.086999)		
IR_{it-1}			-0.000008	0.000008
			(0.000055)	(0.000055)
SMR_{it-1}			-0.094519	-0.108032
			(0.090125)	(0.091240)
$MCAP_{it}$	813.760100**	1218.710000***	849.023300**	1279.881000***
	(347.113200)	(369.910000)	(353.884400)	(375.725600)
$EXITS_{it-1}$	4.924221***	4.995443***	4.877423***	4.974376***
	(0.313874)	(0.327977)	(0.314238)	(0.328375)
$GDPg_{it}$	-0.001851	-0.000906	-0.000603	0.000400
	(0.003426)	(0.003412)	(0.003569)	(0.003535)
EVCA INDEX$_{it}$		0.000891		0.000977
		(0.000595)		(0.000601)
Time dummies	YES	YES	YES	YES
Constant	-0.000568	-0.002794	-0.000729	-0.003121**
	(0.000750)	(0.001551)	(0.000785)	(0.001564)
# Observations	287	278	280	272
# Countries	22	21	22	21
Hausman test (p-value)	0.9274	0.8383	0.9863	0.8672

Random effects generalised least squares estimation robust to heteroskedasticity.
The dependent variable is the amount of new funds raised per year and per country, divided by the country's GDP. The independent variables are: 1) IR_{it}: 10-year government bond yields. 2) SMR_{it}: Yearly change in the local Share Price Index.. 3) $MCAP_{it}$: Market capitalisation of the local market, divided by the local GDP. 4) $EXITS_{it}$: Amount divested at cost per year and per country through trade sale, IPO and secondary buyouts, divided by the local GDP. 5) $GDPg_{it}$: Growth of local GDP in real terms; 6) EVCA INDEX$_{it}$: Index that reports the valuation of a country's tax and legal environment as more (1) or less favourable (3) to VC/PE activity.
Standard errors in small case and parenthesis.
***Significant at 1%, ** Significant at 5%, * Significant at 10%.

Table 8 shows the results for the second VC/PE submarket, where the dependent variable is the volume of investments normalised by GDP.

Table 8. Regression results of the investment side of the VC/PE market (all investments)

Independent Variables	Dependent variable: VC/PE Investments divided by GDP			
	Model 1	Model 2	Model 3	Model 4
IR_{it}	0.000022 (0.000030)	0.000030 (0.000061)	0.000010 (0.000029)	0.000006 (0.000060)
$MCAP_{it}$	-127.079800 (189.668400)	-124.598500 (193.399900)	-208.348700 (198.064500)	-214.147900 (202.278800)
$EXITS_{it-1}$	3.808746*** (0.153871)	3.766389*** (0.157983)	3.882822*** (0.153933)	3.845464*** (0.157876)
$GDPg_{it}$	-0.000245 (0.001791)	-0.000724 (0.001896)	-0.000530 (0.001783)	-0.001055 (0.001886)
$RDl1_{it}$	5.773056*** (1.216401)	5.796146*** (1.225187)		
RD_indl1_{it}			7.657870*** (1.626705)	7.666595*** (1.648850)
TAX_{it}	0.000015 (0.000013)	0.000025* (0.000014)	0.000014 (0.000013)	0.000024* (0.000014)
$URI1_{it}$	-0.000023 (0.000022)		-0.000033 (0.000022)	
JOB_TEN_i		-0.000031** (0.000016)		-0.000033** (0.000016)
Time dummies	YES	YES	YES	YES
Constant	-0.001162* (0.000634)	-0.000457 (0.000832)	-0.000718 (0.000598)	0.000088 (0.000789)
# Observations	289	282	289	282
# Countries	22	21	22	21
Hausman test (p-value)	0.7915	0.8079	0.6414	0.6598

Random effects generalised least squares estimation robust to heteroskedasticity.
The dependent variable is the total VC/PE amount invested per year and per country, divided by the country's GDP. The independent variables are: 1) IR_{it}: 10-year government bond yields. 2) $MCAP_{it}$: Market capitalisation of the local market, divided by the local GDP. 3) $EXITS_{it}$: Amount divested at cost per year and per country through trade sale, IPO and secondary buyouts, divided by the local GDP. 4) $GDPg_{it}$: Growth of local GDP in constant currency. 5) $RDl1_{it}$: Gross domestic expenditure on R&D divided by the country's, lagged one year. 6) RD_indl1_{it}: Share of gross domestic expenditure on R&D financed by industry divided by the country's GDP, lagged one year. 7) TAX_{it}: Corporate tax rate. 8) $URI1_{it}$: Harmonised unemployment rate per year and per country, lagged one year. 9) JOB_TEN_i: Average percentage of workers that have been in their current or main job or with their current employer over 10 years.
Standard errors in small case and parenthesis.
***Significant at 1%, ** Significant at 5%, * Significant at 10%.

The regressions considering all investments are performed using a generalised least square estimation, since the Hausman (1978) test suggests the existence of random effects. It should be noted that the variables RD and RD_ind are lagged one year in the regression, since the effect of the amounts spend on R&D is not immediate. Also, the variable UR is lagged one year to capture the rigidity of the labour market at

the beginning of the period analysed.[4] The results show that the coefficient of one of the variables related to liquidity, namely successful divestments, is positive and significant. This means that liquidity is important, not only on the fundraising side but also on the investment side of the market, so that both investors and VC/PE companies are more willing to provide funds and invest in VC/PE when the liquidity specific to this activity increases by means of successful divestments. As expected, the coefficients of the variables related to R&D spending are also positive and significant. This means that when there is an increase in the amount of money devoted to R&D activities, more VC/PE money is invested the following year to bring to the market the anticipated results deriving from these activities. Although we can not test the causality issue due to the lack of data, the fact that R&D spending affects the volume of investments carried out is in line with Geronikolaou and Papachristou (2008), who find that innovation seems to create a demand for VC and not VC a supply of innovation. In the same vein, the lag considered in the regression could also mitigate potential endogeneity concerns. One of the two coefficients of the variables related to rigidities in the labour market is negative and significant, which is consistent with the predictions. The coefficients related to interest rates, market capitalisation and GDP growth are not significant. It is also important to remark that time dummies capture the main shocks in the industry, such as the peaks of the internet bubble and the buyout market.

Finally, the coefficient of the variable Corporate Tax is positive and significant in some specifications, albeit only at a 10 per cent level. This is contrary to what was expected in VC investments, since an increase in the taxes paid by investee firms would reduce their after tax income, thus increasing the barriers to becoming an entrepreneur and reducing the expected return on VC/PE investments. Nevertheless, regarding buyout investments, which are highly levered, an increase in corporate taxes would also increase the tax credits. Bearing in mind this latter finding and considering that the drivers of the VC/PE investments that are important may be different according to the stage of development of the firms, the investment regression was run again by splitting the total amount invested in VC investments, comprising early stage plus expansion investments, and buyouts. The regression results are shown, respectively, in Tables 9 and 10.

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[4] The variable JOB_TEN is a time invariant variable, so the effect of lagging it one year would only imply missing data. Similarly, the results presented do not include lags in IR and SMR, but the results do not change and are available upon request.

Table 9. Regression results of the investment side of the VC/PE market (venture capital)

Independent Variables	Dependent variable: Venture capital investments divided by GDP			
	Model 1	Model 2	Model 3	Model 4
IR_{it}	0.000044**	-0.000031	0.000036**	-0.000047
	(0.000017)	(0.000036)	(0.000017)	(0.000035)
$MCAP_{it}$	-194.905500*	-247.351900**	-222.089100*	-276.963100**
	(109.193800)	(109.548300)	(114.513200)	(114.941900)
$EXITS_{it-1}$	0.874824***	0.871477***	0.914887***	0.911531***
	(0.088367)	(0.089055)	(0.088847)	(0.089409)
$GDPg_{it}$	-0.000267	-0.000793	-0.000467	-0.001013
	(0.001058)	(0.001103)	(0.001059)	(0.001104)
$RDI1_{it}$	3.248642***	3.040400***		
	(0.703455)	(0.696741)		
RD_indl1_{it}			4.008067***	3.712587***
			(0.945943)	(0.942283)
TAX_{it}	0.000004	0.000011	0.000003	0.000011
	(0.000007)	(0.000008)	(0.000007)	(0.000008)
$URI1_{it}$	-0.000039***		-0.000045***	
	(0.000013)		(0.000013)	
JOB_TEN_i		-0.000027***		-0.000029***
		(0.000009)		(0.000009)
Time dummies	YES	YES	YES	YES
Constant	-0.000060	0.001019**	0.000225	0.001357***
	(0.000370)	(0.000485)	(0.000351)	(0.000463)
# Observations	283	276	283	276
# Countries	22	21	22	21
Hausman test (p-value)	0.9156	0.8305	0.8294	0.7493

Random effects generalised least squares estimation robust to heteroskedasticity.
The dependent variable is the total VC amount invested per year and per country, divided by the country's GDP. The independent variables are: 1) IR_{it}: 10-year government bond yields. 2) $MCAP_{it}$: Market capitalisation of the local market, divided by the local GDP. 3) $EXITS_{it}$: Amount divested at cost per year and per country through trade sale, IPO and secondary buyouts, divided by the local GDP. 4) $GDPg_{it}$: Growth of local GDP in constant currency. 5) $RDI1_{it}$: Gross domestic expenditure on R&D divided by the country's, lagged one year. 6) RD_indl1_{it}: Share of gross domestic expenditure on R&D financed by industry divided by the country's GDP, lagged one year. 7) TAX_{it}: Corporate tax rate. 8) $URI1_{it}$: Harmonised unemployment rate par year and per country, lagged one year. 9) JOB_TEN_i: Average percentage of workers that have been in their current or main job or with their current employer over 10 years.
Standard errors in small case and parenthesis.
***Significant at 1%, ** Significant at 5%, * Significant at 10%.

The results including early and expansion stage investments are presented in Table 9. As in the case of all investments, the coefficient regarding GDP growth is not significant. The coefficients of the variables successful divestments and R&D spending are positive and significant, as before. Regarding the variables aimed at capturing labour market rigidities, the coefficients of both variables are negative and highly significant. But

the greatest changes arise in market capitalisation and interest rates. According to the model, the coefficient related to market capitalisation could either be positive or negative. As it stands for VC investments, the negative sign of the coefficient may be reflecting that when there is enough liquidity in the capital markets the need to access to VC funding may fall. Regarding interest rates, a negative sign of the coefficient was expected due to the effect on the after tax earnings of investee firms. The only explanation for this positive effect is that VC investments may become more attractive as an alternative to the use of debt when the interest rates rise. As in the previous cases, the Hausman (1978) test indicates that the appropriate methodology is the generalised least square estimation, where standard errors robust to heteroskedasticity are presented.

Finally, the results regarding buyout investments are presented in Table 10. In this case, the results of the Hausman (1978) test recommend the fixed effects methodology as the most suitable one. However, standard errors robust to heteroskedasticity are also presented. Therefore, the variables that do not change over time but only across countries are dropped from the estimation, as is the case for the job tenure variable. The results for this subgroup of investments are rather similar to the ones presented in the case of the total amount invested. However, there is one striking result regarding the R&D spending, the coefficient of which now becomes negative and significant. Nevertheless, this result could be explained by the fact that targets in buyout acquisitions are usually mature firms belonging to low-technology industries. Finally, the coefficient of the corporate tax variable now becomes positive and significant in all specifications, as expected in buyout investments due to the larger tax credits on those levered acquisitions. The results in the previous two tables confirm that the determinants of the volume of investments are slightly different according to the stage of development of the investee firm and that it is necessary to separate them in the analysis of the investment side of the VC/PE market.

Table 10. Regression results of the investment side of the VC/PE market (buyout investments)

Independent Variables	Dependent variable: Buyout investments divided by GDP			
	Model 1	Model 2	Model 3	Model 4
IR_{it}	0.000019 (0.000023)	0.000004 (0.000045)	0.000017 (0.000023)	-0.000004 (0.000045)
$MCAP_{it}$	354.595500 (246.547200)	360.779800 (254.598100)	386.917700 (243.343900)	386.865400 (251.220900)
$EXITS_{it-1}$	2.531414*** (0.289576)	2.539004*** (0.288635)	2.557949*** (0.285080)	2.566468*** (0.283480)
$GDPg_{it}$	0.000282 (0.001367)	0.000155 (0.001369)	0.000270 (0.001365)	0.000140 (0.001363)
$RDI1_{it}$	-6.400559** (2.807752)	-6.354606** (2.877112)		
RD_indl1_{it}			-7.604587* (3.848388)	-7.591039* (3.897391)
TAX_{it}	0.000031** (0.000014)	0.000031** (0.000014)	0.000032** (0.000014)	0.000033** (0.000015)
$URI1_{it}$	0.000023 (0.000036)		0.000023 (0.000036)	
Time dummies	YES	YES	YES	YES
Constant	-0.000463 (0.000728)	-0.000206 (0.000591)	-0.000895 (0.000662)	-0.000624 (0.000507)
# Observations	287	280	287	280
# Countries	22	21	22	21
Hausman test (p-value)	0.0028	0.0065	0.0031	0.0058

Fixed effects estimation robust to heteroskedasticity.

The dependent variable is the total PE invested in buyouts per year and per country, divided by the country's GDP. The independent variables are: 1) IR_{it}: 10-year government bond yields. 2) $MCAP_{it}$: Market capitalisation of the local market, divided by the local GDP. 3) $EXITS_{it}$: Amount divested at cost per year and per country through trade sale, IPO and secondary buyouts, divided by the local GDP. 4) $GDPg_{it}$: Growth of local GDP in constant currency. 5) $RDI1_{it}$: Gross domestic expenditure on R&D divided by the country's, lagged one year. 6) RD_indl1_{it}: Share of gross domestic expenditure on R&D financed by industry divided by the country's GDP, lagged one year. 7) TAX_{it}: Corporate tax rate. 8) $URI1_{it}$: Harmonised unemployment rate par year and per country, lagged one year. 9) JOB_TEN_i: Average percentage of workers that have been in their current or main job or with their current employer over 10 years.

Standard errors in small case and parenthesis.

***Significant at 1%, ** Significant at 5%, * Significant at 10%.

5   Conclusions and discussion

The determinants of the level of VC/PE activity have received scant interest in the literature. One of the reasons for this is the limited information available, with only one observation per year in most cases, or the unobservable nature of some of the variables. But another reason may be the lack of a well-established theoretical base able to explain the determinants of the VC/PE market as a whole. The main theoretical and empirical contributions focus either on analysing the determinants of fundraising (Gompers and Lerner, 1998) or the determinants of investment activity (Jeng and Wells, 2000; Schertler, 2003; Romain and Van Pottelsberge, 2004; among others).

This paper builds on Gompers and Lerner (2002), who describe the inelasticity of short term supply of funds to VC/PE firms when there is a shock in demand. Based on this we argue that the lags in the fundraising process (12-18 months) and in the allocation of investments (3-4 years) lead to an effective split of the market into two parts, with VC/PE managers playing the role as agents demanding funds, on the fundraising side of the market, and, later, as suppliers of funds to unlisted firms, on the investment side of the market.

The model proposed in this paper aims to analyse the drivers of fundraising and investment in the VC/PE markets. The amount of funds raised is determined through the equilibrium reached between investors and VC/PE managers at a given return. Similarly, the volume of investments committed would represent the equilibrium between VC/PE managers and entrepreneurs/firms. The interaction between supply and demand on the fundraising side leads to the definition of new funds raised as a function of the returns of alternative assets, market capitalisation, industry-specific liquidity measures and GDP growth. Regarding the investment side, the determinants of the volume invested are interest rates, market capitalisation, industry-specific liquidity measures, GDP growth, R&D expenditures, corporate taxes and labour market rigidities.

The model is tested on a sample of 22 European countries over the period 1987-2007. As regards fundraising, references of liquidity have a significant effect, whereas the return of alternative asset classes is not significantly related to new funds raised. On the investment side, the results also highlight the importance of industry-specific liquidity references, such as IPO, trade sales and secondary buyouts. Nevertheless, the remaining determinants seem to be affected by the mix of investment in firms at different stages. When VC investments are considered, the coefficients of R&D expenditures are

positive and significant, whereas unemployment rates and the average job tenure in the country exert a negative effect, as expected. Regarding buyouts, a negative relationship between R&D spending and investments is found, since levered acquisitions focus on mature industries. Additionally, a positive one is found between corporate taxes and investments, due to the important tax credits of debt in these firms.

This paper contributes to the literature in several ways. Regarding theory, a 'double market' approach is presented, introducing a theoretical explanation of the determinants of supply and demand in both submarkets. The models on funds raised and investments carried out are tested using the largest multi-country sample ever collected with homogeneous data, with results that fit in with the models and are in line with previous empirical work in the literature. One further contribution that has implications for practitioners is the limited correlation between VC/PE and other asset classes, which is frequently presented by VC/PE managers as a reason for including VC/PE in the portfolios of institutional investors.

The limitations of this research have to do with the inability to access data on fundraising that is broken down between VC and buyouts in order to test whether the determinants are different in both markets. Regarding the model, more variables related to the entrepreneurial environment could also be added, but this again could only be made possible as more data are available.

Regarding the implications for policy makers, the importance of liquidity should be highlighted, since this risky activity is based on illiquid long-term investments. Well developed markets make it easier for VC/PE organizations to raise funds that would then be allocated to unlisted firms to fill the equity gap. Nevertheless, the need to create NASDAQ-type markets in the past has led to serious failures. Before 'creating' any market, measures should be taken to increase the amount of shares from unlisted firms in the hands of private individuals. Special schemes to incentivise this investment focus are required well in advance of the creation of any market. Also, evidence of the positive impact that R&D expenditures exert on the volume of VC investments in the following year is found. Thus, policy makers should create schemes that help to increase R&D expenditures, because the amounts committed by VC institutions should increase in the short run. Finally, policies aimed at developing the VC/PE market would in turn attract foreign investors, since Schertler and Tykvova (2006) show that PE investors consider mature PE markets as a potential source of partnership, rather than rivalry, which facilities cross border PE flows.

There are at least three issues pending for further research. First, a dynamic version of the model might help to give a better explanation of the determinants of this activity. However, this could only become possible with more data available to use a sufficient number of instruments. Second, there should also be an extension of the model to analyse equilibrium at the fund level, in order to test whether differences in the main drivers of funds also exist according to the stage of development of the firm. Finally, it is important to study the linkage between fundraising and investment over time so as to reduce the imbalances recorded in the past, which sometimes lead to a shortage of funds in the market while at other times there is a surplus of money that determines rapid price increases.

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