What Drives Venture Capital Investments in Europe? New Results from a Panel Data Analysis

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We examine the determinants of venture capital investments across 21 European countries over 1997-2006. Our empirical model includes many of the macroeconomic determinants already tested in previous studies. But, in addition, we introduce for the first time variables that intend to capture the institutional environment. Using a panel data technique of estimation, we find that GDP growth, market capitalization, research and development expenditures and unemployment are the most macroeconomic determinants of European venture capital investments. We show also that early stage investments and funds raised are differently affected by institutional quality. Thus, while the index of economic freedom has a significant and a positive effect on funds raised, it does not appear a significant determinant of early stage investments.

INTRODUCTION

Venture capital is widely regarded as an important driver of economic growth. While the USA has the largest and most sophisticated venture capital market in the world, its European counterpart has only recently begun to mature, and numerous governmental schemes exist that are meant to help speed up the development of the European market. The further development of fiscal, legal and regulatory frameworks that are more conductive to entrepreneurship, innovation and investment will be central to Europe's future economic health and competitiveness, as capital is increasingly allocated on an international basis on the most competitive economies.

One of the most notorious features of the trend toward globalization in recent times has been the increased importance of foreign direct investment (FDI) around the world (Daude and Stein 2007). FDI and economic development are closely related. Stiglitz (2000) argued that far more relevant for the long-term success of the economy is foreign direct investment. There is some qualified empirical support[1] for growth-promoting effect of FDI. As a form of FDI, venture capital funds developed as important rational financial intermediaries. They are in the business of high risk investment for the long haul (Agmon and Messika 2008, 2009).

The venture capital companies play an important role in the economy. They provide capital to firms that might otherwise have difficulty attracting financing (Gompers and Lerner 2001). Patenting patterns across USA's industries over a three decade period suggest that venture capital have a significant and a positive effect on technological innovation (Kortum and Lerner 2000). Chen (2009) argue that new

ventures with better technology breadth competence can get more complementary help in market development from venture capital firms to improve their performance.

It is by now widely recognized that venture capital is beneficial to economy. Then, the question of what determine venture capital investment becomes important. But, this later question has been a subject of little empirical research. Thus, our paper aims at contributing to the literature on the determinants of venture capital. Our contribution consists in developing an empirical model that introducing simultaneously traditional determinants of venture capital and new potential factors that capture the institutional environment.

The importance of institutions on venture capital investments can be related to the fact that in developed institutional environment, the enforcement of contracts and the verifiability of elements of venture capital contracts is clearly facilitated, thereby making it easier, more valuable and faster to implement such corporate governance mechanism in venture capital financing (Cumming et al. 2010). In fact, imperfect contract enforcements might increase uncertainty regarding future returns and thus have a negative impact on the level of investment. Moreover, "bad" institutions (e.g., risk of contract repudiation etc.) might act as a tax by increasing the cost of doing business (Daude and Stein 2009). Thus, our study contributes by investigating the importance of institutional environment in determining European venture capital investments.

The scope of our study covers 21 European countries, during the period 1997-2006. We use panel data techniques to analyze the impact of the various determinants on investments. Besides many of the determinants traditionally cited in the literature, we use in our study an indicator of institutional quality (The index of economic freedom). As dependant variables we have consider the early stage investments and funds raised.

Our results show that GDP growth, market capitalization and research and development expenditures are the important macroeconomic determinants of European venture capital investments. The variables related directly to venture capital process have no significant effect on European venture capital investments. Our findings also show that early stage investment and funds raised are differently affected by institutional quality. Thus, while the index of economic freedom has a significant and a positive effect on funds raised, it does not appear a significant determinant of early stage investment. Only freedom from corruption affects significantly and positively the early stage investments.

The rest of the paper is set out as follows. Section 2 highlights how do venture capital works. The next section reviews the main findings of the few existing evaluation of the determinants of venture capital. Following there are the data and the methodology of this study. Then the empirical results are presented and interpreted. The last section provides the most conclusions of this study.

HOW DO VENTURE CAPITAL WORKS?

Many young firms with great growth potential have a difficult time getting started because they cannot find capital. Banks to not usually gamble on technology ventures, public markets handle larger companies; and government programs are rarely sufficient on their own. So for many companies, venture capital is the best solution. Venture capital has emerged as an important intermediary in financial markets, providing capital to firms that might otherwise have difficulty in attracting external funding (Gompers and Lerner, 2000). It is the dominant form of equity financing in the U.S. for privately held high technology businesses. Venture capitalists provide the money and support necessary to help these young firms grow. The success stories of companies like Microsoft, Genetech, and Dell Computer highlighted the role of private equity investment in fueling explosive growth and the role such ventures played in generating future productivity gains.

Venture capital's niche exists because of the structure and rules of capital markets. Someone with an idea or a new technology often has no other institution to turn to. Usury laws limit the interest rate banks can charge on loans, and the risks inherent in start up usually justify higher rates than allowed by law. Thus, bankers will only finance a new business to the extent that there are hard assets against which to secure the debt. And in today's information-based economy, many start up have few hard assets.

Furthermore, investment banks and public equity are both constrained by regulations and operating practices meant to protect the public investor.

Venture capital fills the void between sources of funds for innovation (chiefly corporations, governments' bodies, and the entrepreneur's friends and family) and traditional, lower-cost sources of capital available to ongoing concerns. Filling that void successfully requires the venture capital industry to provide a sufficient return on capital to attract private equity funds, attractive returns for its own participants, and sufficient upside potential to entrepreneurs to attract high-quality ideas that will generate high returns. Put simply, the challenge is to earn a consistently superior return on investments in inherently business ventures.

Venture capital firms not only fund but also proactively support the development of high-potential companies in the early stages of their development and growth, often creating highly skilled employment in new innovative areas where other sources of finance are hard to access. For private equity and venture capital to contribute to sustained economic growth, competitiveness and innovation policymakers must ensure coherent, inclusive policies, which will enable the industry to continue to provide a continuous financing cycle for start ups, spin-offs, company transition and buyout investments. The further development of fiscal, legal and regulatory frameworks that are more conductive to entrepreneurship, innovation and investment is central to economic health and competitiveness. For countries to remain competitive, policymakers should support regulations that encourage investments, improve tax and legal measures to develop a truly favorable environment, and ease the raising and deployment of private equity and venture capital funds to drive a high-growth entrepreneurial economy. The patenting activity is also conductive to the creation of global competitive advantage through intellectual property rights. Those rights are crucial on supporting and financing innovation, as no-one would allocate resources in new technologies without the perspective of securing return on investment.

Venture Capitalists can be depicted as « hands on » financial intermediaries. They supply services as would do a manager, hiring members of staff for instance. Their competencies are used not only to screen demand and monitor manager's behaviour but also to participate in the start up management. As observed by Gompers and Lerner (2001) « non monetary aspects of Venture Capitalists are critical to its success ». Venture Capitalists are financial intermediaries who raise funds from investors (pensions funds, insurance companies, banks...) and invest them in firms with high growth potential. Shares of capital are kept for five to eight years, on average. Investment is made with the prospect of reselling shares either on the financial or to large firms, as a way to obtain a capital gain. Compared with other financing modes, this activity is characterised by the high level of uncertainty prevailing on the demand side. As a matter of fact, innovation must be radical and the projected final market must be worldwide. The venture capital cycle starts with raising a venture fund; proceeds through the investment in, monitoring of, and adding value to firms; continues as the venture capital firm exits successful deals and returns capital to its investors; and renews itself with the Venture Capitalists raising additional funds. To make money on their investments, Venture Capitalists need to turn illiquid stakes in private companies into realized return. Typically, the most profitable exit opportunity is an IPO, in which the company issues shares to the public. As long as Venture Capitalists are able to exit the company and industry before it tops, they can reap extraordinary returns at relatively low risk. High rewards can be paid to successful management teams, and institutional investment will be available to provide liquidity in a relatively short period of time.

Venture Capitalists differ from traditional investors in that they are not passive (Hellmann and Puri, 2002). In effect, after being recruited (or recruiting themselves into the deal) they become active social constructors. In other words, they try to shape the future in ways that improve the outcome of their investments. To do this, they offer advice, become involved in critical corporate decisions, assist in corporate recruiting, even at times reassure an important prospective customer or supplier that they stand behind the firm, undertake various other tasks (Sapienza, 1992, Kortum et al. (2000) and try to influence the market outcome in favour of their investment.

The venture capitalist decision-making process has received tremendous attention within the entrepreneurship literature. But, little empirical research has been done on the importance of

macroeconomic and public institutions as determinants of venture capital investments across the word. In addition, only few papers has examines the empirical evidence on economic impacts of venture capital in order to provide empirical examination of the real effect of venture capital investments on public performance and real economy (Growth, employment, IPO, mergers and acquisitions, productivity and other indicators of economic performance).

LITERATURE REVIEW

To the best of our knowledge, little empirical research has been done on the determinants of the venture capital investment. The published papers which are the most related with our analysis, both in terms of model and data used are the Gompers and Lerner (1999), Jeng and Wells (2000), Marti and Balboa (2001), Romain and La Potterie (2004), Felix et al .(2007), Leleux and Serlemont (2003), and Cumming et al. (2010).

Gompers and Lerner (1999) have examined the determinants of fundraising for the venture industry and individual venture organizations in USA for the period of 1972 to 1994. They find that demand for venture capital appears to play a critical role on commitments to new venture capital funds. They confirm that the reduction on the profits tax has a positive impact on demand for venture capital. Gompers and Lerner (1999) also report that 'pension regulations, overall economic growth and research and developments expenditures as well as firm-specific performance and reputation lead to greater fundraising by venture organizations'.

Jeng and Wells (2000) examine the venture capital determinants for a sample of 21 countries, over the period of 1986-1995. They use as dependants variables: venture capital funds (early stage and expansion), early stage investments and new funds raised. The results of Between and Within regressions have shown that different types of venture capital investments are differently affected by the determinants of venture capital. In fact, while later stage venture capital investments respond strongly to different levels IPOs across countries, early stage are unaffected. The opposite holds has observed for the labor market rigidity who affects the early stage investments but not the later stage one. Private pension fund levels are significant determinants overtime but not across countries. However, GDP growth and market capitalization are not significant. Finally they find that government funded venture capital has different sensitivities to the determinants of venture capital than non government funded venture capital.

Accordingly to studies cited above, Marti and Balboa (2001) have examined the determinants of venture capital / private equity fundraising but in countries where both little and asymmetric information exist. They also try to explain the venture capital market financing by means of variables directly related with the venture capital process rather than by macroeconomic variables. Using panel data techniques for 16 European countries for the period from 1991 to 1999, they find that the amount investments have a significant effect in fundraising. This coefficient is even larger when the amounts considered are the ones in the previous year. However, the divestments are significantly and negatively associated with fundraising activities in group of countries analyzed. Contrary to the argument of Gompers and Lerner (1999) and accordingly to this of Jeng and Well (2000) they find that GDP growth is not a significant determinant of venture capital fundraising.

Romain and La Potterie (2004) continue this line of investigation but they first develop a theoretical model which takes into account the factors that affect the demand and supply of venture capital. These factors are the GDP growth, the interest rate, technological opportunity, the growth rate of business research and development capital stock, the number of triadic patents, the labor market rigidities, the level of entrepreneurship and the impact of corporate income tax rate. Second, they conduct an empirical analysis. Using a panel data set of 16 OECD countries over the period of 1990-2000 they observe that GDP growth and both short term and long term interest rate have a positive impact on venture capital intensity. The indicators of technological opportunity are also significantly and positively associated with the relative level of venture capital. Turning to entrepreneurial environment they find that labor market rigidities reduces the impact of GDP and research and development on venture capital. However, the level of entrepreneurship increases the impact of research and development on venture capital.

In more recent study, Félix et al. (2007) have analyzed the determinants of the European venture capital market. Using a fixed and random effects models on a data set with 23 countries and for the period from 1992 to 2003 they conclude that GDP growth, the level of interest rate, stock market growth, venture capital divestments are significantly and positively associated with venture capital. In the case of IPO divestments, they conclude that the IPO divestments remain one of the strongest determinants for venture capital financings, or for venture capital investments. Similar results are observed for the trade sales divestments. Finally, they conclude that the unemployment rate and the price /book ratio are relevant in the European venture capital markets. Such as Jeng and Well (2000), they find that different types of venture capital financing are affected differently by certain factors. In the case of high-tech investment they find that the economic growth, the level of the long term interest rates, the level of unemployment rates and the market capitalization growth are the most important determinants of venture capital. However, in the case of early stage investment, only the level of long term interest rates, the level of unemployment rate, the IPO divestments and the price-book ratio are its main determinants.

Besides the macroeconomic factors, the institutional environment affects the venture capital investments. The strand in the literature looks at financial development from an institutional quality goes back to the seminal contributions of LLSV (1997/1998) on how the legal rules covering protection of shareholders and creditors, the origin of these rules and the quality of their enforcement affect financial development.

Building on this theory, Leleux and Serlemont (2003) have study the role played by public investors in the development of European national venture capital industries from both a conceptual and an empirical standpoint. Using a data of 15 European countries over the period 1990-1996, Leleux and Surlemont (2003) find that countries offering relatively poor investor protections (French and German civil law countries in particular) develop smaller venture capital industries. They findings also show that the very nature of the legal systems in terms of investors' protection, more than the quality of the enforcement of these rules, that seems to influence market size.

In more recent study, Cumming et al. (2010) argue that the source of international differences in venture capital markets is most likely attributable to the impact of laws and institutions on venture capital governance structures. Using a new dataset on investments of venture capitalists in 3848 portfolio firms in 39 countries from North and South America, Europe and Asia spinning 1971-2003, Cumming et al. (2010) found that better legal institutions including better accounting standards significantly increase the benefits to venture capitalist board representation even with multivariate controls for other market factors, venture capital fund, entrepreneurial firm and transaction characteristic.

According to the previous studies, there are several potential determinants of venture capital. Some of them can be measured qualitatively or quantitatively at the macro level, whereas others like the general partner reputation and the strategy of the venture funded firms are microeconomic factors (Romain and de La Potterie 2007).

DATA AND ECONOMETRIC METHODOLOGY

Data

For the empirical analysis, we use data on 21 European countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, and UK over the period of 1997-2006. To examine the determinants of venture capital we use two dependant variables: The first is the early stage investments which are defined as the sum of startup and seed investments. The second is the funds raised. The data are obtained from the European Private Equity and Venture Capital Association (EVCA) yearbooks. Besides, we use the following indicators as explanatory variables:

Macroeconomics Determinants of Venture Capital Investments

- GDP growth: The first macroeconomic determinant of venture capital is the annual GDP growth rate in local currency (*Growth*) which is provided by OECD for (1998-1999) and Eurostat (2000-

2003). According to Gompers and Lerner (1999), Romain and La Potterie (2004) Félix et al. (2007), we expect to have a positive impact on venture capital.

- The interest rate: It is defined as the annual real interest rate (*Interestrate)* which is collected from WDI 2006. We expect that the interest rate effect on venture capital is ambiguous. In fact, Gompers and Lerners (1999) have found that interest rate affect positively the venture capital demand. However, Romain and La Potterie (2004) have found that both short and long interest rate affect more the demand side of venture capital than the supply side. This can indicate that in the equilibrium the real interest rate effect is ambiguous.
- The unemployment rate (*Unemployment*): It is defined as total unemployment in percentage of total labor force. The data source is the World Development Indicators (WDI) 2006. According to Félix et al. (2007) we expect that the unemployment rate effect in venture capital investments is ambiguous in an equilibrium model. They have argued that the unemployment rate affect positively the demand of venture capital investments and negatively the supply of funds for venture capital.
- Stock market capitalization: Stock market capitalization (*MCAPGDP*) equals to the value of listed domestic copany shares on each country's major stock exchanges as a percent of GDP (WDI 2006). Stock market capitalization affects positively the venture capital investments.

Technological Opportunities

As indicators of technological opportunities we use the Research and Development expenditures (*RD*) which are collected from Eurostat. Research and Development expenditure are positively associated with venture capital investments.

Variables Related Directly to the Venture Capital Process

As variables related directly to venture capital process, we use three divestments forms: IPO divestments (*DIVESIPO*), trade sales divestments (*DIVESTRADE*) and the write-offs divestments (*DIVESWROFF*).

According to the literature[2] we expect a positive relationship between venture capital investments and both IPO and trade sales divestments. However, Write-offs divestments affect negatively the venture capital investments (Marti and Balboa 2001).

In the variables related with investments and divestments values of the venture capital market, we follow the methodology used by Marti and Balboa (2001) and Félix et al. (2007). Theses authors normalize the values of these variables for the respective GDP value (for year and country)[3].

Institutional factors

In order to assess the role of public institutions as a determinant of European venture capital investment we use the *index of economic freedom* from the heritage foundation (1995-2007) as indicator of institutional quality. The composite index is a simple average of 10 individual freedoms, each of which is vital to the development of personal and national prosperity. Beach and Kane (2007) have defined each of the 10 Economic Freedoms as follows:

- Business freedom (*Business*) is the ability to create, operate, and close an enterprise quickly and easily. Burdensome, redundant regulatory rules are the most harmful barriers to business freedom.
- Trade freedom (*Trade*) is a composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services.
- Monetary freedom (*Monetary*) combines a measure of price stability with an assessment of price controls. Both inflation and price controls distort market activity. Price stability without microeconomic intervention is the ideal state for the free market.
- Freedom from government (*Government)* is defined to include all government expenditures - including consumption and transfers - and state-owned enterprises. Ideally, the state will provide only true public goods, with an absolute minimum of expenditure.

- Fiscal freedom (*Fiscal*) is a measure of the burden of government from the revenue side. It includes both the tax burden in terms of the top tax rate on income (individual and corporate separately) and the overall amount of tax revenue as portion of GDP.
- A property right (*property rights)* is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state.
- Investment freedom (*Investment*) is an assessment of the free flow of capital, especially foreign capital.
- Financial freedom (*Financial*) is a measure of banking security as well as independence from government control. State ownership of banks and other financial institutions such as insurer and capital markets is an inefficient burden, and political favoritism has no place in a free capital market.
- Freedom from corruption *(Corruption*) is based on quantitative data that assess the perception of corruption in the business environment, including levels of governmental legal, judicial, and administrative corruption.
- Labor freedom *(Labor)* is a composite measure of the ability of workers and businesses to interact without restriction by the state.

Each one of the 10 freedoms is graded using a scale from 0 to 100, where 100 represent the maximum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom.

The problem with the index of economic freedom is that it gives us very little which aspects of institutions should be policy directed towards. To avert this problem, the paper studies the impact of the first nine components[4] of the index of economic freedom on European venture capital investments.

Econometric Methodology

Basing on the previous studies we chose to estimate reduced form equations[5], where the level of venture capital investment is regressed against a set of observables factors which are expected to affect both supply and demand. Our basic equation to be estimated is the following:

$$Y_{i,t} = \alpha_i + \beta M_{i,t} + \theta INST_{it} + \mu_{i,t} \quad , \text{for } i = 1, 2, \ldots..N, \; t = 1,2, \ldots T_i \qquad (1)$$

Where Y is defined as the dependant variable (Early stage investments/ Funds raised), M is a matrix of macroeconomic variables made up of GDP growth, interest rate, investment rate, the unemployment rate, stock market capitalization, technological opportunities and variables directly related to venture capital process. The INST variable is the indicator of institutional quality. α_i is the unobserved country specific fixed effect, $\mu_{i,t}$ is the error term for each observation.

Fixed effects (FE) as well as random effects (RE) models are considered in this study. We use the Hausman test to select the appropriate estimator. If the Hausman test reject the null hypothesis that the individual effects are not correlated with the explanatory variables, the most suitable estimation would then be the fixed-effects model[6].

While the panels techniques (fixed effects and random effects specifications) account for time-invariant country characteristics and time trends that may influence venture capital investments, fixed and random effects models are not a panacea, since reverse causation and measurement error might still plague the estimates when we consider the institutional quality. Empirical research on institutions and development must deal with the endogeneity of institutions. As argued by Aghion et al.(2004), institutions themselves are endogenous[7]. One frequent solution to this problem implies searching for a variable that while influencing institutions, is not directly caused by venture capital funding. The quest for such a variable, an instrument for institutions, naturally leads to a search for fundamental determinants of institutions. The first contribution goes back to the seminal contributions of La Porta et al. (1997/1998) on how the "legal origin" has an effect on current institutions. Empirically it is argued that "legal origin" is a valid instrument to pin down the causal effect on the legal framework on financial development. These legal origin variables have been increasingly adopted as exogenous determinants of institutional quality in

the economic growth literature. Thus, when we consider the institutional quality besides the fixed effects and random effects models we use the instrumental variable techniques. Besides endogeneity the instrumental variables estimates also account for measurement error in the institutional proxies[8].

EMPIRICAL RESULTS

Macroeconomic Determinants of Venture Capital Investments

Descriptive statistics are shown in Table (1). We examine correlations among the potential venture capital funding determinants. Since the highest correlation in absolute values is 0.54 (between the index of economic freedom and stock market capitalization) and most of the correlation are below 0.52, Table (2) does not indicate any serious multicollinearity.

TABLE 1
SUMMARY STATISTICS

Variable	Obs	Mean	Std. Dv.	Min	Max
Early-Stage	193	.0002775	.0003074	0	.0022726
Funds	193	.0028355	.0045357	.0000162	.0401912
Growth	210	.0302204	.0217031	-.0610278	.11681
MCAP	194	.7036122	.6142224	.0177691	3.220146
Interest rate	161	.0437823	.03364	-.0597787	.1527376
Unemployment	168	.0809464	.0418164	.025	.206
RD	198	.0141533	.0098588	0	.0425
DIVESTRADE	193	.0002774	.0003475	0	.0022189
DIVESIPO	178	.0000553	.0001286	0	.0011144
DIVESWOff	194	.0001023	.0001629	0	.0013243
Index of Economic Freedom	210	67.5157	7.211381	45.98672	82.41284

Obs is number of observations from 21 countries during simple period 1997-2006. (1) *Early –stage* is the early stage investments (i.e seed and startup) divided by GDP. (2) *Funds* is funds raised divided by *GDP. (3) Growth* is the annual GDP growth in local currency. (4) *MCAP* is the stock market capitalization which equals to the value of listed domestic company shares on each country's major stock exchanges as a percent of GDP. *(5) Interest rate* is defined as the annual real interest rate. (6) *Unemployment* is defined as total unemployment in percentage of total labor force. (7) *RD* is the Research and Development expenditures. (8) *DIVESTRADE* is the annual trade sale total divestments divided by GDP, (9) *DIVESIPO* is the annual IPO total divestments divided by GDP. (10) *DIVESWOFF* is the annual Write-Offs divestments, divided by GDP. (11) *Index of Economic Freedom* is a simple average of 10 individual freedoms.

TABLE 2
CORRELATION MATRIX

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)Early-Stage	1										
(2)Funds	0.56*	1									
(3)Growth	-0.054	-0.01	1								
(4)MCAP	0.42*	0.41*	-0.04	1							
(5)Interest rate	-0.13*	-0.15*	-0.08	-0.24*	1						
(6)Unemployment	-0.31*	-0.22*	0.15*	-0.28*	0.35*	1					
(7)RD	0.39*	0.31*	-0.09	0.05	0.06	-0.07	1				
(8)DIVESTRADE	0.40*	0.70*	-0.035	0.30*	-0.18*	-0.15*	0.21*	1			
(9)DIVESIPO	0.39*	0.74*	-0.007	0.34*	-0.10	-0.15*	0.15*	0.56*	1		
(10)DIVESWOFF	0.27*	0.28*	-0.25*	0.13*	-0.10	-0.27*	0.10	0.31*	0.21*	1	
(11)Index of Economic Freedom	0.36*	0.36*	-0.03	0.54*	-0.52*	-0.49*	0.21*	0.29*	0.28*	0.31*	1

In the table we present the correlations matrix for the variables used in the study. The definitions of the variables are same as in Table 1. *The correlation is significant to the level of 10%.

Table (3) reports the results from panel technique estimations of early stage investments on macroeconomic variables. In the first column of Table (3) we present results when we include only GDP growth, market capitalization, unemployment, interest rate and technological opportunities in the regression. We use it as the basic regression.

GDP growth has a positive and a significant effect on early stage investment. This result is consistent with the arguments of Gompers and Lerner (1999), Romain and La Potterie (2004) and Félix et al. (2007) who argue that increases in the real GDP lead to greater commitments to venture funds. However, this result is contrary to this of Jeng and Wells (2000) and Marti and Belboa (2004), who find that GDP growth is not a significant determinant of venture capital investments. In the case of market capitalization our results confirm those of Gompers and Lerner (1999) and Félix et al. (2007) who find that increases in market capitalization correspond to increases in venture capital investments.

Research and development expenditures variable is positively and significantly associated with early stage investments. This results is consistent with those of Gompers and Lerner (1999) who have argued that if the expenditures in research and development rise that means that the number of potential entrepreneurs with promising ideas increase. The unemployment rate variable has a strong negative impact on early stage investments. This is consistent with the Félix et al. (2007)'s argument, who have argued that the unemployment rate may be positively correlated with labor market rigidities, as they expect to have higher long term unemployment in countries with more rigid labor markets. As a consequence, the negative coefficient might be capturing the effect of this excluded variable. Real interest rate does not appear a significant determinant of early stage investments.

In columns 2-3-4 we include the variables directly related to venture capital process (Divestments by IPO, Divestments by trade sale and Divestments by Write-Offs). Contrary to Marti and Belboa (2001) findings who argue that the variables related to the venture capital market, like investments and divestments are statically related to venture capital financing, our results show that all three variables directly related to venture capital process appear no significant determinants of early stage investments.

TABLE 3
MACROECONOMIC DETERMINANTS OF EARLY STAGE INVESTMENTS: PANEL REGRESSIONS

	Model 1 (FE)	Model 2 (FE)	Model 3(FE)	Model 4 (FE)
Growth	.00330** (1.99)	.00331** (1.99)	.00566* (3.03)	.00365** (2.15)
MCAP	.00014*** (1.94)	.00014*** (1.93)	.000097 (1.22)	.00015** (2.09)
Interest rate	.00066 (0.62)	.00068 (0.63)	.0012 (1.02)	.00073 (0.68)
Unemployment	-.00376* (-2.40)	-.0037** (-2.39)	-.00285 (-1.50)	-.00361** (-2.30)
RD	.06669* (3.22)	.06689* (3.21)	.08033* (3.39)	.06457* (3.10)
DVESTRADE		-.02500 (-0.22)		
DIVESIPO			-.18386 (-0.54)	
DIVESWOFF				.1287 (0.95)
R^2	0.46	0.30	0.39	0.48
H-statistic	0.0062	0.013	0.013	0.0095

Panel regressions of 21 countries. The dependant variable is the early stage investments (i.e seed and startup) divided by GDP. The independent variables are (1) *Growth* is the annual GDP growth in local currency, (2) *MCAP* is the stock market capitalization which equals to the value of listed domestic company shares on each country's major stock exchanges as a percent of GDP, (3) *Interest rate* is defined as the annual real interest rate, (4) *Unemployment* is defined as total unemployment in percentage of total labor force, (5) *RD* is the Research and Development expenditures, (6) D*IVESTRADE* is the annual trade sale total divestments, divided by GDP, (7) *DIVESIPO* is the annual IPO total divestments divided by GDP, (8) *DIVESWOFF* is the annual Write-Offs divestments divided by GDP. H- statistic corresponds to Hausman test for comparison between fixed (FE) or random (RE) effects specifications. The null hypothesis indicates that the fixed effects specification is more efficient. T-statistics for coefficients in parentheses. *significant at 1%, **significant at 5%, significant at 10%.

Table (4) reports funds raised regressions. As we found for early stage investments, GDP growth, market capitalization and expenditures in research and developments are significantly and positively associated with funds raised. However, real interest rate does not appear a significant determinants of funds raised.

Contrary to as shown in early stage investments regressions unemployment is not statistically significant determinant of funds raised. However, in some cases, the impact presents the expected sign.

Similarly to as shown in early stage investments regressions the variables directly related to venture capital process (Divestments by IPO, divestments by trade sales and divestments by write-offs) have no significant effect on Funds raised.

TABLE 4
MACROECONOMIC DETERMINANTS OF FUNDS RAISED: PANEL REGRESSIONS

	Model 1 (RE)	**Model 2(FE)**	**Model 3 (RE)**	**Model 4 (FE)**
Growth	.01245 (1.30)	.01866*** (1.75)	.01387 (1.27)	.01854*** (1.69)
MCAP	.00116* (2.98)	.00082*** (1.75)	.00125* (3.28)	.00080 (1.66)
Interest rate	.00077 (0.12)	.00278 (0.40)	-.00218 (-0.29)	.0034 (0.49)
Unemployment	-.0101 (-1.46)	-.01465 (-1.46)	-.00724 (-1.17)	-.0151 (-1.49)
RD	.11751* (2.99)	.20023 (1.51)	.11269* (4.10)	.21314 (1.58)
DVESTRADE		1.0446 (1.42)		
DIVESIPO			1.1699 (0.52)	
DIVESWOFF				-.27034 (-0.31)
R^2	0.44	0.45	0.47	0.36
H-statistic	0.60	0.0001	0.55	0.0001

Panel regressions of 21 countries. The dependant variable is funds raised divided by GDP. The independent variables are (1) *Growth* is the annual GDP growth in local currency, (2) *MCAP* is the stock market capitalization which equals to the value of listed domestic company shares on each country's major stock exchanges as a percent of GDP, (3) *Interest rate* is defined as the annual real interest rate, (4) *Unemployment* is defined as total unemployment in percentage of total labor force, (5) *RD* is the Research and Development expenditures, (6) *DIVESTRADE* is the annual trade sale total divestments, divided by GDP, (7) *DIVESIPO* is the annual IPO total divestments divided by GDP, (8) *DIVESWOFF* is the annual Write-Offs divestments divided by GDP. H- Statistic corresponds to Hausman test for comparison between fixed (FE) or random (RE) effects specifications. The null hypothesis indicates that the fixed effects specification is more efficient. T-statistics for coefficients in parentheses. *significant at 1%, **significant at 5%, significant at 10%.

In summary, we find that GDP growth, market capitalization, research and development expenditures are the main macroeconomic determinants of both early stage investments and Funds raised. However, the real interest rate and the three variables directly related to venture capital process does not appear a significant determinant of venture capital investments in European countries.

Institutional determinants of venture capital investments

The next exercise we conduct in this paper is to examine the impact of institutions on European venture capital investments.

To test the effect of institutional quality on venture capital investments we add the '*Index of Economic Freedom*' to our baseline regression.

Column 1 (Table 5) reports results from the panel techniques estimations of early stage investments. As we can see, GDP growth, market capitalization and research and development expenditures have a positive and a significant effect on early stage investments. The index of economic freedom has the expected positive sign even though it is not statistically significant. The latest result signifies that institutional environment has no effect on early stage investment.

However, when we consider the funds raised, the results from Table 6 (Column 1) show that the index of economic freedom has a significant and a positive effect on funds raised which signify that institutional environment affect Funds Raised in European countries.

Our second approach is to run Instrumental Variables (IV) regressions using instruments that are not subject to reverse causality and can account for the institutional variation. La Porta et al. (1997, 1998) argue that countries with different legal histories offer different types of legal protection to their investors. English originated common law countries protect creditors and shareholders on average better than countries of the civil law tradition. Thus, the legal origin variables have been increasingly adopted as exogenous determinants of institutional quality in the economic development literature.

In column (2) tables (5, 6) we use legal origin[9] as instrument of institutional quality in early stage investments and Funds raised regressions respectively. The first interesting result is that in terms of significance, the results are analogous to the fixed-effect models. Thus, while the freedom index appears a significant determinant of funds raised (column 2 table 6), this latest index has no significant effect on early stage investments.

In summary the results show that institutional quality has a significant effect on Funds raised. However, it does not affect the European Early stage investments.

TABLE 5
INSTITUTIONAL DETERMINANTS OF EARLY STAGE INVESTMENTS

	(1) Panel technique estimation (FE)	**(2) IV estimation (Instruments = Legal Origin)**
Growth	.00352** (2.09)	.0009263 (0.74)
MCAP	.00015** (2.03)	.000177* (3.50)
Interest rate	.00081 (0.74)	.0000282 (0.03)
Unemployment	-.00361** (-2.28)	-.001255*** (-1.68)
RD	.06547* (3.14)	.01107* (4.11)
Index of economic freedom	7.26e-06 (0.77)	-3.53e-06 (-0.35)
R^2	0.49	0.36
H- statistic	0.0095	

Panel estimations (column 1) and instrumental variables (IV) estimation (column 2) of 21 countries. The dependant variable is the early stage investments (i.e seed and startup) divided by GDP. The independent variables are (1) *Growth* is the annual GDP growth in local currency, (2) *MCAP* is the stock market capitalization which equals to the value of listed domestic company shares on each country's major stock exchanges as a percent of GDP, (3) *Interest rate* is defined as the annual real interest rate, (4) *Unemployment* is defined as total unemployment in percentage of total labor force, (5) *RD* is the Research and Development expenditures and (6) *Index of economic freedom* is the

index of economic freedom which is a simple average of 10 individual freedoms (is the indicator of institutional quality). We use *legal origin* as instrument of *index of economic freedom*. H- Statistic corresponds to Hausman test for comparison between fixed (FE) or random (RE) effects specifications. The null hypothesis indicates that the fixed effects specification is more efficient. T-statistics for coefficients in parentheses. *significant at 1%, **significant at 5%, significant at 10%. We use legal origin as instrument of institutions.

TABLE 6
INSTITUTIONAL DETERMINANTS OF FUNDS RAISED

	(1) Panel technique estimation (RE)	**(2) IV estimation (Instruments = Legal Origin)**
Growth	.01501 (1.57)	-.00365 (-0.35)
MCAP	.00112* (2.90)	.000271 (0.51)
Interest rate	.00362 (0.54)	.01490 (1.52)
Unemployment	-.00587 (-0.81)	.02105** (2.43)
RD	.11531* (2.95)	.10813* (4.25)
Index of economic freedom	.00010*** (0.068)	.00041* (2.96)
R^2	0.48	0.30
H-statistic	0.75	

Panel estimations (column 1) and instrumental variables (IV) estimations (column 2) of 21 countries. The dependant variable is funds raised divided by GDP. The independent variables are (1) *Growth* is the annual GDP growth in local currency, (2) *MCAP* is the stock market capitalization which equals to the value of listed domestic company shares on each country's major stock exchanges as a percent of GDP, (3) *Interest rate* is defined as the annual real interest rate, (4) *Unemployment* is defined as total unemployment in percentage of total labor force, (5) *RD* is the Research and Development expenditures and, 6) *Index of economic freedom* is the index of economic freedom which is a simple average of 10 individual freedoms (is the indicator of institutional quality). We use *legal origin* as instrument of *index of economic freedom*. H- statistic corresponds to Hausman test for comparison between fixed (FE) or random (RE) effects specifications. The null hypothesis indicates that the fixed effects specification is more efficient. T-statistics for coefficients in parentheses. *significant at 1%, **significant at 5%, significant at 10%. We use legal origin as instrument of institutions. Legal origin is a dummy variable which equals to 1 if country has the civil law tradition and 0 if the county has the common law tradition.

Unbundling

As mentioned earlier, the problem with the concept of the freedom index is that it tells us very little about which aspect of institutions policy should be directed towards. To remedy this deficiency, the paper studies the impact of some of the components of the index of the economic freedom on venture capital investments. The resulted are reported in Tables 7 and 8 for early stage investments and funds raised respectively.

Among the institutional index only freedom from corruption has a significant and a positive effect on early stage investments. Corruption may deter investment by increasing the cost of doing business, as investors need to bribe officials in order to obtain licences and permits. In addition, corruption may increase uncertainty, which may deter investment as well. However, fiscal freedom and investment freedom score affect significantly and negatively the early stage investment. The negative sign does not confirm the theoretical expectations. When we consider the funds raised we find that property rights freedom, financial freedom and trade freedom have a significant and a positive effect on Funds raised.

Fiscal and monetary index have a negative effect on Funds raised. Investment, freedom from corruption and business freedom have no significant effect on funds raised.

TABLE 7
INSTITUTIONAL DETERMINANTS OF EARLY STAGE INVESTMENTS BY COMPONENTS)

	1 (FE)	2 (FE)	3 (FE)	4 (FE)	5(FE)	6 (FE)	7 (FE)	8 (FE)	9 (FE)
Growth	.00336** (2.02)	.00329** (1.96)	.00249 (1.47)	.00353** (2.08)	.00322** (1.93)	.00258 (1.52)	.0032** (1.98)	.00335** (2.02)	.00292** (1.86)
MCAP	.00013*** (1.78)	.00014** (1.93)	.00012*** (1.68)	.00014*** (1.97)	.00013*** (1.87)	.00014*** (1.94)	.00013*** (1.83)	.00014** (2.01)	.00015** (2.17)
Interest rate	.00073 (0.67)	.00067 (0.62)	.00008 (0.07)	.00090 (0.80)	.00093 (0.76)	.00071 (0.66)	.00039 (0.34)	.00033 (0.29)	.00015 (0.15)
Unemployment	-.00364** (-2.29)	-.00377** (-2.37)	-.00411* (-2.64)	-.00381** (-2.43)	-.00376** (-2.40)	-.00427* (-2.71)	-.00383** (-2.44)	-.00361** (-2.30)	-.0035** (-2.42)
RD	.06931* (3.23)	.06648* (3.16)	.06132* (2.96)	.0664* (3.19)	.06520* (3.10)	.0624* (3.02)	.06737* (3.23)	.06233* (2.92)	.06248* (3.17)
Business	-2.27e-06 (-0.50)								
Trade		-3.17e-07 (-0.07)							
Fiscal			-.00001*** (-1.83)						
Government				1.83e-06 (0.70)					
Monetary					4.05e-06 (0.46)				
Investment						-5.29e-06 (-1.72)			
Financial							-2.02e-06 (-0.60)		
Property rights								5.48e-06 (0.86)	
Corruption									7.97e-06* (3.47)
R^2	0.45	0.46	0.50	0.46	0.47	0.45	0.45	0.50	0.55
H-statistic	0.013	0.0066	0.0018	0.004	0.010	0.003	0.010	0.0031	0.0002

Panel regressions of 21 countries. The dependant variable is the early stage investments (i.e seed and startup) divided by GDP. The independent variables are (1) *Growth* is the annual GDP growth in local currency, (2) *MCAP* is the stock market capitalization which equals to the value of listed domestic company shares on each country's major stock exchanges as a percent of GDP, (3) *Interest rate* is defined as the annual real interest rate, (4) *Unemployment* is defined as total unemployment in percentage of total labor force, (5) *RD* is the Research and Development expenditures (6) *Business* is business freedom (7) *Trade* is trade freedom (8) *Fiscal* is fiscal freedom

(9) *Government* is government freedom (10) *Monetary* is monetary freedom (11) *Investment* is investment freedom (12) *Financial* is financial freedom (13) *Property rights* and (14) *Corruption* freedom from corruption. H- statistic corresponds to Hausman test for comparison between fixed (FE) or random (RE) effects specifications. The null hypothesis indicates that the fixed effects specification is more efficient. T-statistics for coefficients in parentheses. *significant at 1%, **significant at 5%, significant at 10%.

TABLE 8
INSTITUTIONAL DETERMINANTS OF FUNDS RAISED (BY COMPONENTS)

	1(RE)	2 (RE)	3(RE)	4(RE)	5 (RE)	6 (RE)	7(RE)	8 (RE)	9 (RE)
Growth	.01102 (1.15)	.01462 (1.53)	.00938 (0.97)	.01241 (1.27)	.01262 (1.34)	.01279 (1.30)	.01340 (1.41)	.01293 (1.36)	.01173 (1.23)
MCAP	.00123* (3.18)	.00111* (2.86)	.00108* (2.79)	.00118* (3.04)	.00135* (3.49)	.00115* (2.93)	.00118* (3.11)	.00107* (2.74)	.00107* (2.74)
Interest rate	.00017 (0.03)	.00002 (0.00)	-.00201 (-0.30)	.00101 (0.15)	-.00573 (-0.81)	.00090 (0.14)	.00562 (0.80)	-.00159 (-0.24)	.00009 (0.02)
Unemployment	-.00939 (-1.37)	-.00932 (-1.33)	-.01144 (-1.63)	-.00980 (-1.43)	-.01225*** (-1.79)	-.01028 (-1.43)	-.00730 (-1.08)	-.00472 (-0.61)	-.00808 (-1.14)
RD	.11029* (2.87)	.12009* (2.99)	.08617*** (1.93)	.11841* (3.04)	.14593* (3.68)	.11805* (2.92)	.12448* (3.38)	.09918** (2.35)	.10281** (2.49)
Business	.00003 (1.37)								
Trade		.00005*** (1.89)							
Fiscal			-.00006*** (-1.82)						
Government				3.17e-06 (0.20)					
Monetary					-.00010** (-2.19)				
Investment						1.11e-06 (0.06)			
Financial							.00003** (1.98)		
Property rights								.00005** (1.74)	
Corruption									.00002 (0,096)
R^2	0.48	0.44	0.38	0.45	0.50	0.44	0.55	0.40	0.41
H-statistic	0.62	0.64	0.19	0.68	0.51	0.65	0.74	0.13	0.71

Notes: Panel regressions of 21 countries. The dependant variable is funds raised divided by GDP. The independent variables are (1) *Growth* is the annual GDP growth in local currency, (2) *MCAP* is the stock market capitalization which equals to the value of listed domestic company shares on each country's major stock exchanges as a percent of GDP, (3) *Interest rate* is defined as the annual real interest rate, (4) *Unemployment* is defined as total unemployment in percentage of total labor force, (5) *RD* is the Research and Development expenditures (6) *Business* is business freedom (7) *Trade* is trade freedom (8) *Fiscal* is fiscal freedom (9) *Government* is government freedom (10) *Monetary* is monetary freedom (11) *Investment* is investment freedom (12) *Financial* is financial freedom (13) *Property rights* and (14) *Corruption* freedom from corruption. H- statistic corresponds to Hausman test for comparison between fixed (FE) or random (RE) effects specifications. The null hypothesis indicates that the fixed

effects specification is more efficient. T-statistics for coefficients in parentheses. *significant at 1%, **significant at 5%, significant at 10%.

Overall, the results show that the index of economic freedom plays a crucial role in determining European funds raised. A higher index of economic freedom indicates better substantive legal content pertaining to investing, the quality and likelihood of enforcement. Indeed, the existence of a strong institutional environment enforces contract efficiently and quickly. Moreover, in an economically free country, there would be no constraints on the flow of investment capital. Individuals and firms would be allowed to move their resources into and out of specific activities both internally and across the country's borders without restriction. Thus, a higher index of economic freedom implies increases in the rate of investment and ability of a fund to properly manage deal flow and financing of meritorious entrepreneurial firms.

CONCLUSION

The objective of this study was to identify the determinants of the European venture capital. To this end, we have used a panel data technique of estimation on a data set with 21 European countries for the period from 1996 to 2006. Our empirical model includes many of the determinants already tested in previous studies. In addition, we test whether the institutional quality is an important factor in explaining venture capital in European countries. Empirical results can be summarized as follows: we have shown that while interest rate does not appear as a significant determinant of venture capital in Europe, the results in the cases of market capitalization, research and development expenditures, GDP growth and unemployment confirm the expected theoretical impact. For the divestments forms, this study has shown that none of the three variables have significant effects on both early stage investments and funds raised. Finally, we have shown the relevance of the institutional quality as an important determinant of the European funds raised. Among the institutional dimensions, property rights freedom, financial freedom and trade freedom seem to play a major role in determining European funds raised. However, early stage investments are not affected by the index of economic freedom.

For private equity and venture capital to contribute to sustained economic growth, policymakers must ensure coherent, inclusive policies, which will enable the industry to continue to provide a continuous financing cycle for start ups, spin-offs, and company transition and buyout investments. For Europe to remain competitive, policymakers should support regulations that encourage investments that will bring productivity growth and innovation, which are to encouraging and retaining employment. Furthermore, policy decision makers should ease the raising and deployment of private equity and venture capital funds to drive a high-growth entrepreneurial economy.

ENDNOTES

1. Bengoa and Sanchez-Robles (2003), and Prabirjit (2007).
2. Jeng and Wells (2000), and Félix et al. (2007)
3. Marti and Balboa (2001) explain that this adjustment is necessary for two reasons: 'First, since countries differ in economic levels and each one has a different economic growth, the well-known problem of heteroskedasticity may arise, that is, the greater the economic level, the higher the observed variability. So, economic level data by GDP allows us to cope with this problem. Second, all variables are originally expressed in nominal terms, so an observed increase overtime in a variable could exclusively be due to an increase in price levels. Therefore, different inflation rates among countries could bias the estimated parameters'.
4. We take only the nine first sub-indicators of the index of economic freedom because the data for labor freedom are available only for three years (2004/2005/2006), however our analysis are for 1997-2006 periods.
5. Rin et al. (2006) argue that 'estimating a structural model of demand and supply is made problematic by the unobservability of the rate of return on venture capital investment and by the difficulty in convincingly identifying variables which affect only demand or only supply'.
6. Fixed effects model indicates that the individual effects are correlated with the explanatory variables.
7. Aghion et al.(2004) argue that institutions themselves are chosen by individuals and they evolve in response to changing of politico-economic conditions
8. Papaionnou (2009)
9. Dummy variable equals to 1 if country have the civil law tradition and 0 if the countries have the common law tradition.

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