The Macro and Political Determinants of Venture Capital Investments around the World

Stefano Bonini*
Università Commerciale "Luigi Bocconi"
Istituto di Amministrazione, Finanza e Controllo
Piazza Sraffa 11, 20122, Milan, Italy
stefano.bonini@unibocconi.it

Senem Alkan
Università Commerciale "Luigi Bocconi"
PhD Candidate
Piazza Sraffa 11, 20122, Milan, Italy
senem.alkan@phd.uni-bocconi.it

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* corresponding author: E-mail: stefano.bonini@unibocconi.it, Ph. +39 02 58363612; Fax +39 02 58363799

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Abstract:

This paper examines two different topics related to venture capital (VC) investments. The objective is to identify the main determinants of VC investments around the world. We test macro factors from the VC literature such as Initial Public Offerings (IPO), labor market rigidities, technological opportunities, stock market, Gross Domestic Product (GDP), interest rates, inflation, and corporate income taxation. We use a combination of data from 16 countries from 1995 to 2002. Plus, using risk ratings of the International Country Risk Guide (ICRG), we add political risk variables to our analysis. We examine relevant hypotheses in addressing the impact of macroeconomic and political risk factors on VC investments. In our between, fixed and random effects models, we discover that one of the most important determinants of VC investment is the total value of stocks traded. In contrary to Jeng and Wells (2000), we can only provide evidence for the significance of IPO in our fixed effects model and for only early stage VC investments. We also present that corporate income tax rate, total entrepreneurial activity, inflation, labor market rigidities, GDP growth and some of the political risk variables- investment profile, socioeconomic conditions and corruption-affect both all stages (early and expansion) investments used as a broader definition of VC, and early stage investments used as a narrower definition.

1.1. Introduction

Although VC is recognized as an important source of funding for countries' entrepreneurial activities, there are huge differences across countries in the relative amounts invested in VC. For instance, VC intensity is relatively high in the US and Canada while it is very low in Japan (See Table 1 for comparisons).

Table 1: The size of the venture capital pool in 21 nations

COUNTRY	TOTAL VENTURE CAPITAL UNDER MANAGEMENT
Australia	54
Austria	0.4
Belgium	8
Canada	182
Denmark	4
Finland	1
France	35
Germany	116
Ireland	1
Israel	550
Italy	60
Japan	11
Netherlands	100
New Zealand	1
Norway	7
Portugal	9
Spain	24
Sweden	9
Switzerland	1
United Kingdom	36
United States	3,651

Source: Jeng and Wells (2000)

First and foremost, we would like to point out that venture capital is described differently in US and Europe. In the latter, venture capital refers to private equity investments, which are investments by institutions or wealthy individuals in both publicly traded and privately held companies. On the other side, in the US, venture capital refers to one specific type of private equity investing. It involves three stages of investing-seed, startup and expansion-excluding buyouts. These various stages of investing are related to the stage of development of the portfolio company receiving the investment. Seed capital is usually used to finance initial product research and development, where as startup investments are offered to companies that have passed the idea stage and are moving into production, marketing and sale stage. Together seed and startup stages are referred as early stage investments. After early stage, a company enters expansion stage where the company needs additional capital to finance its growing manufacturing, distribution and R&D capacity. Buyouts are usually applied to more mature companies. In private equity investments, there are different types of buyouts such as leveraged buyouts and management buyouts. The former is used as to acquire a company and reduce its equity base, where as the latter is a leveraged buyout where current management takes control of the company. Our primary goal is to understand venture capital investments, not private equity. Thus, in all our analyses, we use the US definition of venture capital including only early and expansion stages of VC investments.

Before considering the driving forces of venture capital intensity across countries, it is also important to review why meeting financial needs through traditional mechanisms is difficult for VC-backed companies. There are four main factors that limit a young company to receive financing: uncertainty, asymmetric information, intangibility of firm assets, and the conditions in the relevant financial and product markets (Gompers and Lerner 2002). If investors cannot easily expect that the company will succeed in the future, the uncertainty will be high. If investors are risk averse, it will be difficult to persuade them to finance projects with high uncertainty, which affects not only the contribution of capital but also the timing of investments. Asymmetric information emerges when an entrepreneur knows more about the company than investors. Entrepreneurs may take actions that investors cannot observe and this may end up at investor’s expense. Asymmetric information may also lead to adverse selection problem where it is difficult for investors to differentiate between efficient and inefficient projects and entrepreneurs. The third factor is the intangibility of company's assets. If a company's assets does not rely on physical assets and are mainly intangible such as ideas, it may be more challenging to find financing for company's projects. Lastly, market conditions play important roles in the rigidity of financing companies. At this point, VC firms emerge as financial intermediaries to bring lenders and borrowers together where adverse selection, asymmetric information, uncertainty costs exist.

On the topic of the determinants of VC investments, previous papers have examined various variables like Initial Public Offerings (IPO), Gross Domestic Product (GDP) growth, market capitalization growth, capital gains taxes, private pension funds and so on. As there are other potential factors affecting VC investment intensity, the diversity of financial systems is perhaps one of the most important determinants underlying the differences across countries. Along this line, Black and Gilson (1998) find a linkage between countries' financial system and VC intensity. In sum, they demonstrate that active stock market is more appropriate to strong venture capital market than bank market because of the potential for VC exit through an IPO. Other possible determinants of VC investment intensity are analyzed by Gompers and Lerner (1998), Jeng and Wells (2000) and Sherlter (2003). With a panel dataset of 21 countries, Jeng and Wells (2000) shows that labor market rigidities, the level of Initial Public Offerings (IPO), government programs for entrepreneurship, and bankruptcy procedures explain a significant share of cross-country variations in VC intensity (See Table 2 for survey).

The objective of this essay is to contribute to this recent stream of research in several ways. To begin with, we use panel data techniques on data from 16 countries. We analyze the macro factors from the literature including GDP growth (GDP), interest rates (IR), IPO, total value of stocks traded (ST), stock turnover (STURN) and corporate income tax rate (CITR). To this analysis, we also add new variables such as inflation rate (INF), technological opportunities, entrepreneurial environment and political risk; which have not been seen in the literature. We discover that the one of the most important determinants of VC investment intensity is the total value of stocks traded (ST). In line with Gompers and Lerner (1998), we also demonstrate that GDP growth (GDP) is significant in explaining the variances in VC investments. In addition, we present evidence that corporate income tax rate (CITR), total entrepreneurial activity (TEA), inflation (INF), labor market rigidities (EPL), and some of the political risk variables – investment profile (INV), socioeconomic conditions (SOC), corruption (CORR)- are other important determinants of VC investments in all stages (early and expansion) of operation (Table 10). On the other hand, we do not totally agree with Jeng and Wells (2000) since we can provide evidence for the significance of initial public offerings (IPO) only for early-stage VC investments in our fixed effects model. Eventually, we present new opportunities for further research and empirical investigation by contributing new potential variables such as political risk variables, inflation, technological opportunities and entrepreneurial environment to existing VC literature. Finally, almost all of our analyses involve an international setting that help us to examine differences among countries which has been an issue of growing significance for internationalization of entrepreneurship studies (McDougall and Oviatt 1997).

The remainder of this chapter is organized as follows. Section 1.2 contains a literature review. Section 1.3 describes the hypothesis formation of what determines VC investment intensity. Section 1.4 discusses methodology, data and sampling. Section 1.5 provides the empirical results. Section 1.6 contains this chapter's conclusion.

1.2. Literature Review

This section reviews the relevant literature concerning the determinants of VC investments. First, we assess the macro determinants of VC activity involving factors dealing mainly with the general economy, technological opportunities, and entrepreneurial environment. Next, we study the existing literature on political risk from related fields.

1.2.1. Macro determinants of VC activity

First, this section does not address the many studies that examine various aspects of VC on a micro-level basis. However, we want to point out that some articles have examined the determinants of VC performance on a micro-level basis (Gompers and Lerner 1999, Kaplan and Stromberg 2003, Das et.al 2001, Hege et al. 2003, Manigart et.al 2002). Kaplan and Stromberg (2003) studies actual contracts between VCs and entrepreneurs to compare the characteristics of actual financial contracts to their counterparts in financial contracting theory. They find that various aspects of VC contracts have the effect of helping VCs in screening out good entrepreneurs and companies from bad ones. Relying on VentureXpert database, Das et.al (2001) provides a detailed study of VC deal characteristics in US. Hege et.al (2003) carries out a comparative study of the determinants of the venture financing success between Europe and US. They find that American VCs perform better than European counterparts under type of exits and internal rate of return measures of the deals. Hege et.al (2003) also suggests that either American VCs are more sophisticated than their European equivalents or the network effects are especially important.

As stated previously, this section primarily focuses on the existing literature concerning the determinants of VC investments at macro level. Only few articles have so far focused on the determinants of VC at macro level. Poterba (1989) is the first to theoretically describe venture capital investment changes in supply and demand. He argues that many of changes in financing could occur from changes in either supply of or demand for venture capital. Similarly, the impact of variations in the capital gains tax rate has received particular consideration from Poterba (Poterba 1987, 1989). Poterba's suggestion is that; since VC funds are from tax-exempt investors, they are affected by the variations in capital gains tax rates. Poterba also describes this impact as it affects not those who supply the funds but rather prompts the employees to become entrepreneurs leading to more VC demand. Following Poterba (1987, 1989) model, in their empirical study, Gompers and Lerner (1998) finds that lower capital gains tax rates have strong effect on the amount of VC investments supplied. On the other side, Jensen (1991) and Sahlman and Stevenson (1986) argue that institutional investors are prone to over or under invest in markets like venture capital. They discuss that this irrational pattern of investing can explain the variances in fundraising. Moreover, they propose that these divergences can delay entrepreneurship in American economy.

To the best of our knowledge, only four articles attempted to quantitatively evaluate the macroeconomic determinants of venture capital investments. Among these papers, Black and Gilson (1998) finds a relationship between countries' financial system and VC market. They argue that the key source of the U.S. competitive advantage in VC industry is the existence of a strong IPO market. Active stock market requires a liquid stock market and is more appropriate to strong VC market than bank market because of the potential for VC exit through an IPO. Along a similar line, Jeng and Wells (2000) develops a model aiming at identifying the determinants of VC and testing them on a cross-section of 21 countries over a period of 10 years. They find that labor market rigidities, the level of IPOs, government programs for entrepreneurship, and bankruptcy procedures explain a significant part of cross-country variations in VC investments. On the other hand, Gompers and Lerner (1998) focuses on American economy over the period 1969-1994 and take IPO as a proxy for fund performance and find no significant impact in their analyses. Seemingly, IPO is strongly correlated with the expected returns on the alternative investments and with GDP. Therefore, Gompers and Lerner (1998) finds significant impact of GDP on VC, but no impact of IPO. The opposite is the case in Jeng and Wells (2000); GDP is part of the impact of IPOs and thus appear to be not significant for Jeng and Wells (2000). Recently, Schertler (2003) analyzes the driving forces of VC activity with data from fourteen Western European countries for the time period 1988 to 2000. This paper shows that liquidity of stock markets, human capital endowment, and labor market rigidities do not affect expansion stage VC investments but affect early stage VC investments. In contrast to Jeng and Wells (2000), Schertler (2003) finds that liquidity of stock markets has a significant positive impact on early stage investments. These opposing results could be because of their different treatment of proxies. For instance, Jeng and Wells (2000) takes the market value of IPOs where as Schertler (2003) uses stock market capitalization as a proxy for liquidity of stock markets.

Table 2: Survey Literature for Potential Macro Determinants of VC investments

Main Determinants of VC investments	Gompers and Lerner (1998) over US between 1972 and 1994	Jeng and Wells (2000) over 21 countries between 1986 and 1995	Schertler (2003) over 14 European countries between 1988 and 2000
Initial Public Offerings (IPO)	Not Significant	Positive (not for early stage)	NA
Gross Domestic Product (GDP) growth	Positive	Not Significant	NA
Stock Market	Positive	Not significant	Positive (for early VC)
Interest Rates	Positive	NA	NA
Labor Market Rigidities	NA	Negative (for early VC)	Positive (for early VC)
Private Pension Funds	Positive(proxied by changes in ERISA prudent man rule)	Positive (only across time) proxied by level and growth of pension funds	NA
Capital Gains Tax Rate	Negative	Not significant	NA
Accounting Standards	NA	Negative	NA
Technological Opportunities	NA	NA	NA
Research & Development (R&D)	Positive	NA	Positive

Another variable that has been studied in VC literature is the level of pension funds in the economy; given that they are allowed to devote in venture capital. Since pension funds involve great deal of money, their contribution affects the supply of venture capital (Gompers and Lerner 1998, Jeng and Wells 2000). Although, this variable may have great importance in US; this is not the case in European countries, because pension funds in Europe do not deal with large sums of money or do not prefer investing in unquoted firms. The main results of these four existing studies are summarized in Table 2.

1.2.2. Political determinants of VC activity

Despite the recent attention for the determinants of VC intensity, there is substantial lack in academic studies of political determinants of VC investments. Yet, VC professionals include political stability among the important determinants of receiving VC funding. For instance, Markus Ableitinger, a director of Capital Dynamics says: "Successful private equity needs macro-economic and micro-economic factors. These include political stability, sophisticated capital markets, corporate governance, strong entrepreneurial structure, and proper benchmarking. Other factors include fragmented markets, low competition, and comparability of funds. If some of these criteria are not there it makes it a high risk and volatile proposition, so Russia has problems" (EVCA 2005). Moreover, venture capitalists and investors are growing in Singapore taking advantage of the country's political stability, highly educated workforce and strategic location (Kolesnikov-Jessop 2003).

Despite the fact that micro, macro and even legal determinants of VC financing have more or less been analyzed; changes in political stability of countries have not received any attention. This lack of attention is possibly due to measurement difficulties of political stability (Jodice 1985). Indeed, some researchers have studied the link between political stability and foreign direct investments (Literature survey can be found in Gastagana et al. 1998 and Busse 2004). Dealing with private investment, Brunetti and Weder (1998) demonstrates that there is a negative link between institutional uncertainty and private investment. Along a similar line, we argue that VCs would prefer to invest in countries with low political risk (politically more stable). In the remainder of this section, we attempt to provide a short description of political risk. We also review the existing literature from related fields.

We believe that "political risk" is best described as the likelihood of an event occurring over a given time period and is typically related to major alterations in government policies precipitated by striking periods such as war, insurrection or political violence (Jodice 1985). Besides, Prast and Lax (1982) argues that political risk is the probability that the goals of a project will be affected by changes in the political environment. These changes of political environment can involve various characteristics such as expropriation or nationalization of property or resources; inconvertibility of currency; actions against personnel, government intervention with contractual terms; discriminatory taxation; and politically based regulations on operations (Howell & Chaddick 1994).

This existing literature on political risk relies on institutional economics and positive political theory to assess the outcome on investors' strategies (Henisz and Williamson, 1999; Henisz, 2000a; Henisz, 2000b). Firms tend to avoid investments high in uncertainty (Cyert and March 1963). And, political bodies are key determinants of this uncertainty of a location from the perspective of a foreign investor. Political risk occurs when the government's rules for doing business in the country such as product and price regulations and relative taxation can be quickly changed (Henisz and Williamson, 1999; Henisz, 2000a). Henisz (2000a, 2000b) empirically analyze political risk as a structural characteristic of countries that may change over time. In this essay, using political risk ratings of international country risk guide (ICRG), we propose a similar analysis of political risk as a structural attribute of countries. Further empirical evidence also proves that firms favor to make business in countries with low political risk (Henisz and Delios, 2001). Following this related literature, we argue that VCs invest more in countries with low political risk.

1.3. The question and formulation of hypotheses

Following Poterba (1989), Gompers and Lerner (1998) and Jeng and Wells (2000), we argue that variations in VC investments around the world emerge from either supply or demand of VC investments. The demand of VC comes from entrepreneurs' desire to start up innovative firms, whereas the supply exists as the share of risk capital provided by private investors. Along this line, our macro and political factors in the formulation of hypotheses are mainly general economy, technological opportunities, entrepreneurial environment, and political risk.

The relevant questions and hypotheses of macro and political determinants of VC intensity are presented in next sub-sections.

1.3.3. Macro question

This section develops the hypotheses dealing with macro factors affecting the intensity of VC investments. Mainly the question, "What macro factors determine the intensity of VC investments around the world?" is analyzed. Nine different hypotheses are examined in addressing the macro question.

1.3.3.1.General Economy

It is expected that the general health of the economy affects the amount of VC investments. If the economy is growing quickly, then there may be more attractive opportunities for entrepreneurs to start new companies, thus, increases the demand for VCs. To infer the impact of general economy, we examine the initial public offerings, GDP growth, stocks traded, inflation and interest rates.

1.3.3.1.1. Initial Public Offerings (IPO)

Since VC literature shows that the most attractive option for exit is through an IPO, we select IPO for our analysis. IPOs affect the supply of VC investments because with IPOs, VC-backed companies can signal their experience to the market. Also, VCs build reputation when they successfully exit through IPOs (Schertler 2003).

Hypothesis One: Higher levels of Initial Public Offerings (IPO) in a country will lead to more venture capital investments.

This hypothesis deals with the effect of IPO on the intensity of VC investments in 16 countries around the world. Black and Gilson (1998) considers IPO as being a very important determinant of VC. Similarly, according to Jeng and Wells (2000), IPO is the strongest driver of VC financing. Berlin (1998) also finds that new funds enter the venture capital market when the IPO market is outstanding. However, Gompers and Lerner (1998) cannot find any significant effect of IPO when they take it as a proxy for fund performance in their multivariate regressions. It emerges that IPO variable is strongly correlated with the expected return on alternative investments and with the Gross Domestic Product (GDP) which is also a proxy for exit opportunities. Similarly, Gompers and Lerner (1998) find positive impact of equity market return and GDP on VC but no impact of IPO.

1.3.3.1.2. GDP, Stocks Traded and Inflation

We argue that countries with high GDP growth, low inflation and high value of stocks traded are more likely to be associated with a strong demand for VCs.

Hypothesis Two: Higher Gross Domestic Product (GDP) growth will lead to more VC investments.

Hypothesis Three: Higher levels of inflation (INF) pose a hindrance to venture capital investments.

Hypothesis Four: As total value of stocks traded (ST) in a country increases, venture capital investments increase.

Hypothesis two deals with the impact of GDP growth on VC investments in 16 countries around the world. This hypothesis is interconnected with the hypothesis one dealing with the IPO impact, where it appears that IPO is strongly correlated with the expected return on alternative investments and with the Gross Domestic Product (GDP). Since GDP and market capitalization growth are part of the impact of IPOs, Jeng and Wells (2000) finds these variables to be insignificant in their analysis. On the other hand, Gompers and Lerner (1998) find the reverse: a positive impact of equity market return and GDP on VC but no impact of IPOs.

Similarly, Gompers and Lerner (1998) includes stock market return variable in their regression analysis arguing that VC investments should be positively affected by the value of stocks traded. They use CRSP value of weighted stock market return and find no significance impact of stock market return. Surprisingly, inflation variable has not yet been analyzed in VC literature. However, we argue that it could emerge as an important determinant of a country's general health of economy.

1.3.3.1.3. Interest Rates

As the cost of capital for alternatives increases, entrepreneurs are more likely to switch to venture capitalists. While Jeng and Wells (2000) does not take this factor into account, Gompers and Lerner (1998) argues that VC funding is positively affected by interest rates. They underline bonds as an alternative to VC investments and use short-

term interest rates in their analysis. However, economic theory would suggest a negative relationship. Thus, if the interest rates rise, the level of VC investments should fall. The positive impact found by Gompers and Lerner (1998) is possibly due to their use of short-term interest rates. As short-term interest rates increase, the attractiveness of VC financing vs. credit through usual financial institutions increases from entrepreneur's viewpoint. Hence, we assume that different types of interest rates can affect the entrepreneurs in different ways. For our analysis, we prefer to use the real interest rates since this data is available for all countries over our sample-period allowing us to keep a balanced panel data. On the other hand, short-term and long-term interest rates are available only for eleven countries from 1996 to 2002. Then, our hypothesis is as follows:
Hypothesis Five: Higher real (short or long) interest rates will lead to lower VC investments.

1.3.3.2.Technological Opportunities

For Gompers and Lerner (1998), VC growth in the late 1990s can be due to increases in technological opportunities. We prefer to proxy the technological opportunity by two variables: business expenditures on research and development (BERD) and the number of triadic patent families (PAT). The first indicates a country's research motivation where as the latter can describe the innovation in a country. Nevertheless, we discover that these two variables are very strongly related with each other (table 7); therefore, we decide to omit the number pf triadic patent (PAT) variable from our estimation analysis. In that case, we construct only one hypothesis for the effect of technological opportunities, including only business expenditures on R&D (BERD).
Hypothesis Six: As the business expenditures on R&D increases, the venture capital investments in a country increase.

1.3.3.3.Entrepreneurial Environment

We measure the entrepreneurial environment by three variables: the level of corporate tax rate, the level of total entrepreneurial activity, and labor market rigidities.

1.3.3.3.1. Corporate Tax Rates

The general level of tax rates will probably reduce the rate of entrepreneurship, therefore the demand for VC investments.

Hypothesis Seven: Higher levels of corporate income tax will lead to lower levels of venture capital investments.

This hypothesis deals with the impact of corporate income tax rate (CITR) on VC investment activity. Poterba (1989) argues that corporate tax system is important since it determines the revenue and profit of entrepreneurship; and lower capital gains tax rates would increase the quantity of VC commitments. In their empirical analysis, Gompers and Lerner (1998) confirms the result of Poterba's model by finding that a decrease in capital gains tax rate has a positive and important impact on VC commitments. A reduction in capital gains tax rate often encourages entrepreneurship and thus the desire of people to create their own firm and to engage in R&D activities. By contrast, higher corporate income tax rate leads to lower levels of entrepreneurial activity in an economy; and thus, lower levels of demand for venture capital.

1.3.3.3.2. Labor Market Rigidities

Labor market regulations affect entrepreneurial activity as well. An employee has lower motivation to start his own company in countries with rigid labor markets than in countries with soft markets. The reason for this is that an employee who plans to start his own business evaluates his expected pay-off in the entrepreneurial activity with his/her actual income as an employee. Thus, the higher the rigidities in labor markets are, the lower the expected pay-off of the entrepreneurial activity. This is because in the case of a failure of the new business, the adaptation of the former entrepreneur into employment would be more difficult in a rigid labor market than a soft one.

Within VC literature, labor market rigidities are often described as one of the important determinants of why venture capital is not more established in Europe and Asia compared to US. Sahlman (1990) argues that the labor market rigidities in Germany and Japan hinder the growth in VC investing. According to Schertler (2003), an employee has lower incentives to start his own enterprise in economies with rigid labor markets than in economies with flexible markets. Therefore, we expect that labor market rigidity should impact the demand for VC funds negatively, meaning that higher labor market rigidity

leads to less demand for VC funds (Jeng and Wells 2000). We proxy labor market rigidities by the employment protection legislation (EPL), taken from OECD (2003) index, and is based on the strength of the legal framework governing hiring and laying off employees. It is a measure for labor market rigidities ranking countries from 1 to 20 with 1 being the least regulated. On the other hand, this indicator is fixed over time. Therefore, we also consider this variable in interaction with GDP in our fixed-effects regressions.
Hypothesis Eight: Labor market rigidities (EPL) will affect negatively the intensity of VC investments.

1.3.3.3.3. Total Entrepreneurial Activity

We argue that the level of entrepreneurship in a country affects positively the amount of VC investments. We consider the total entrepreneurial activity (TEA) variable by itself in our between and cross-section random effects regressions, but also introduce it in interaction with business expenditures on R&D (BERD) variable in our fixed-effects regressions since this index is only available for one year in our data.
Hypothesis Nine: Total entrepreneurial activity (TEA) will affect positively the intensity of VC investments.

1.3.4. The political risk question

This section develops four hypotheses dealing with political risk factors affecting demand and supply of VC investments. Mainly the question, "What political risk factors determine the intensity of venture capital investments around the world?" is analyzed. We provide the hypotheses and empirical results dealing with only four categories of political risk. After pre-analyzing all sub-categories of political risk that are calculated by International Country Risk Guide (ICRG), we select mainly the "investment profile, socioeconomic conditions, internal conflict and corruption" categories, which we believe that manipulate the VC intensity the most. They are also strongly correlated with VC investment intensity. In addition, out of all other sub-categories, these four components of political risk contributed to our model's explanation power the most.

1.3.4.1.Socioeconomic Conditions

This is an assessment of the socioeconomic pressures at work in society that could constrain government action or fuel social dissatisfaction. Our "socioeconomic conditions" variable is the sum of three subcomponents' rankings: unemployment, consumer confidence, poverty.

Hypothesis Ten: Countries with higher ratings in "socioeconomic conditions" receive higher amounts of VC investments compared to the countries with lower ratings in "socioeconomic conditions".

1.3.4.2.Investment Profile

This is an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components. Our "investment profile" indicator is the sum of three subcomponents' rankings: Contract viability/ Expropriation, profits repatriation, payment delays.

Hypothesis Eleven: Countries with higher ratings in "investment profile" obtain higher amounts of VC investments than countries with lower ratings in "investment profile".

1.3.4.3.Internal Conflict

This is an assessment of political violence in the country and its actual and/or potential impact on governance. This "internal conflict" factor is constructed by totaling the ratings of three subcomponents': civil war/coup threat, terrorism/political violence, civil disorder.

Hypothesis Twelve: Countries with higher ratings in "internal conflict" obtain lower amounts of VC investments than countries with lower ratings in "internal conflict".

1.3.4.4.Corruption

This is an assessment of corruption within the political system. Such corruption is a threat to foreign investment for several reasons: it distorts the economic and financial environment; it reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability; and, last but not least, introduces an inherent instability into the political process.

The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans. Such corruption can make it difficult to conduct business effectively, and in some cases my force the withdrawal or withholding of an investment.

Although our measure takes such corruption into account, it is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business. In our view these insidious sorts of corruption are potentially of much greater risk to foreign business in that they can lead to popular discontent, unrealistic and inefficient controls on the state economy, and encourage the development of the black market.

Hypothesis Thirteen: Countries with higher ratings in “corruption” obtain lower amounts of VC investments than countries with lower corruption.

1.4. Methodology

This section concentrates on the techniques that we apply for analyzing the key determinants of VC investment intensity in 16 countries around the world.

First, we provide an overview of panel data estimation, and then discuss our panel data methodology, which was employed in this essay. Second, we start our analysis with the assumption that VC activity does not have to be a linear function of the determinants because of venture capitalists’ investment behavior. Above all, VCs form their portfolios at particular development stages and/or particular industries. Therefore, in all our regression analyses, we work with nonlinear specifications of all dependent and independent variables. Next, we introduce between, cross-section fixed-effects (within) and cross-section random-effects models; however, we principally treat individual cross-section effects as random and rely on the results from random-effects model. Yet, we offer other possibilities such as fixed-effects and between regression results to compare our empirical findings.

1.4.1. Panel Data Analysis

Panel data analysis is an increasingly popular form of longitudinal data analysis among researchers in various fields. Our panel is a cross-section of 16 countries, which are surveyed annually from 1995 to 2002. With repeated observations of enough cross-sections, panel analysis permits us to study the dynamics of change with short time series. The combination of time series with cross-sections can enhance the quality and quantity of data in ways that would be impossible using only one of these two dimensions (Gujarati, 638).

Panel analysis provides a rich and powerful study of our 16 countries, since we want to consider both the space and time dimension of the data. Panel data analysis endows regression analysis with both cross-sectional and temporal dimension. The cross-sectional dimension involves our set of 16 countries. The temporal dimension pertains to annual observations of a set of variables characterizing these cross-sectional units over 1995-2002.

In order to estimate whether the general economy, technological opportunities, and entrepreneurial environment have significant explanatory impacts on the intensity of venture capital investments, the panel data methodology is employed. As mentioned, our panel data set is composed of 16 countries, for which there are the same explanatory variables dealing with general economy, technological opportunities and entrepreneurial environment, and the data is collected annually for eight years from 1995 to 2002. Thus, our time series cross-sectional data contains a total of 16*8=128 observations. Plus, our panel data set is a balanced panel since we do not have any missing years or countries.

In this context, the use of panel data methodology offers several advantages. First, having panels of information allows a more efficient handling of data than individual cross-section or time series analyses. The major advantage is that it permits to control for the individual heterogeneity. Basically, we control for the effects of variables that specifically influence the VC intensity of each country but are unobservable. There are relevant factors like, total entrepreneurial activity (TEA) and employment protection legislation (EPL), which are different for each country (but stable in time) and can be causing a different effect on VC intensity. The problem is that this type of variables is complicated to measure and the exclusion of these variables may lead to bias the parameter estimates. Consequently, the panel data methodology let us to control for this kind of individual heterogeneity. Hsiao (1986) and Arellano and Bover (1990) provide a more comprehensive review of topics related to panel data estimation.

1.4.2. Panel Data Estimation

The panel data regression is based on the following model:

$$Y_{it} = \beta_0 + \beta\, x_{it} + \mu_{it} \qquad i = 1, 2, \ldots, N \quad ; \quad t = 1, 2, \ldots, T \qquad (1)$$

With *i* denoting the cross-section dimension (countries) and *t* denoting the time series dimension (years). We denote x_{it} as the *it*th observation on *K* explanatory variables.

Our estimation strategy is as follows. In a first step, we estimate a between regression (4). Secondly, we estimate a cross-section fixed effects (within) model, i.e., we estimate (3) by using the OLS (ordinary least square) estimator. Lastly, we estimate a cross-section random effects model, i.e., we estimate (6) by using EGLS (estimated general least squares)[1].

Statistically, fixed effects models always give consistent results, but they may not be the most efficient model to estimate. Random effects give us more accurate p-values as they are a more efficient estimator. Although both models are described in this section, we rely more on random effects because according to our Hausman test*,* it is also statistically justifiable to rely on random-effects model.

[1] For all of our panel estimations, we use Eviews 5.1 program.

1.4.2.1.Fixed Effects Model

The standard fixed effect model assumes that all members of the panel have the same variance (homoskedastic error terms) and that there is no correlation over time neither across nor within the members of the panel. Fixed-effects methods are increasingly used with longitudinal data because they make it possible to control for all constant characteristics of an individual (or other unit of analysis such as countries in our case), including those characteristics that are not observed or measured. The unobserved or unmeasured component is commonly referred to as "individual heterogeneity." In recognized modeling, we represent unobserved heterogeneity a_i in a model as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \ldots + \beta_k X_{kit} + a_i + u_{it} \qquad (2)$$

where a_i represents unobserved heterogeneity that is fixed over time. Since its effect is fixed over time, the a_i is not subscripted with t. The error term (what is unaccounted for in the model) is thus the time-varying (or idiosyncratic) error and represents the unobserved factors that change over time and affect our dependent variable.

An alternative modeling approach is within-groups regression, which includes "fixed effects":

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \ldots + \beta_k X_{kit} + a_i + c_1 D_{1it} + c_2 D_{2it} + \ldots + c_k D_{kit} + u_{it} \qquad (3)$$

In this equation, the *D*'s represent dummy variables marking every country. Thus, we have a panel dataset of 16 countries which are observed over 8 years, we have N*T=128 observations, and we have 15 fixed effects[2]. The "within" estimator uses only the variance in *X* that varies over time; it ignores variation across groups. Therefore, the fixed effects estimator cannot be used to estimate the effects of time-invariant independent variables[3].

The opposite of within-groups regression is between-groups regression. In equation (4), we demonstrate that each of the 16 countries is collapsed over time, so that

[2] We must exclude one category, when using dummy variables.
[3] In this case, we need to introduce our interaction terms (e.g. EPL*GDP and BERD*TEA) since we cannot use the time invariant forms of EPL and TEA variables.

all of the variables represent each country's eight year average. The resulting regression would ignore temporal variance and focus solely on cross-sectional comparisons:

$$Ybar_i = \beta_0 + \beta_1 Xbar_{1i} + \beta_2 Xbar_{2i} + \ldots + \beta_k Xbar_{ki} + a_i + u_i \quad (4)$$

Fixed effects models have some drawbacks. For instance, the fixed effects models may often have too many cross-sectional units of observations requiring too many dummy variables for their specification. Too many dummy variables such as in our case may lessen the adequate number of degrees of freedom for powerful statistical tests. Moreover, a model with many such variables may be overwhelmed with multicollinearity, which increases the standard errors and thereby depleting statistical power to test the parameters. Although the residuals are assumed to be normally distributed and homogeneous, there could easily be unit-specific heteroskedasticity or autocorrelation over time that would further deteriorate the estimation.

1.4.2.2. Random Effects Model

Some studies have argued whether the cross-section effects should be treated as fixed or random variables. In fact, we can always treat the cross-section effects as random variables without loss of generality (Arellano and Bover 1990). In fact, what is essential is to decide whether these individual effects are correlated with the observed variables X_{it} or not. To test for the existence of this correlation we use the Hausman test (1978). If the Hausman test does not reject the null hypothesis that the cross-section effects are not correlated with the explanatory variables, the most suitable estimation would then be the random effects model. Although we do not report, in all the regressions we ran, the Hausman test did not reject the null hypothesis. Therefore, we treat the specific effects as being random and apply the Swamy and Arora estimator, which we believe is the most efficient one in our case. Even though we rely on random-effects model while drawing our conclusions, we also discuss the estimation results from fixed-effects and between regressions.

Now, we describe random-effects model where we additionally assume that the unobserved effect a_i is uncorrelated with each explanatory variable. Wooldridge (2002) writes this assumption as:

$Cov(x_{kit}, a_i) = 0$ for each time period t and variable 1…k

The random effects model is also sometimes described as a regression with a random constant term. In other words, it is assumed that the intercept is a random outcome variable that is a function of a mean value plus a random error.

A "combined" error term is formed as follows:

$$v_{it} = a_i + u_{it}$$

where a_i denotes the unobservable individual effect and u_{it} denotes the underlying disturbance, which can be thought of as a zero-mean white noise process. Mainly, we assume both u_{it} and a_i have zero means:

$$E(a_i) = 0 \quad E(u_{it}) = 0$$

And our random effects model estimated is:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \ldots + \beta_k X_{kit} + v_{it} \qquad (5)$$

Note that the combined error term v_{it} is subscripted with both *i* and *t*. Because a_i is in the combined error for each time period t, the error term v_{it} is serially correlated across time (i.e., the error terms are correlated with each other over time). The random effects estimators used in Eviews approximate the degree of serial correlation (or its importance in the model) and compute estimates accordingly.

The following equation is our complete random-effects model, which will describe the intensity of VC funds in an economy *i* in period *t* and it can be written as:

$$\text{Log(VC)}_{it} = \beta_0 + \beta_1 \log(\text{IPO})_{it} + \beta_2 \log(\text{GDP})_{it} + \beta_3 \log(\text{INF})_{it} + \beta_4 \log(\text{IR})_{it} + \beta_5 \log(\text{ST})_{it} + \beta_6 \log(\text{BERD})_{it} + \beta_7 \log(\text{CITR})_{it} + \beta_8 \log(\text{TEA})_{i} + \beta_9 \log(\text{EPL})_{i} + \beta_{10} \log(\text{SOC})_{it} + \beta_{11} \log(\text{INV})_{it} + \beta_{12} \log(\text{INT})_{it} + \beta_{13} \log(\text{CORR})_{it} + \nu_{it} \qquad (6)$$

In equation (6), the parameters that are to be estimated are identified as follows:

β_1: The impact of IPOs (+)

β_2: The impact of GDP growth (+)

β_3: The impact of inflation (-)

β_4: The impact of real interest rates (-)

β_5: The impact of stocks traded (+)

β_6: The impact of business expenditures on R&D (+)

β_7: The impact of corporate income tax rate (-)

β_8: The impact of the total level of entrepreneurial activity (+)

β_9: The impact of labor market rigidities (-)

β_{10}: The impact of socioeconomic conditions (+)

β_{11}: The impact of investment profile (+)

β_{12}: The impact of internal conflict (-)

β_{13}: The impact of corruption (-)

As explained in previous sections, we believe that the following factors will influence the supply of VC investments: Initial Public Offerings (IPO), GDP growth (GDP), inflation (INF), real interest rates (IR), stocks traded (ST), corporate income tax rate (CITR), socioeconomic conditions (SOC), investment profile (INV), internal conflict (INT), and corruption (CORR). We also introduced the factors that are important in affecting the demand for VC investments: Initial Public Offerings (IPO), GDP growth (GDP), interest rates (IR), stocks traded (ST), inflation (INF), technological opportunities—business R&D expenditures (BERD), entrepreneurial environment—total entrepreneurial activity (TEA), corporate income tax rate (CITR) and labor market rigidities (EPL).

Further detail on these variables can be seen in descriptive statistics section and in Table 5.

1.4.3. Data

The data set contains annual data from 16 countries for the time period starting from 1995 to 2002. These countries are selected according to the availability and accessibility of databases and are as follows: Australia, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, New Zealand, Norway, Poland, Spain, Sweden, United Kingdom and United States.

Our analysis is restricted to these countries due to unavailability or inaccessibility of data sources. One can refer to Table 3, Figure 1 and Figure 2 to compare the all-stages (early and expansion) VC investment activity across our sample countries and time span.

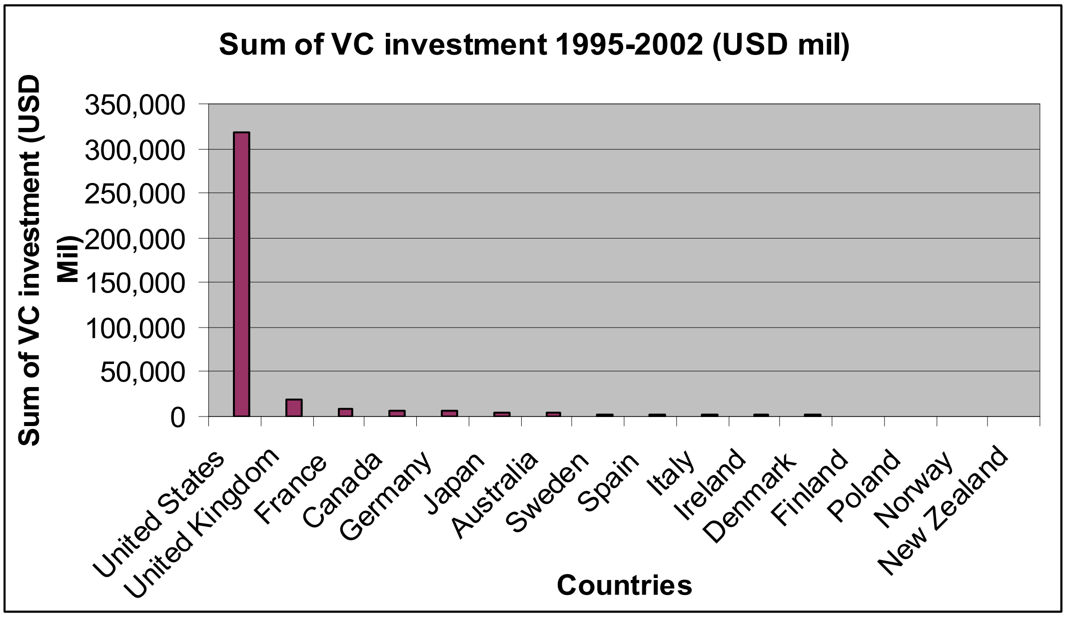
We identify that US is the chief player in the venture capital industry as the most VC activity takes place in the US. It is by far ahead of other countries; however, when we disregard US data (outlier), there is no significant change in our results. United Kingdom is another major actor with a considerable amount of VC activity. Other countries such as France, Germany and Canada are also important locations for the existing VC investment action. On the other side, some European countries such as Norway fall behind in the VC investment growth.

Table 3: Total VC investment activity across 16 countries in 1995-2002

Company Nation	Number of VC Deals	Sum VC (in Mil)	GDP level (in Mil)	Sum VC /GDP(Mil)
United States	37,770	317,427.69	7340000	0.043246
United Kingdom	2,944	18,345.73	1130000	0.016235
France	1,445	7,636.63	1550000	0.004927
Canada	1,018	6,545.72	581600	0.011255
Germany	1,610	5,923.44	2460000	0.002408
Japan	537	4,258.61	5280000	0.000807
Australia	1,083	3,188.51	372700	0.008555
Sweden	579	2,242.85	248000	0.009044
Spain	297	1,684.04	584000	0.002884
Italy	254	1,540.96	1100000	0.001401
Ireland	295	1,419.85	66500	0.021351
Denmark	235	1,160.26	180200	0.006439
Finland	458	566.67	130000	0.004359
Poland	265	548.54	136000	0.004033
Norway	103	388.29	148000	0.002624
New Zealand	94	208.74	60800	0.003433

Source: Thomson Venturexpert 1995-2002

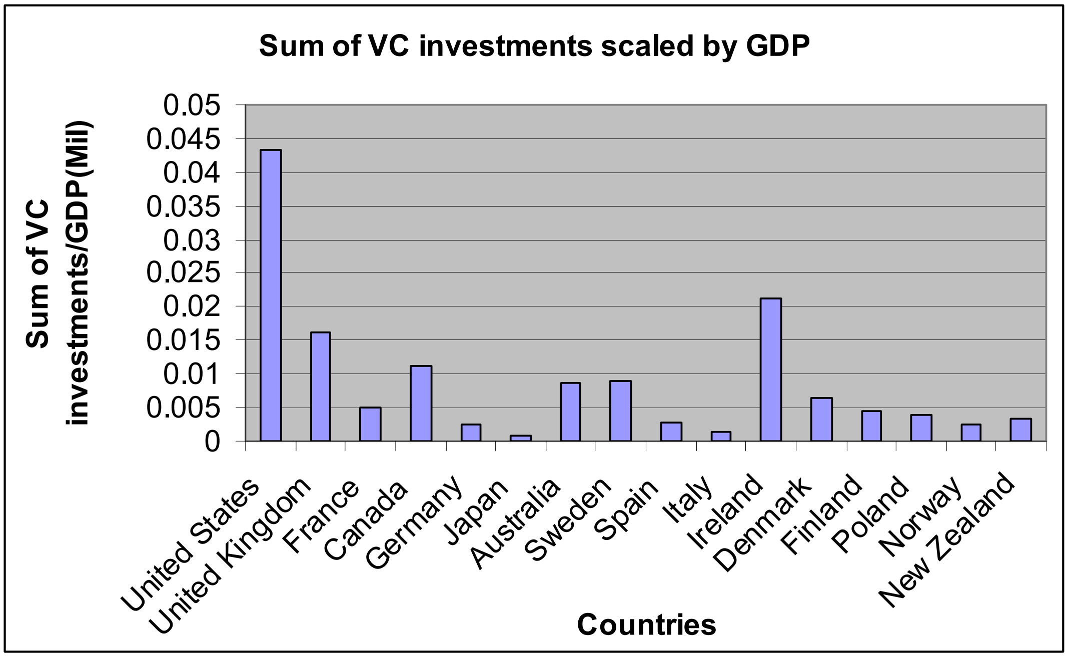
Figure 1: The sum of VC investments (USD Mil) across 16 countries in 1995-2002



Source: Thomson Venturexpert 1995-2002

As a measure of VC activity, we use the sum of all stages (early and expansion) VC investments (in USD millions) as a broader definition of VC investments in a country. Since the countries differ considerably in size, we normalize the sum of VC investments by each country's GDP level, which approximate the overall size of an economy (See Table 3 and Figure 2 for comparison). After the normalization process, The United States has again the leading VC industry, but this time it is followed by Ireland and United Kingdom. The sum of VC investment data is obtained from Thomson Venture Economics Venturexpert Database Investment Analytics Report from 1995 to 2002 for the 16 nations. Further definition and sources of all other variables in our analyses are summarized in Table 4.

Figure 2: The sum of VC investments scaled by GDP (USD Mil) in 1995-2002



Source: Thomson Venturexpert 1995-2002

Table 4: Data Definitions and Sources[4]

Variable	Description	Source
VC	Sum of venture capital investments (US$)divided by GDP levels	VentureXpert Database
GDP	Gross Domestic Product Growth as annual percentage (%)	World Bank: World Development Indicators (WDI) (1995-2002)
IR	Real Interest Rates as annual percentage (%)	World Bank: World Development Indicators (WDI) (1995-2002)
ST	Total value of stocks traded as a % of GDP	World Bank: World Development Indicators (WDI) (1995-2002)
STURN	Stock turnover rate	World Bank: World Development Indicators (WDI) (1995-2002)
IPO	Initial public offerings: annual data of the number of newly listed companies	International Federation of Stock Exchanges (1995-2002)
CITR	Corporate income tax rate: annual data	Office of Tax Policy (1995-2002)

[4] This table shows not only the variables in our complete random-effects model but also other (excluded) variables such as STURN, and PAT that we use in other analyses.

INF	Inflation: consumer prices as annual percentage (%)	World Bank: World Development Indicators (WDI) (1995-2002)
BERD	Business expenditures on research and Development	OECD, Main Science and Technology Indicators (1995-2002)
TEA	Total entrepreneurial activity: index of the proportion of adults involved in the creation of emerging firms and the proportion involved in new firms	The Global Entrepreneurship Monitor (2003)
EPL	Employment protection legislation: strength of the legal structure for hiring and laying off employees	OECD, Employment Protection Legislation (2003)
PAT	Patent: Number of triadic patent families	OECD, Main Science and Technology Indicators (1995-2002)
SOC	Socioeconomic Conditions: rating (1-12)	International Country Risk Guide (PRS database)
INV	Investment Profile: rating (1-12)	International Country Risk Guide (PRS database)
CORR	Corruption: rating (1-6)	International Country Risk Guide (PRS database)
INT	Internal Conflict: rating (1-12)	International Country Risk Guide (PRS database)
POL	Political Risk: sum of all 12 political risk Components, (max 100 points)	International Country Risk Guide (PRS database)

Among the variables defining the state of general economy; we use GDP growth (annual %), Inflation (consumer prices (annual %)), total value of stocks traded as a percentage of GDP, stock turnover rate (%) and the real interest rates (%). This annual macroeconomic data is obtained from World Bank, World Development Indicators (WDI) - the World Bank's primary database for cross-country comparable development data- between 1995 and 2002 for our 16 countries. Although we expect that different types of interest rates impact VC investment intensity differently; in our analysis, we prefer to employ real interest rates. The reason is that, long-term and short-term interest rates (taken from International Federation of Stock Exchanges) are available only for 11 countries in the period of 1996-2002, while the real interest rates are available for all the countries in our sample between 1995 and 2002. Due to showing no meaningful differences in our pre-analysis, we prefer to include only real interest rates in reporting our empirical results. As a measure of IPO, we use annual data of the number of newly listed companies, which is obtained from International Federation of Stock Exchanges for the 16 countries between 1995 and 2002.

Our proxies for the technological opportunities are the business expenditures on R&D and the number of triadic patent families[5]. Both these measures are obtained from OECD, Main Science and Technology Indicators) for 16 countries from 1995 to 2002.

As a measure of entrepreneurial environment, we use the corporate taxation, total entrepreneurial activity, and labor market rigidities. As a measure of corporate taxation, we use annual corporate income tax rate data, which is obtained from the Office of Tax Policy Research (OTPR) from 1995 to 2002 for the 16 countries. Total entrepreneurial activity data is available as an index computed by adding the proportion of adults involved in the creation of emerging firms and the proportion involved in new firms. This data is gathered from The Global Entrepreneurship Monitor for the year 2003. We treat this variable as the expected total entrepreneurial activity in a country. This variable ranks from 1 to 20, 1 having the least entrepreneurial activity. Since it is only available for one year, it varies only across countries[6]. Labor market rigidities data is rather difficult to obtain. As a measure of labor rigidities, we use OECD's employment protection legislation (EPL) which is based on the strength of the legal structure for hiring and laying off employees. Our 16 countries are ranked from 1 to 20 with 1 being the least regulated. Such as TEA indicator, EPL variable is fixed overtime[7].

The independent variables dealing with political risk in our empirical analysis include the measures from Political Risk Services (PRS)'s International Country Risk Guide (ICRG) political risk ratings. Political Risk Services (PRS) ICRG index is not widely available in universities' databases and therefore is difficult to obtain[8].

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[5] Since the number of triadic patent families (PAT) is highly correlated (about .9) with business expenditures on R&D (BERD) and some other explanatory variables; we later omit PAT variable from the regression analyses in our parsimonious and complete models.

[6] TEA is also introduced in an interaction with BERD variable (TEA*BERD); however because of strong correlation of (TEA*BERD) with other variables, we omitted this interaction in our complete random-effects model.

[7] EPL is also introduced in an interaction with GDP variable (EPL*GDP); however because of strong correlation of (EPL*GDP) with other variables, we omitted this interaction in our complete random-effects model.

[8] The PRS data is gathered through Prof. Mahmut Yasar and Mehmet O. Karabag from Emory University; we thank you for helping us to enrich our analysis on political determinants.

PRS political risk rating includes 12 weighted variables covering both political and social features. The intention of the political risk rating is to provide an approach of assessing the political risk of the countries.

This is done by assigning risk points to a pre-set group of factors, termed political risk components. The minimum number of points that can be assigned to each component is zero, while the maximum number of points depends on the fixed weight that component is given in the overall political risk assessment. In every case the lower the risk point total, the higher the risk, and the higher the risk point total the lower the risk.

Table 5: PRS Political Risk Components[9]

Component	Points (max)
Government Stability	12
Socioeconomic Conditions	12
Investment Profile	12
Internal Conflict	12
External Conflict	12
Corruption	6
Military in Politics	6
Religious Tensions	6
Law and Order	6
Ethnic Tensions	6
Democratic Accountability	6
Bureaucracy Quality	4
Total	100

Source: PRS ICRG

1.4.3.1.Descriptive Statistics

Descriptive statistics for all macro and political variables are presented in Table 6. The mean value of the dependent variable VC investment intensity in all stages (early and

[9] In our analyses, we treat each component of political risk as separate independent variables. In our parsimonious and complete models, we include the investment profile (INV), internal conflict (INT), socioeconomic conditions (SOC), corruption (CORR) and the overall political risk (POL).

expansion) (VC) (which is scaled by dividing the sum of VC investments by GDP levels) varies from 122.760 (USD Mil) in Japan to 4254.172 (USD Mil) in US, as shown in the third column in Table 6. On average, over all periods, VC investment intensity in only early stage (Early VC) (which is scaled by dividing the sum of early VC investments by GDP levels) is about 7.634 (USD Mil) in Japan, while it is 1628.009 (USD Mil) in US. Thus, in US, all stages (early and expansion) VC investments are about 2.5 times as high as early stage VC investments; where as in Japan, all stages (early and expansion) VC investments are about 7 times as high as early stage VC investments. The countries also differ substantially with respect to the total value of stocks traded (ST) as a percentage of GDP. In Poland, ST is as low as 4.84 per cent of GDP, while in US, it is as high as 187.059 per cent of GDP. US is also far ahead of other countries with regard to business expenditures on R&D (BERD). Other descriptive statistics confirm that on average, labor market is most rigid in Spain, where as it is most flexible in US. Generally, GDP is growing in Ireland the most, where Japan shows the slowest growth. Finally, the lowest corporate income taxation rate is found in Sweden, Norway and Finland (about 28%).

The number of observations for all variables is 128, except for Sum of VC growth and stock turnover (STURN) variable, in which we have 127 observations.

Table 6 Descriptive Statistics in 16 countries

COUNTRIES	SumVC		SumVC+1/GDP (VC)		SumVCgrowth		EarlySumVC		EarlySumVC+1/GDP (Early VC)		BERD		CITR		EPL		GDP		INF		TEA		POL	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
AUS	400,064	324,455	1029,225	854,254	0,950	1,235	36,349	55,830	36,349	55,830	3,678	0,719	33,875	2,642	1,500	0,000	3,778	1,004	2,710	1,722	13,400	0,000	86,224	2,416
CAN	797,334	734,909	1159,966	1022,793	0,710	1,670	23,021	19,409	23,021	19,409	8,595	1,772	38,000	0,000	1,100	0,000	3,598	1,471	1,950	0,578	8,900	0,000	85,755	3,117
DEN	145,033	145,335	876,629	872,474	33,914	71,855	21,766	44,017	21,766	44,017	1,976	0,578	33,000	2,619	1,800	0,000	2,344	0,687	2,305	0,322	5,300	0,000	89,333	3,405
FI	70,835	90,543	584,254	753,387	3,995	6,074	4,320	5,037	4,320	5,037	2,523	0,790	28,000	1,309	2,100	0,000	3,803	1,661	1,608	0,910	4,400	0,000	90,281	4,060
FR	984,054	1047,879	718,595	779,175	1,314	1,893	62,046	89,805	62,046	89,805	20,207	2,461	33,300	0,000	2,900	0,000	2,296	1,038	1,430	0,575	6,000	0,000	80,141	0,856
GER	742,251	915,775	385,611	494,597	1,230	1,616	55,593	75,163	55,593	75,163	32,199	4,843	32,500	8,018	2,500	0,000	1,471	0,855	1,422	0,474	4,500	0,000	85,214	2,404
IRE	176,440	198,755	1806,377	2022,911	38,141	104,615	11,094	9,550	11,094	9,550	0,800	0,137	30,000	9,071	1,300	0,000	9,018	1,879	3,104	1,662	7,700	0,000	87,490	2,731
IT	238,929	285,827	214,748	262,096	2,143	2,776	8,524	13,688	8,524	13,688	7,253	0,791	36,625	0,518	2,400	0,000	1,831	0,879	2,834	1,202	4,300	0,000	79,583	4,296
JPN	533,196	687,764	122,760	154,375	2,572	3,929	7,634	14,700	7,634	14,700	66,689	8,919	33,375	3,739	1,800	0,000	1,132	1,616	-0,033	0,878	1,500	0,000	82,656	3,326
NO	48,435	58,457	292,043	345,861	3,512	7,382	4,896	6,098	4,896	6,098	1,282	0,232	28,000	0,000	2,600	0,000	3,313	1,442	2,285	0,691	7,000	0,000	87,026	2,790
NZ	26,599	25,181	492,397	455,918	11,059	17,535	0,500	0,903	0,500	0,903	0,292	0,167	33,000	0,000	1,300	0,000	3,094	1,522	2,037	1,198	14,700	0,000	87,078	2,504
PL	70,900	41,127	423,859	232,992	1,598	3,645	2,530	2,231	2,530	2,231	0,871	0,182	34,250	5,600	2,100	0,000	4,385	2,264	12,440	8,430	8,800	0,000	80,380	3,541
SP	207,165	240,121	343,188	382,089	4,823	10,173	11,419	28,754	11,419	28,754	3,547	0,997	35,000	0,000	3,100	0,000	3,361	0,934	3,055	0,966	5,200	0,000	77,813	3,773
SW	280,613	319,340	1204,651	1417,155	3,279	4,032	13,314	18,240	13,314	18,240	6,193	1,237	28,000	0,000	2,600	0,000	2,919	1,418	1,167	1,034	3,700	0,000	86,953	3,580
UK	2394,010	2216,306	1662,681	1518,518	0,696	1,177	190,455	250,158	190,455	250,158	17,223	2,491	31,375	1,408	1,100	0,000	2,786	0,666	2,544	0,788	6,300	0,000	86,370	4,372
US	39727,180	35219,760	4254,172	3531,651	0,141	0,705	1628,009	1059,379	1628,009	1059,379	171,761	27,285	35,000	0,000	0,700	0,000	3,245	1,397	2,450	0,654	11,300	0,000	84,432	3,711

COUNTRIES	IPO+1/GDP (IPO)		IR		ST		INV		INT		SOC		CORR		STURN		BERD*TEA		EPL*GDP		PAT	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
AUS	237,617	103,108	6,721	1,629	48,681	15,440	8,542	1,787	11,292	0,683	8,292	1,242	4,927	0,175	53,524	14,710	49,280	9,632	0,590	0,030	299,625	59,649
CAN	199,313	66,448	4,637	1,393	55,169	16,897	8,885	2,273	11,229	0,947	8,302	0,838	5,792	0,525	63,780	7,919	76,498	15,772	0,717	0,061	557,625	106,426
DEN	47,396	22,400	6,034	1,134	33,757	14,111	8,625	1,948	11,760	0,444	8,729	1,285	5,865	0,252	61,293	12,725	10,472	3,061	0,308	0,016	220,125	16,591
FI	104,605	67,219	3,514	1,547	81,434	63,152	9,146	2,077	11,979	0,059	8,135	1,295	6,000	0,000	60,451	21,920	11,099	3,478	0,265	0,009	465,875	100,327
FR	60,052	49,221	5,369	0,625	49,330	25,631	9,042	1,845	10,365	1,086	7,323	1,162	3,531	0,508	79,790	29,659	121,241	14,768	4,158	0,260	2279,625	198,381
GER	157,609	168,952	8,579	0,649	43,861	19,156	8,911	2,007	11,792	0,402	7,521	1,401	4,813	0,762	133,616	37,954	144,898	21,793	5,288	0,543	6254,500	936,026
IRE	74,461	61,558	0,963	1,950	27,824	14,711	9,490	1,813	11,630	0,361	8,875	1,816	3,323	1,218	54,563	28,529	6,163	1,058	0,117	0,023	44,750	14,290
IT	20,617	12,362	5,011	1,710	35,875	22,841	8,583	2,134	10,938	1,224	7,323	0,812	3,208	0,492	80,325	26,174	31,187	3,399	2,769	0,141	764,125	83,352
JPN	19,185	11,382	3,311	0,715	35,623	11,782	7,813	2,198	11,938	0,177	7,505	0,862	3,531	1,167	52,100	15,863	100,034	13,378	7,997	0,817	11573,750	1259,296
NO	161,413	101,190	4,209	5,483	27,968	6,341	8,599	1,772	11,891	0,205	9,188	1,229	5,188	0,372	74,954	11,609	8,972	1,621	0,423	0,036	95,000	10,212
NZ	283,400	145,491	8,598	1,851	16,380	3,070	8,938	1,925	11,792	0,388	8,188	1,014	5,260	0,371	40,940	9,738	4,300	2,455	0,076	0,008	36,250	7,517
PL	172,908	136,027	8,927	5,303	4,840	2,169	9,396	1,772	11,167	1,073	5,458	0,718	3,927	1,232	54,940	21,863	7,668	1,599	0,347	0,037	10,000	6,845
SP	41,122	25,396	2,441	1,857	106,026	57,447	9,719	2,318	8,344	1,316	6,792	1,557	4,120	0,703	162,000	60,731	18,442	5,183	1,840	0,093	186,625	208,162
SW	136,164	70,893	5,079	1,303	90,897	41,898	8,255	2,165	11,474	0,707	7,885	1,478	5,927	0,175	82,619	20,945	22,913	4,576	0,639	0,037	916,750	112,775
UK	208,765	81,326	3,160	1,232	95,572	45,469	9,958	1,899	10,115	1,038	9,396	1,962	4,854	0,193	68,000	31,026	108,507	15,692	1,507	0,159	1809,375	254,042
US	52,785	25,849	5,951	1,425	187,059	93,594	9,641	1,706	10,911	0,459	8,958	1,425	4,240	0,446	139,501	52,515	1940,903	308,316	6,249	0,771	15296,000	2590,828

1.4.3.2.Correlations

Pairwise correlations that are presented in Table 7 offer a first clue at the relationship between venture capital investments and macro and political determinants. The correlation coefficients between venture capital investments in all stages (VC) and the total value of stocks traded (ST), socioeconomic conditions (SOC), investment profile (INV) are comparatively high (about .5, .5, .6, respectively). By contrast, correlation coefficients between VC and IPO, STURN, INF, CITR, IR, GDP, CORR are below .20. Thus, the correlation coefficients between VC and INV, SOC, ST are much stronger than the correlations between VC and IPO, STURN, INF, CITR, IR, GDP, CORR.

Many economic variables have the property that they are correlated. This is not surprising, given the natural links between almost all facets of economic activity within any given economy. However, this feature of most economic data suggests that within the context of regression, not only are the regressors (or independent variables) related to the dependent variable in a regression model, but the independent variables are also correlated with one another. When the independent variables are correlated with one another, then we have what is termed "multicollinearity".

As table 7 shows our following independent variables are highly correlated with each other: Business expenditures on R&D (BERD), Number of Triadic Patent Families (PAT), our interaction variables- employment protection legislation * gross domestic product levels (EPL*GDP), and total entrepreneurial activity * business expenditures on R&D (TEA*BERD). To deal with a possible multicollinearity problem, we attempt to use both methods; applying the first differences method and omitting highly correlated variables.

On simple remedy is to omit one of the variables that is highly multicollinear, as the informational content of this variable is essentially the same as that of other variable(s), anyways. Another common solution is to difference of log difference the data. This often removes much of the multicollinearity among regressors, particularly since the multicollinearity may have arisen because the regressors were all trending upwards over time. The advantage is that ‘changes’ in natural logarithm of the venture capital investments may not be as highly correlated as their ‘levels’. However, applying first differences method reduces the explanation power considerably.

Therefore, we prefer to omit both of our interaction variables (EPL*GDP and TEA*BERD) and one of our technological development proxy -the number of triadic patent families (PAT)-. We believe that PAT has essentially the same informational content and therefore could be represented by Business expenditures on R&D (BERD) variable. Although, the interaction terms are also omitted, we include the variables Employment Protection Legislation (EPL) and Total Entrepreneurial Activity (TEA) without their interactions in our between and random-effects regressions, where applicable.

1.4.4. Panel Regression Results

In this section, we provide empirical results from our panel estimations. First, we report our results for all stages- early and expansion- of VC investments in our between, fixed (within) and random-effects panel models. Then, to analyze whether the determinants of early stage VC investments differ from other stages, we also run between, fixed (within) and random-effects regressions with only early-stage VC investments as the dependent variable.

In order to estimate whether the identified driving forces have a significant impact on the level of VC activity, we employ panel data techniques. We provide results from between, fixed-effects (within) and random-effects estimations for our parsimonious and complete models. For all our analyses; we use Eviews panel estimation capabilities.

Table 8 shows the panel estimation regression results from between regressions of venture capital investments on macro and political variables. First, we include all macro variables in our regression analysis (OLS 1). Then, we add our single political variables into the model, which also increases the explanatory power (OLS 2). The next model includes the combined political risk variable (POL) instead of single political risk components, which seems to reduce the model's explanatory power (OLS 4). We also try to replace stocks traded (ST) variable by stock turnover (STURN) to observe whether or not stocks traded is a more significant determinant (OLS 5). In the last two models (OLS 6 and 7), we run the regressions only with 'entrepreneurial environment' variables

(CITR, EPL, TEA) and ‘general economy’ variables (GDP, INF, IPO, ST, IR), respectively.

Table 7 Pairwise Correlation Matrix

This table provides a pairwise correlation matrix of the variables used in the empirical analysis. The measure sumVC is the sum of all-stages(early and expansion) VC investments divided by the corresponding GDP levels of each country. The measure GDP is the annual % of gross domestic product of each country. The measure INF is the annual % of consumer prices. The measure IR is the annual % of real interest rates. ST is a measure of the total value of stocks traded (%of GDP). CITR is the measure of corporate income tax rate. BERD is the measure of business expenditures on R&D. PAT is the measure of the number of triadic patent families. GDP*EPL is an interaction measure of employment protection legislation index (EPL) multiplied the corresponding annual GDP levels of each country. BERD*TEA is an interaction measure of total entreprenuerial activity (TEA) multiplied by BERD variable. STURN is a measure of annual % of stock turnover. IPO is a measure of initial public offerings plus 1 divided by corresponding GDP levels of each country. GOV, SOC, INV, INT, EXT, CORR, LO, ETH, MLT, DEM, BUR, and REL are all political risk component measures. All variables are in their natural logaritmic forms. *, ** describe significance level of pairwise correlations at 5% and 1%, respectively.

	GDP	INF	IR	ST	CITR	VC	BERD	PAT	GDP*EPL	BERD*TEA	STURN	GOV	SOC	INV	INT	EXT	CORR	LO	ETH	DEM	BUR	MLT	REL	IPO
GDP	1																							
INF	0,201 *	1																						
IR	-0,201 *	-0,076	1																					
ST	-0,094	-0,319 **	-0,275 **	1																				
CITR	0,081	0,066	0,212 *	-0,054	1																			
VC	0,150	0,184 *	-0,154	0,477 **	-0,141	1																		
BERD	-0,366 **	-0,300 **	0,016	0,566 **	0,167	0,121	1																	
PAT	-0,427 **	-0,492 **	0,030	0,605 **	0,065	0,036	0,939 **	1																
GDP*EPL	-0,437 **	-0,255 **	0,055	0,383 **	0,236 **	-0,109	0,911 **	0,834	1															
BERD*TEA	-0,267 **	-0,195 *	0,093	0,578 **	0,225 *	0,271 **	0,948 **	0,859 **	0,822	1														
STURN	-0,167	-0,003	-0,158	0,591 **	0,130	0,194 *	0,439 **	0,366 **	0,468 **	0,441	1													
GOV	0,023	-0,152	-0,158	0,433 **	-0,140	0,484 **	0,097	0,082	-0,022	0,147 *	0,228 *	1												
SOC	0,000	-0,082	-0,345 **	0,529 **	-0,261 **	0,540 **	0,133	0,219	-0,093 *	0,184	0,105	0,477 **	1											
INV	-0,071	0,108	-0,195 *	0,402 **	-0,212 *	0,640 **	0,069	-0,004	-0,026	0,127 **	0,306 **	0,663 **	0,494 **	1										
INT	-0,076	-0,089	0,219 *	-0,396 **	-0,120	-0,265 **	-0,134	-0,007 **	-0,248	-0,159 **	-0,385 **	-0,200 *	0,006	-0,399 **	1									
EXT	0,034	-0,010	0,185 *	-0,456 **	0,017	-0,377 **	-0,482 **	-0,385 **	-0,380 **	-0,579 **	-0,329 **	-0,286 **	-0,326 **	-0,334 **	0,295 **	1								
CORR	0,206 *	-0,113	0,236 **	0,112	0,080	-0,072	-0,172	-0,078 **	-0,306	-0,129	0,041	-0,033	0,071	-0,184 *	0,208 *	0,204 *	1							
LO	0,115	-0,208 *	0,040	0,082	-0,041	-0,062	0,024	0,181 *	-0,180	0,054 **	-0,228 **	-0,102	0,345 **	-0,339 **	0,569 **	0,042	0,412 **	1						
ETH	-0,006	0,103	0,016	-0,336 **	-0,249 **	-0,273 **	-0,120	-0,074	-0,092 **	-0,243 **	-0,242 **	-0,257 **	-0,189 *	-0,240 **	0,451 **	0,135	-0,194 *	0,147	1					
DEM	0,391 **	0,013	-0,073	0,059	-0,180 *	0,146	-0,300 **	-0,302 **	-0,449 *	-0,218	-0,160	0,119	0,117	0,017	0,077	0,003	0,456 **	0,152	-0,128	1				
BUR	0,077	-0,356 **	-0,051	0,307 **	-0,221 *	0,112	0,128	0,284	-0,127	0,163	-0,070	0,142	0,447 **	-0,119	0,384 **	-0,096	0,418 **	0,565 **	-0,069	0,421 **	1			
MLT	-0,016	0,023	0,204 *	-0,278 **	-0,130	-0,021	-0,125	-0,047 **	-0,290	-0,119 **	-0,383 **	-0,065	0,152	-0,193 *	0,662 **	0,186 *	0,222 *	0,530 **	0,299 **	0,078	0,246 **	1		
REL	0,057	-0,256 **	0,251 **	0,375 **	-0,014	0,065	0,100	0,215	-0,020 *	0,182	0,105	0,009	0,121	-0,074	-0,079	0,035	0,618 **	0,255 **	-0,406 **	0,377 **	0,494 **	-0,110	1	
IPO	0,410 **	0,079	0,171	-0,067	0,071	0,176 *	-0,331 **	-0,319 **	-0,434 *	-0,186	-0,157	0,092	-0,026	-0,076	0,115	0,122	0,454 **	0,250 **	-0,219 *	0,301 **	0,253 **	0,229 **	0,391 **	1

Table 9 demonstrates the results from fixed-effects (within) models. Here, our models differ from between regressions since we are now obliged to use the interaction variables due to the time-invariant characteristic of EPL and TEA. Also, we prefer to include single political risk components in our fixed-effects models since they raise the models' power extensively. First, we use no interaction variable, but we add our single political variables (OLS 1). In OLS 2, we include BERD*TEA interaction[10]and in OLS 4, we analyze EPL*GDP interaction. On the other hand, OLS 3 examines no interactions but combined political risk variable (POL). The last model in fixed-effects estimations replaces stocks traded (ST) with stock turnover (STURN).

Finally Table 10 illustrates cross-section random effects and the modeling strategy is the same as in between regressions since we do not have interaction variables here. In fact, all three models provide similar results for some explanatory variables, and in our final conclusions, we consider all regression analyses; however, we depend more on our random-effects model since random-effects model provides better estimators than the other models as we discussed in the panel estimation section of this essay. In addition, for robustness check of our results, we perform a robustness test by excluding US data and running the cross-section random-effects regressions for all stages and early stage VC investments excluding US. The results for robustness check regressions are provided in Table 11.

Before starting the regression analyses, we want to emphasize several issues. First, to date, researchers have focused on linear regressions in their empirical analyses. Making linear assumptions, they have documented the results for the main determinants of VC investments. In fact, VC activity does not have to be a linear function of the determinants identified in this essay, because of venture capitalists' investment behavior. Hence, we believe that the VC investments follow nonlinear mechanisms. One of the advantages of non linear models is that almost any function that can be written in closed form can be incorporated in a nonlinear regression model. Unlike linear regression, there will be very few limitations on the way parameters can be used in the functional part of a

[10] We do not want to include both EPL*GDP and BERD*TEA interaction variables in a model at the same time since they appear to be strongly correlated. Instead we prefer to analyze them separately in our within models.

nonlinear regression model. By transforming our original data into natural logarithm of all variables, we encounter nonlinear specifications[11].

Second, in the complete models (Table 8, 9 and 10), we include all general economy variables –gross domestic product growth (GDP), initial public offerings (IPO), stocks traded (ST), inflation (INF), real interest rates (IR). As a proxy for technological opportunities, we take in only the business expenditures on R&D (BERD)[12]. The entrepreneurial environment consists of corporate income tax rate (CITR), labor market rigidities –proxied by the employment protection legislation- and total entrepreneurial activity (TEA)[13]. On the political side, our model includes four components of political risk variable- investment profile (INV), socioeconomic conditions (SOC), corruption (CORR), and internal conflict (INT). Among other components of political risk, these four variables are correlated to VC activity the most. Plus, they increase the explanation power of the model the most.

We also want to make sure that the stocks traded (ST) variable is a good proxy. By replacing stocks traded (ST) with stock turnover (STURN) in our OLS 4 in Table 8 and Table 10, and OLS 5 in Table 9, we confirm that stocks traded (ST) is a better proxy and show that stock turnover (STURN) is not a significant determinant of VC investments for our sample countries. As we demonstrate; stocks traded (ST) is a very important explanatory variable in explaining the variance in VC investment intensity (Tables 8, 9, and 10). Since ST and STURN are strongly correlated with each other, we omit STURN variable for the most part in drawing our conclusions.

Next, instead of considering the components of political risk separately in our model, we also combine them into one variable and run the regressions with only political risk (POL) variable to see if it would make a difference and/or fit better (OLS 3 in Tables 8, 9, 10). The R-squares have fallen considerably when we replace political risk components with the combined POL variable. Still, political risk (POL) variable appears in some cases to be significant at 1%, which highlights its importance once more in

[11] Descriptive statistics is calculated by using original data points instead of their natural logarithms. Yet, in all panel estimation analyses, we regress the nonlinear specifications of the data.

[12] Due to strong correlations between the two variables, we omit the number of triadic patent families (PAT) which was the other proxy for technological opportunities.

[13] Instead of interaction variables (EPL*GDP and TEA*BERD), we include only employment legislation (EPL), and total entrepreneurial activity (TEA by themselves because of strong correlations between the variables.

determining the variance in VC investments across countries and making our results more robust.

Lastly, we sub-sample the data for only early stage VC investments instead of including all stages (early and expansion) of VC investment. The reason for us doing that is the mixed results provided in the VC literature regarding early stage VC investments. Interestingly enough, we observe some divergence from the all-stages VC sample. The results for the early stage VC investments regressions are represented in the last columns of Tables 8, 9 and 10.

At this time, we start presenting our regression results from between, fixed effects (within) and random-effects models, successively. Table 8 reports results from the between regressions of venture capital investments on Business expenditures on R&D (BERD), corporate income tax rate (CITR), employment protection legislation (EPL), gross domestic product growth (GDP), inflation (INF), Initial public offerings (IPO), stocks traded (ST), interest rates (IR), stock turnover (STURN), investment profile (INV), internal conflict (INT), socioeconomic conditions (SOC), corruption (CORR), and political risk (POL). The explanatory power of all regressions is high, with R^2s ranging from 54% to 95.4%. In our complete models (OLS 1-4) for all stages VC sample (VC) and early stage VC sample (Early VC), all of our independent variables are insignificant. Still, in our more parsimonious models (OLS 5 and 6); we find some of our macro variables being important. For instance, in OLS 5, we see that labor market rigidities (EPL) is significant in explaining the variances in all stages VC sample (VC). Also, with respect to general economic variables, we observe that GDP growth and stocks traded are statistically significant for both all stages VC sample (VC) and early stage VC sample (Early VC). The interesting result here is that two of our entrepreneurial environment proxies (CITR and TEA) are very important in illuminating early stage VC intensity but not significant in determining all stages VC sample investment intensity across our 16 countries. In other words, CITR and TEA together with GDP growth and stocks traded help to explain the discrepancies in early stage VC investment intensity in 16 countries, while GDP growth, stocks traded and labor market rigidities seem to explain the difference in all stages VC investment intensity across these countries. Between regressions is important for the purposes of our study since it does not involve time-period dimension so that it is relevant to compare the variation of VC investments only across countries.

In overall between regression results, we can conclude that stock traded is the most important determinant of VC intensity across countries. This lends support to the hypothesis advanced in previous sections that 'high levels of stocks traded in a country will lead to more VC intensity'. Plus, all of the significant explanatory variables have their signs as we expected. For instance; as the total value of stocks traded in a country increases, the VC intensity in that country also increases. Also, labor market rigidities proxied by employment protection legislation (EPL) is negatively related to VC investment activity. As expected in our hypothesis on labor market rigidities; when labor market in a country becomes more rigid, VC activity in that country diminishes.

In fixed-effects (within) regressions (Table 9), our models' explanatory powers still remain high ranging from 70.4% to 82.3 %. We confirm that the total value of stocks traded (ST) is again one of the most important determinants of VC investment intensity for our all stages VC sample (VC) investments. Yet, stocks traded variable is less significantly important for our early stage VC (Early VC) investments. The socioeconomic condition emerges to be another important determinant of VC investments for both our all stages sample and early stage VC investments. Corruption is also statistically significant and negatively associated with both all stages VC sample and early stage VC investments. Remarkably, we find that internal conflict is only significant for our early stage VC investments, which shows that early stage VC investment activity is highly influenced by the condition of internal conflict in a country. Perhaps, VC investors evaluate the internal conflict conditions of relevant countries more when the firms requiring financing are at early stage. On the other hand, such as in expansion stage, the firms' characteristics together with economic conditions in the related countries may be more prominent in the eyes of VC investors.

Another striking result shown in Table 9 appears to be that the coefficient of IPO is positive and statistically significant for only early stage specifications (EarlyVC OLS 1, 2, 4 and 5). On the other hand, we find that IPO is not significant for all stages VC sample. Regarding to our early stage results, we could provide another explanation for why the coefficient on IPO is positive. This alternative explanation involves reverse causality. Since VC investments end up as IPOs, a higher level of early stage VC investments will lead to higher level of IPOs eventually. In other words, our coefficient is positive and significant not because more IPOs lead to more VC investments, but because higher levels of VC eventually show up as greater amounts of IPOs.

In addition, in line with Gompers and Lerner (1998), we find that interest rates are significant determinants in explaining the variances in the early VC investments. Our result confirms that the real interest rate is positively and significantly related to early stage VC investments (EarlyVC 1, 2, 4, and 5).

Table 8 Venture Capital Investments, Between Regressions

Between regressions of 16 countries. The dependent variables are VC (all stages) investments and Early VC (only early-stage) investments. The independent variables are (1) Business expenditures on R&D (BERD); (2) Corporate Income Tax Rate (CITR); (3) Employment Protection Legislation (EPL); (4) GDP growth; (5) Inflation (INF); (6) Initial Public Offerings (IPO); (7) Real Interest Rate (IR); (8) Stocks Traded (ST); (9) Total Entrepreneurial Activity (TEA); (10) Investment Profile (INV); (11) Internal Conflict (INT); (12) Socioeconomic Conditions (SOC); (13) Corruption (CORR); (14) Political Risk (POL); (15) Stock Turnover (STURN). T-statistics for coefficients are in parentheses. Asterisks indicate significant differences at 1%***; 5%**; and 10%* levels.

	Dependent Variable											
	VC (OLS) 1	VC (OLS) 2	VC (OLS) 3	VC (OLS) 4	VC (OLS) 5	VC (OLS) 6	Early VC (OLS) 1	Early VC (OLS) 2	Early VC (OLS) 3	Early VC (OLS) 4	Early VC (OLS) 5	Early VC (OLS) 6
Constant	7.245	-28.379	-19.725	-32.782	15.424 **	1.388	16.696	-48.913	-97.054	-54.589	20.233 **	-2.912
	(0.784)	(-0.936)	(-0.423)	(-1.075)	(2.357)	(0.927)	(1.043)	(-0.785)	(-1.486)	(-0.879)	(2.277)	(-1.416)
BERD	0.182	0.057	0.255	-0.074			0.071	0.123	0.379	0.011		
	(1.040)	(0.197)	(1.145)	(-0.244)			(0.233)	(0.207)	(1.216)	(0.018)		
CITR	-1.220	5.167	-0.104	5.671	-2.626		-5.156	4.860	-0.446	5.230	-5.208 *	
	(-0.489)	(1.150)	(-0.032)	(1.205)	(-1.408)		(-1.193)	(0.526)	(-0.098)	(0.546)	(-2.055)	
EPL	-0.722	-0.594	-0.319	-0.716	-1.244 **		-0.345	0.683	1.354	0.777	-0.773	
	(-1.423)	(-0.820)	(-0.368)	(-0.751)	(-2.689)		(-0.392)	(0.459)	(1.115)	(0.400)	(-1.231)	
GDP	1.583	6.140	1.486	5.978		1.503 *	0.619	6.331	0.209	5.771		1.753 *
	(1.701)	(2.665)	(1.487)	(2.510)		(2.192)	(0.384)	(1.338)	(0.149)	(1.190)		(1.861)
INF	-0.127	-1.122	0.020	-0.975		-0.037	0.310	-0.728	0.930	-0.406		0.048
	(-0.276)	(-1.573)	(0.036)	(-1.524)		(-0.081)	(0.388)	(-0.497)	(1.211)	(-0.312)		(0.076)
IPO	-0.043	0.242	-0.073	0.387		0.022	-0.107	0.056	-0.234	0.185		0.175
	(-0.150)	(0.533)	(-0.237)	(0.830)		(0.079)	(-0.215)	(0.060)	(-0.541)	(0.195)		(0.445)
IR	0.557	4.408	0.402	4.445		0.603	0.286	4.684	-0.369	4.441		0.677
	(1.005)	(2.235)	(0.625)	(2.088)		(1.264)	(0.297)	(1.156)	(-0.409)	(1.024)		(1.033)
ST	0.316	-0.305	0.276			0.660 **	0.595	-0.507	0.428			0.751 **
	(1.025)	(-0.453)	(0.829)			(2.745)	(1.115)	(-0.366)	(0.917)			(2.272)
TEA	0.090	-4.112	0.256	-4.290	0.521		1.046	-3.893	1.748	-3.734	1.120 **	
	(0.128)	(-1.851)	(0.322)	(-1.730)	(1.521)		(0.857)	(-0.853)	(1.565)	(-0.739)	(2.411)	
INV		5.807		5.418				9.279		9.290		
		(1.266)		(1.098)				(0.984)		(0.924)		
INT		-7.521		-6.194				-7.394		-4.911		
		(-1.498)		(-1.515)				(-0.717)		(-0.590)		
SOC		10.952		10.676				15.303		14.240		
		(2.092)		(1.959)				(1.422)		(1.283)		
CORR		-3.303		-3.961				-2.464		-2.956		
		(-1.276)		(-1.427)				(-0.463)		(-0.523)		
POL			5.164						21.779			
			(0.592)						(1.782)			
STURN				0.159						-0.145		
				(0.197)						(-0.088)		
F-statistic	3.512	3.202	2.854	2.949	5.616	4.066	1.657	1.172	2.349	1.094	4.703	3.366
R-squared	0.840	0.954	0.851	0.950	0.584	0.670	0.713	0.884	0.824	0.877	0.540	0.627
Sample size	128	128	128	127	128	128	128	128	128	127	128	128

Table9-Fixed Effects (Within) Regressions

Cross-section fixed (w ithin) effects OLS regression for 16 countries. The dependent variables are VC (all stages) investments and Early VC (only early-stage) investments. The independent variables are (1) Business expenditures on R&D (BERD); (2) Corporate Income Tax Rate (CITR); (3) GDP and Employment Protection Legislation Interaction (GDP*EPL); (4) GDP grow th; (5) Inflation (INF); (6) Initial Public Offerings (IPO); (7) Real Interest Rate (IR); (8) Stocks Traded (ST); (9) BERD and Total Entrepreneurial Activity Interaction (BERD*TEA); (10) Investment Profile (INV); (11) Internal Conflict (INT); (12) Socioeconomic Conditions (SOC); (13) Corruption (CORR); (14) Political Risk (POL); (15) Stock Turnover (STURN). T-statistics for coefficients are in parentheses. Asterisks indicate significant differences at 1%***; 5%**; and 10%* levels.

	Dependent Variable									
	VC (OLS) 1	VC (OLS) 2	VC (OLS) 3	VC (OLS) 4	VC (OLS) 5	Early VC (OLS) 1	Early VC (OLS) 2	Early VC (OLS) 3	Early VC (OLS) 4	Early VC (OLS) 5
Constant	-0.539	-2.698	2.525	-0.532	1.374	3.841	4.209	-4.116	5.652	5.253
	(-0.101)	(-0.508)	(0.168)	(-0.101)	(0.249)	(0.795)	(0.872)	(-0.267)	(1.229)	(1.093)
BERD	1.185		2.665 ***		1.549 *	-0.202		1.422 *		0.118
	(1.542)		(3.755)		(1.938)	(-0.289)		(1.951)		(0.169)
CITR	-0.465	-0.465	-1.732 *	-1.135	-0.083	-0.004	-0.004	-1.633 *	-0.923	0.362
	(-0.476)	(-0.476)	(-1.826)	(-1.107)	(-0.081)	(-0.005)	(-0.005)	(-1.677)	(-1.031)	(0.408)
EPL*GDP				-2.175 *					-3.088 ***	
				(-1.938)					(-3.152)	
GDP	0.054	0.054	0.025	0.053	-0.014	0.138	0.138	0.223	0.136	0.059
	(0.294)	(0.294)	(0.135)	(0.289)	(-0.073)	(0.822)	(0.822)	(1.183)	(0.846)	(0.344)
INF	0.098	0.098	-0.036	0.119	0.059	0.311 *	0.311 *	0.155	0.165	0.279
	(0.485)	(0.485)	(-0.175)	(0.611)	(0.278)	(1.690)	(1.690)	(0.741)	(0.977)	(1.521)
IPO	0.160	0.160	0.011	0.170	0.262	0.305 **	0.305 **	0.064	0.289 **	0.395 ***
	(1.085)	(1.085)	(0.070)	(1.166)	(1.734)	(2.283)	(2.283)	(0.417)	(2.270)	(2.994)
IR	0.070	0.070	-0.157	0.075	0.000	0.583 ***	0.583 ***	0.266	0.565 ***	0.470 **
	(0.312)	(0.312)	(-0.691)	(0.336)	(-0.000)	(2.868)	(2.868)	(1.143)	(2.913)	(2.191)
ST	0.800 ***	0.800 ***	1.252 ***	0.868 ***		0.426 *	0.426 *	1.159 ***	0.399 *	
	(2.866)	(2.866)	(4.846)	(3.180)		(1.679)	(1.679)	(4.367)	(1.675)	
BERD*TEA		1.185					-0.202			
		(1.542)					(-0.289)			
INV	0.979	0.979		1.639 **	1.618 *	0.415	0.415		0.343	0.890
	(1.184)	(1.184)		(2.301)	(1.929)	(0.552)	(0.552)		(0.551)	(1.218)
INT	-1.404	-1.404		-0.905	-2.892 *	-4.927 ***	-4.927 ***		-4.562 ***	-5.785 ***
	(-0.903)	(-0.903)		(-0.585)	(-1.898)	(-3.486)	(-3.486)		(-3.379)	(-4.357)
SOC	2.643 ***	2.643 ***		3.179 ***	3.073 ***	4.248 ***	4.248 ***		4.375 ***	4.421 ***
	(2.740)	(2.740)		(3.435)	(3.074)	(4.848)	(4.848)		(5.414)	(5.075)
CORR	-1.394 **	-1.394 **		-1.337 **	-1.440 **	-1.507 ***	-1.507 ***		-1.463 ***	-1.356 **
	(-2.141)	(-2.141)		(-2.067)	(-2.055)	(-2.547)	(-2.547)		(-2.590)	(-2.223)
POL			0.060					1.143		
			(0.017)					(0.320)		
STURN					0.066					-0.298
					(0.187)					(-0.977)
F-statistic	14.273	14.273	13.127	14.515	12.871	16.151	16.151	10.734	18.104	16.213
R-squared	0.786	0.786	0.744	0.789	0.770	0.806	0.806	0.704	0.823	0.808
Sample size	128	128	128	128	127	128	128	128	128	127

Finally, in our cross-section random-effects, we verify that the total value of stocks traded (ST) is one of the most significant determinants in explaining the divergences of VC intensity in early and all stages (OLS 1, 2, 3, and 6). Again, repeating the within regression results, real interest rate (IR) is also important for early stage VC investments but not for all stages. One of the remarkable results here is that inflation appears to be very important (significant at 1% in most cases) for both early stage VC and all stages VC sample. Yet, despite the fact that we expect a negative relationship between inflation rate and VC investments, we find that they are positively linked. Since inflation has not been taken into account in VC literature, we expect that this economic variable should be observed more in VC studies. For now, we cannot find any reasoning for the positive relationship between inflation and VC investments. We also find that total entrepreneurial activity (TEA) is almost equally important for all stages of VC investments (OLS 1-5). As the total amount of entrepreneurial activity in a country increases, VC investment activity also moves up. GDP growth is important for early stage VC investments but less important for all stages (OLS 2, 4), which proves that VC investors scrutinize general economy more when screening out early stage firms than they do in the case of expansion stage firms. Labor market rigidities appear to negatively affect VC investments intensity in both early and all stages (OLS 2, 4, 5).

On the political side, we discover that for all stages, investment profile (INV) and socioeconomic conditions (SOC) are the most important political risk components that determine the discrepancy in VC investment intensity in 16 countries (OLS 2 and 4). Yet, corruption is another factor which is negatively linked and significant at 5% level for all VC stages in our complete models (OLS 2). As expected in our corruption hypothesis, VC investments are deteriorated with an increase in corruption in the associated country. When we run the EGLS (estimated or feasible general least squares) on all and early stages VC investments including only the combined political variable (POL) instead of single political components; we find that combined political risk (POL) is tremendously important and with a positive sign. Political risk variable is constructed by adding the total risk points of 12 components. The minimum number of points that can be assigned to each component is zero, while the maximum number of points depends on the fixed weight that component is given in the overall political risk assessment. In every case the lower the risk point total, the higher the risk, and the higher the risk point total the lower the risk. This is why we obtain a positive relationship between overall political risk (POL) and VC investment intensity (VC). We believe that this result is not surprising and as a result, we confirm that political risk factors can be important determinants of VC investments in 16 countries across time.

Validating between and within regression results, we furnish no evidence of importance for stock turnover. We are also disappointed with the insignificance of business expenditures on R&D (BERD) variable since this variable was one of the first variables which came into our minds in starting this work. This surprising result illustrates that the demand for VC investments is not much sensitive to business research actions. Perhaps, in a later study, one can attempt to analyze this variable using another proxy.

On the other hand, in our random effects setting, we also provide evidence of employment protection legislation (EPL) for being significant in all stages VC investments, where as it shows little less importance in early stages of VC investments. At last, IPO seems to be not significant in most models, but in only one parsimonious model for early stage VC investments, it is significant at 10% (Early VC OLS 6).

Finally, as a robustness check of our results, we analyze a sub-sample of 15 countries (excluding US) over 1995 to 2002 in random-effects settings. We exclude US data since it seems to be an outlier in the case of VC investment intensity across countries. Excluding this outlier data does not change most of our results. Table 11 presents our robustness check results.

1.5. Conclusions

The VC industry around the world has been growing in the last two decades. This growth has received particular attention from academicians and professionals. Yet, the macro and political determinants of VC intensity around the world have drawn little consideration. In this essay, we focus on various macro and political factors that may possibly influence the VC intensity around the world. We contribute to the existing literature by introducing traditional determinants of VC investments as well as new potential indicators such as inflation, entrepreneurial environment and technological opportunities. On the political side, this essay is the first to analyze political risk factors to explain the variance in VC intensity across time and countries. To achieve that, we use International Country Risk Guide's PRS political risk database.

Table 10- Random Effects Regression Results

Cross-section rendom effects EGLS regression for 16 countries. The dependent variables are VC (all stages) investments and Early VC (only early-stage) investments. The independent variables are (1) Business expenditures on R&D (BERD); (2) Corporate Income Tax Rate (CITR); (3) Employment Protection Legislation (EPL); (4) GDP growth; (5) Inflation (INF); (6) Initial Public Offerings (IPO); (7) Real Interest Rate (IR); (8) Stocks Traded (ST); (9) Total Entrepreneurial Activity (TEA); (10) Investment Profile (INV); (11) Internal Conflict (INT); (12) Socioeconomic Conditions (SOC); (13) Corruption (CORR); (14) Political Risk (POL); (15) Stock Turnover (STURN). T-statistics for coefficients are in parentheses. Asterisks indicate significant differences at 1%***; 5%**; and 10%* levels.

	Dependent Variable											
	VC (OLS) 1	VC (OLS) 2	VC (OLS) 3	VC (OLS) 4	VC (OLS) 5	VC (OLS) 6	Early VC (OLS) 1	Early VC (OLS) 2	Early VC (OLS) 3	Early VC (OLS) 4	Early VC (OLS) 5	Early VC (OLS) 6
Constant	6.712 **	-4.139	-25.943 **	0.019	15.971 ***	-0.170	7.464 ***	-1.158	-30.228 **	2.265	13.182 ***	-2.650 ***
	(2.312)	(-0.904)	(-2.152)	(0.004)	(4.016)	(-0.215)	(2.611)	(-0.279)	(-2.567)	(0.565)	(3.894)	(-3.122)
BERD	0.122	0.007	0.226	0.210			-0.072	-0.138	0.075	0.035		
	(0.794)	(0.054)	(1.359)	(1.583)			(-0.491)	(-1.203)	(0.501)	(0.307)		
CITR	-2.283 ***	-1.251 *	-1.795 **	-1.594 **	-3.226 ***		-3.140 ***	-2.449 ***	-2.489 ***	-2.681 ***	-3.525 ***	
	(-2.826)	(-1.742)	(-2.127)	(-2.130)	(-2.913)		(-3.917)	(-3.771)	(-3.015)	(-4.112)	(-3.722)	
EPL	-0.536	-0.626 *	-0.095	-0.659 *	-1.505 ***		-0.715 *	-0.466	-0.227	-0.469	-1.077 **	
	(-1.210)	(-1.907)	(-0.189)	(-1.735)	(-2.604)		(-1.780)	(-1.583)	(-0.544)	(-1.418)	(-2.360)	
GDP	0.063	0.329 **	0.042	0.328 **		0.210	0.385 **	0.624 ***	0.380 **	0.615 ***		0.448 ***
	(0.390)	(2.280)	(0.259)	(2.175)		(1.343)	(2.389)	(4.778)	(2.365)	(4.681)		(2.794)
INF	0.496 ***	0.412 ***	0.458 ***	0.229		0.794 ***	0.444 ***	0.374 ***	0.449 ***	0.224 *		0.612 ***
	(2.924)	(2.781)	(2.642)	(1.575)		(4.600)	(2.627)	(2.787)	(2.673)	(1.766)		(3.426)
IPO	-0.144	0.048	-0.117	0.030		-0.121	-0.121	0.043	-0.103	0.028		-0.203 *
	(-1.193)	(0.459)	(-0.940)	(0.280)		(-1.235)	(-1.013)	(0.460)	(-0.869)	(0.295)		(-1.891)
IR	-0.105	0.250	-0.184	0.082		0.110	0.327 *	0.737 ***	0.227	0.590 ***		0.375 *
	(-0.531)	(1.331)	(-0.903)	(0.407)		(0.544)	(1.657)	(4.322)	(1.138)	(3.376)		(1.786)
ST	1.261 ***	0.690 ***	1.078 ***			1.457 ***	1.101 ***	0.572 ***	0.827 ***			1.320 ***
	(7.525)	(3.639)	(5.596)			(9.175)	(6.704)	(3.340)	(4.593)			(7.857)
TEA	1.448 ***	0.738 **	1.642 ***	0.887 ***	0.990 **		1.153 ***	0.656 **	1.356 ***	0.787 ***	1.425 ***	
	(3.590)	(2.425)	(3.759)	(2.681)	(2.287)		(3.077)	(2.398)	(3.650)	(2.730)	(4.169)	
INV		3.188 ***		3.444 ***				1.422 ***		1.638 ***		
		(5.718)		(5.798)				(2.814)		(3.164)		
INT		0.487		-1.282				-0.387		-1.897 **		
		(0.437)		(-1.239)				(-0.384)		(-2.104)		
SOC		1.315 *		2.191 ***				3.270 ***		4.037 ***		
		(1.898)		(3.227)				(5.221)		(6.826)		
CORR		-0.871 **		-0.229				-0.820 **		-0.260		
		(-2.089)		(-0.550)				(-2.177)		(-0.715)		
POL			6.964 ***						8.025 ***			
			(2.768)						(3.323)			
STURN				0.083						0.022		
				(0.300)						(0.093)		
F-statistic	12.943	17.489	12.564	15.350	9.496	14.820	13.572	18.764	14.503	16.921	16.314	11.539
R-squared	0.497	0.666	0.518	0.638	0.187	0.378	0.471	0.681	0.553	0.661	0.283	0.321
Sample size	128	128	128	127	128	128	128	128	128	127	128	128

Table 11 VC investments Random-Effects Regressions Robustness Check

Cross-section random-effects EGLS regression for 15 countries for our subpanel . The dependent variables are all stages VC (VC) and Early VC (only early-stage) investments. The independent variables are (1) Business expenditures on R&D (BERD); (2) Corporate Income Tax Rate (CITR); (3) Employment Protection Legislation (EPL) (4) GDP grow th (GDP); (5) Inflation (INF); (6) Initial Public Offerings (IPO); (7) Real Interest Rate (IR); (8) Stocks Traded (ST); (9) Total Entrepreneurial Activity Interaction (TEA); (10) Investment Profile (INV); (11) Internal Conflict (INT); (12) Socioeconomic Conditions (SOC); (13) Corruption (CORR). T-statistics for coefficients are in parentheses. Asterisks indicate significant differences at 1%***; 5%**; and 10%* levels.

	Dependent Variable					
	VC (OLS) 1	VC (OLS) 2	VC (OLS) 3	Early VC (OLS) 1	Early VC (OLS) 2	Early VC (OLS) 3
Constant	7.532	-4.633	-23.549	9.692	-2.709	-32.458
	(2.659)	(-0.927)	(-1.925)	(3.730)	(-0.665)	(-2.745)
BERD	0.155	0.049	0.245 *	-0.104	-0.188 *	0.010
	(1.121)	(0.346)	(1.740)	(-0.917)	(-1.967)	(0.084)
CITR	-2.581 ***	-0.850	-1.971 **	-3.759 ***	-2.040 ***	-2.634 ***
	(-3.248)	(-1.064)	(-2.379)	(-5.108)	(-3.197)	(-3.285)
EPL	-0.886 **	-0.575	-0.436	-0.820 **	-0.233	-0.196
	(-2.022)	(-1.202)	(-0.937)	(-2.362)	(-0.763)	(-0.481)
GDP	0.045	0.192	0.050	0.359 **	0.517 ***	0.339 **
	(0.260)	(1.131)	(0.289)	(2.169)	(3.778)	(2.018)
INF	0.568 ***	0.369 **	0.570 ***	0.489 ***	0.352 ***	0.487 ***
	(3.324)	(2.245)	(3.334)	(3.054)	(2.633)	(2.971)
IPO	-0.050	0.242 *	-0.072	0.015	0.336 ***	-0.020
	(-0.384)	(1.805)	(-0.555)	(0.123)	(3.131)	(-0.163)
IR	-0.090	0.202	-0.153	0.313	0.731 ***	0.182
	(-0.446)	(0.972)	(-0.747)	(1.629)	(4.282)	(0.916)
ST	1.229 ***	0.690 ***	1.013 ***	1.019 ***	0.495 ***	0.798 ***
	(7.247)	(3.095)	(5.456)	(6.656)	(2.822)	(4.609)
TEA	1.574 ***	0.722 *	1.692 ***	1.086 ***	0.245	1.296 ***
	(3.893)	(1.662)	(4.205)	(3.269)	(0.843)	(3.646)
INV		2.792 ***			1.571 ***	
		(4.617)			(3.178)	
INT		-0.189			-0.822 ***	
		(-0.148)			(-0.820)	
SOC		2.102 ***			3.843 ***	
		(2.640)			(6.043)	
CORR		-1.356 ***			-1.207 ***	
		(-2.773)			(-3.165)	
POL			6.598 ***			8.663 ***
			(2.621)			(3.604)
F-statistic	10.696	14.431	10.442	13.338	17.972	13.375
R-squared	0.467	0.639	0.489	0.522	0.688	0.551
Sample size	120	120	120	120	120	120

Our main results can be summarized as follows. With an annual data from 16 countries between 1995 and 2002 in non linear specifications in our between, fixed (within) and random effects models, we discover that the most important determinant of VC investment intensity is the total value of stocks traded (ST). Not too much in line with Jeng and Wells (2000), we can only provide evidence for the significance of IPO in our fixed effects model and for only for early stage VC investments. In line with Gompers and Lerner (1998), we also demonstrate that GDP growth (GDP) is significant in explaining the variances in VC investments. In addition, we present evidence that corporate income tax rate (CITR), total entrepreneurial activity (TEA), inflation (INF), labor market rigidities (EPL), and some of the political risk variables –investment profile (INV), socioeconomic conditions (SOC), corruption (CORR)- are other important determinants of VC investments in all stages (early and expansion) (Table 10). Finally, we believe that by introducing new potential variables such as inflation, technological opportunities (BERD) and entrepreneurial environment (EPL, CITR, TEA); we present new opportunities for further research and empirical investigation.

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