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Abstract

This paper is an empirical analysis of the effects of foreign direct investment (FDI), institutional quality and the size of a government on venture capital (VC) activity. We conclude that institutional quality, the FDI and public spending have definitive importance as elements for the development of a public policy that increases the quantity and quality of venture capital fund (VCF) investment. Higher institutional quality, higher FDI and lower public spending allow the VCF investment volume to grow. The FDI shows higher level of significance in promoting investment in high-tech companies and institutional quality increases the productivity of FDI investment in the generation of VCF. Government spending dramatically and adversely affects the activity of VCF and institutional quality increases the negative effect of government spending on the activity of VCF in emerging countries. This last result suggests that the higher the institutional quality of a country, the less state intervention it requires to promote investment of VCF. The results are consistent with the hypothesis of the FDI spillover and crowding out of public spending.

Keywords: Foreign Direct Investment; Venture Capital; Public Expenditure

JEL Classification: G24, G18

1. Introduction

The literature acknowledges that the financing of venture capital funds (VCFs) is vital for the creation of new companies (Black and Gilson: 1998, Hellmann and Puri: 2000, 2002, Kortum and Lerner 2000). Companies in early development stages and the ones operating in high-tech industries, benefit from funding of VCF because they have greater knowledge,

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higher willingness to participate in development of financing companies and a greater risk tolerance. (Gompers, 1995; Grabielsson and Huse: 2002; Hsu: 2004).

Emerging countries have tried to follow the example of the most developed[1] by adopting measures to promote the development of venture capital investment. Nevertheless, there's a lack of empirical studies necessary to validate the effectiveness of these policies. Very little is known about how to encourage the creation of active VC markets in emerging countries.

One of the purposes of this paper is to help fill this void through the empirical analysis of the relationship between foreign investment, institutional quality and size of government with VC activity. It is argued that these instruments are of great importance in the definition of a public policy which seeks the development of VC markets and recommendations regarding their use are presented to promote the growth of VCF investments in emerging countries.

A study of panel data with a new database is made. The VCR investment registration from the *Thomson one's Private Equity / Venture Capital* database is used to build a database with a larger time period than the one used in these type of studies for emerging countries (historical data of fifteen years, 1996-2010) and with a greater number of emerging countries (forty-three countries classified as emerging economies in the Financial Times and the London Stock Exchange: FTSE index)

The results indicate that the effect of institutional quality is definitive for the VCF investment in emerging countries because it reduces potential agency problems, opportunistic behavior and the risks associated with high uncertainty that exists in the relationship between the VCF and entrepreneurs. The effect of institutional quality is more important for fostering investment in technology-based entrepreneurships, which are of greater importance for the development objectives of emerging countries.

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[1] The literature recommends maintaining a high enrollment rate, developing supportive government policies to encourage the migration of scientists and entrepreneurs, a strong protection of property rights, the creation of tax benefits, the development of capital markets, a low rigidity of the labor market and the liberalization of pension funds investment (Jeng and Wells, 2000; Belke et al.: 2002, Megginson, 2004).

The FDI has a positive effect on VCF investments in emerging countries; the FDI shows a higher level of significance in promoting investment in high-tech companies and institutional quality increases the productivity of FDI by generating greater VCF investment.

Government spending has an adverse and significant effect on VCF activity. It can be concluded that government size does matter in the dynamics of VC markets in emerging countries. Furthermore, institutional quality increases the negative effect of government spending on the VCF activity in emerging countries. This last result suggests that the higher a country's institutional quality, the less state intervention it requires to promote VCF investment.

Institutional quality and FDI have higher level of significance in the promotion of investment in high-tech companies. The negative effect of government spending on the VCF activity maintains a consistently high level of significance in all types of VC investments. This situation becomes even more critical for investment in companies that are part of the high-tech industry.

It may be concluded that institutional quality, the FDI and government spending have definitive importance as elements for the development of a public policy that fosters VCF investment. Furthermore, these instruments are crucial to increase the quality of VCF investment in terms of its contribution to the development of emerging countries. Higher institutional quality, increased FDI and lower public spending, not only help to boost the VCF investment volume, they also support the growth of certain companies who benefit from the VCF activity: high-tech companies and the those in the early development stage, all of which are also essential to   the economic growth contribution in emerging countries.

The article continues as follows: the second section provides a motivation for research and a review of literature on the subject; the third section demonstrates the development of the econometric model; the fourth section describes the data and the sources used in developing

this work; the fifth section considers the results and finally, the conclusions and result limitations are presented.

2. Motivation and literature review

2.1. Venture Capital investment dynamics and institutional quality

The activities of economic agents are strongly influenced by existing institutions in the environment (Powell and DiMaggio 1991, Scott 2001). There is consensus among economists about the importance of institutions for economic development. Healthy institutions induce individuals to invest and drive economic growth. Recent evidence shows that countries with solid institutions have greater growth than those that don't have them (Barro: 1991, Knack and Keefer: 1995, Johnson et al.: 1997).

The financing of entrepreneurships benefits from the existence of healthy institutions. In the VCF – entrepreneur relationship, conflicts arise between the agent (entrepreneur) and the principal (VCF) due to the different expectations and interests of each party. The existence of asymmetric information (due to the entrepreneur having more information than the VCF), the difficulty of monitoring the actual effort that the entrepreneur applies and the delegation of property rights that the he/she receives from the VCF, leave open a possibility for the appearance of potential moral hazard and adverse selection problems, especially in the context of high uncertainty surrounding the young, growing companies (Amit et al.: 1998; Elitzur and Gavious: 2003; Gompers: 1995, Kaplan and Stromberg: 2004 , Wright et al.: 2005; Zacharakis et al., 2007).

Formal institutions are important for VCF because they establish the restrictions that are necessary to structure the interaction, provide rules that facilitate the exchange, increase the trust among economic actors and reduce transaction costs (North: 1990, Williamson 2000). Healthy institutions will help reduce the costs and the difficulties faced by VCF to evaluate potential projects, ensure an adequate VCF property rights protection and improve both the monitoring process and the process of enforcing entrepreneur contractual obligations.

Healthy institutions protect property rights and an adequate protection of property rights gives rise to economic incentives that emerge from the appropriation of the investment

benefits. Satisfactory levels of property rights protection reduce risk perception, encourage business creation, stimulate reinvestment in future development projects (Frye and Shleifer: 1997, Shleifer: 1997, La porta et al. 1999; Demirgüç- Kunt and Vojislav: 1998, Johnson et al.: 2002, Kumar et al.: 2002, Claessens and Laeven: 2003) and encourage innovation (Parker: 2007).

In short, a higher VC market dynamic is associated with a strong institution context; institutions that increase the trust of investors and promote private sector development. The contribution of this paper is in the empirical analysis of the relationship between VCF investment and institutional quality in emerging countries. The impact that institutional quality has in the investments of VCF in companies in early development stages and who are part of the high-tech industry, is clearly shown. Finally, we determine how the institutional quality, FDI and government spending, all interact in generating investment commitments in emerging countries.

2.2. Dynamics of investments by venture capital funds and public expenditure

The effect public spending has on private investment is an important issue of importance in the fiscal policy debates of different nations. The studies follow three main lines:

- The neoclassical view argues that a high government spending can generate a budget deficit, forcing to finance a portion of this spending with debt and promotes increased interest rates, which in turn, discourages private investment (Beck, 1993; Heijdra and Ligthard, 1997, Voss, 2002; Amirkhakhali et al., 2003; Ganelli, 2003). This "crowding out" effect is based on the concept that resources are scarce and are consumed with use. Therefore, no matter how any state activity is financed, it always involves an equivalent reduction of alternative uses of these resources in private hands. Thus, by acting as a substitute, government spending discourages private investment.

- A second line of argument is associated with the Keynesian Acceleration Theory, which states that an increase in government spending leads to an increase in income, which induces private agents to increase investment to the extent that a higher level of income has a positive effect on investor expectations (Aschauer, 1989; Baldacci et al., 2004).

By acting as a complement, government spending encourages private investment, however it is noted that not all the government spending categories produce the same effect on private investment.

- The third point of view on the effect government spending has on private investment is the "Equivalence" or "rational expectations" Theorem. It is expected that an increase in the government budget deficit is accompanied by an increase in taxes or debt, making government budget deficits irrelevant in financial decisions. Thus, private agents don't change their consumption or saving expectations and consequently, there's no effect on interest rates or on private investment (Barro: 1978.1989; Kormendi: 1983; Darrat and Suliman: 1991, Ghatak and Ghatak: 1996).

Some empirical studies try to address the theoretical controversies raised. The results are not conclusive the final entries of such studies point in different directions. For example Aschauer (1985), Monadjemi (1993), and Akkina and Celebi (2002) support the substitution hypothesis while Ehrenburg (1993), Karras (1994), and Ehrenburg and Wohar (1995) are in favor of the complementarity hypothesis. The same happens with studies for other countries. For example, Monadjemi (1996) and Looney (1995) say that there is no significant evidence to support complementarity or displacement. Laopodis (2001), Atukeren (2005), and Erden and Holcombe (2005) support the substitution hypothesis in some countries and complementarity in others.

Finally there are some scholars who state that government spending discourages entrepreneurial activity and reduces the creation of investment opportunities for the VCF. For example, Henrekson (2005) demonstrated in the case of Sweden, that a country that provides high levels of welfare, public employment and alternative sources of income, causes a negative effect on entrepreneurial behavior. Similarly, Koellinger and Minniti (2009) provide evidence empirical data from 16 developed countries in which it is shown that generous unemployment benefits are negatively related to the creation of ventures.

There remains a need to clarify the relationship between government spending and VCF activity in emerging countries: Is there a substitute or complementary effect between government spending and VCF investment?

2.3. Dynamics of investments by venture capital funds and FDI

A free market economy is characterized by few restrictions to the free flow of capital investments. Different agents are allowed to move their resources to and from various activities, both internally and abroad. This aspect is of great importance for the development of the VC industry in several ways.

- Foreign capital is a potential contributor to VC investments (Salehizadeh: 2005), in the emerging and developed countries, funding sources are required to fill the capital gap necessary to finance innovative ideas and this way, foreign investors searching higher returns, may be willing to take more risks (White and Fan: 2006). The studies made by of Alfaro et al. (2009), Alfaro and Charlton (2008) found that entrepreneurial activity is promoted by international financial integration in industries in which there is greater reliance on external funding.

- Foreign direct investment (FDI) is related to technological transfer levels, which encourages domestic investment (Borensztein et al.: 1998, Mody and Murshid, 2005).

- The foreign presence stimulates entry of domestic firms within the same industry (*horizontal spillovers*) and in related industries up and down the same production chain (vertical *spillovers*) (Acs et al.: 2009, Görg and Strobl: 2002; Ayyagari et al.: 2010).

- In emerging countries, where the capital market is not well developed, the *Trade Sales* figure (sales of a young, starting company to a larger company, known as strategic buyer) is an alternative exit mechanism of VCF and many of these strategic buyers use foreign investment for acquisitions (Jeng and Wells 2000).

All this indicates a positive impact of investment freedom and FDI on VCF investment. However, there are other theoretical (Grossman 1984) and empirical (Barbosa and Eiríz:

2009, De Backer and Sleuwaegen: 2003) positions, indicating the FDI could generate an outlet for domestic entrepreneurs through the selection of products and labor markets. Other studies mention that the positive effect of FDI on productivity is very small since the benefits are entirely captured by the companies with foreign ownership participation (Aitken and Harrison 1999; Konings: 2001).

From the literature review, it can be concluded that most studies conducted to establish the relationship between FDI, institutional quality, government spending and VCF activity, focus on developed countries and the research on the topic in emerging countries is still very limited. Although there's consensus in the literature in regards to how institutional quality favors investment, there is no information on the types and significance of the relationship between FDI, government spending and VC activity.

3. Models

The panel data technique for the period of time between 1996 and 2010 is used to assess the impact of institutional quality, FDI and government spending on VCF investment in emerging countries.

The Wald test results (Baltagi, 2001) shows significance in the temporary effects for some specific years; *dummy* variables are used in those periods. The result of the Hausman specification test indicates random effects and the Breusch and Pagan test (Lagrange Multiplier to test random effects) confirms the choice. The model is presented in equation (1) and (2)

$$Y_{it} = v_i + \beta_1 \chi_{it} + \beta_2 \gamma_{it} + \beta_3 \delta_{it} + \beta_4 \varphi_{it} + y' \partial_t + \varepsilon_{it} \qquad (1)$$

$$\alpha_i = \alpha + \vartheta_i \qquad (2)$$

Where Y_{it} is a measure of company creation in country i during the year t. χ_{it}, γ_{it}, δ_{it} and φ_{it} are the variables associated with institutional quality, FDI, government spending and the control variables for each country in each year, respectively. ∂_t is a dummy vector per year, which has a dimension of T X 1. Equation 2 allows us to control each country's

"individual" character, α_i is a random variable with a mean value of α and a random deviation ϑ_i.

The result of the Wooldridge test (2002) indicates no serial correlation. The modified Wald test indicates heteroskedasticity. Finally the *Pasaran CD* test (Hoechle, 2007) indicates contemporaneous correlation. Following Beck and Katz (1995) estimates are made by PCSE (Panel Corrected Standard Errors) to solve the problems of contemporaneous correlation and heteroskedasticity. Dicotomic variables are introduced to include the significance detected in the temporary effects. Having a appropiate period of time in the sample (15 years) allows the use of the correction through PCSE models (Beck, 2001).

To mitigate potential endogeneity between FDI and institutional, a model was built to see the significance of institutional quality in *t*-1 when FDI is in t. Although the coefficient is positive, is not significant for the countries and time of the sample, therefore you cannot choose the solution involving the use of residuals. However, to the extent that intuition tells us that higher institutional quality may encourage an increase in FDI, time differences of the variables are used and the relationship between FDI in *t*-2 and institutional quality in *t*-1 on VCF investment in *t* is analyzed.

4. Justification of variables, measures chosen and empirical implications
4.1. Dependent variables

Three different measures are used to determine the level of investment activity of VCF in a country in a given year. The first one is the logarithm of the total number of VC investments scaled by the active population in the country (Gompers et al., 1998; Da Rin et al., 2006, Li and Zahra, 2011). The second measure is the logarithm of the amount of investment per capita, based on the economically active population (Salehizadeh, 2005, Armour and Cumming, 2006; Cumming and MacIntosh, 2006, Li and Zahra, 2011). The third measure is the logarithm of the average amount of investment. Emerging countries

were chosen according to the *Financial Times* and *the London Stock Exchange: FTSE index*[2] classification.

Annex 1 describes the countries included in the sample, the amount and the average number of investments made during the study period (from 1996 to 2010). The data is obtained from individual VCF investments registered in the *Thomson One's Private Equity / Venture Capital* database. Alternative measures are used to validate the robustness of the relationships since the database omits the amounts of investment of some agreements.

Subsequently, investments are classified by two criteria: development stage and type of activity carried out by the company where the investment is made. For the first criterion, the *Thomson One* database classifies investments in the following categories: seed, start-up, expansion, replacement capital and buyouts. VC investment is defined as the sum of the first four categories and VC investments in companies in early stages of development are the sum of the first two categories. For the second criterion, VC investments in companies belonging to the high-tech sector are defined as the sum of investments in the following sectors: communications, computing and related biotechnology and related electronics, medicine and related.

This classification allows us to structure four additional dependent variables: the first two are the logarithm of the total number of VC investments in high-tech and early stage companies scaled by the country's active population and climbing; the next two are the logarithm of the amount invested in high-tech and early stage companies per capita, based on the economically active population. These last four allow us to examine the relationship between the explanatory variables and these specific types of VC investments, which are the most relevant to the development of emerging countries.

4.2. Independent variables: institutional quality, foreign direct investment and government spending

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[2] The definition of this method of the *Financial Times and the London Stock Exchange, FTSE Index* was consulted in the following webpage: http://www.ftse.com/Indices/Country_Classification/index.jsp

Institutional quality is measured with the latest version of the *Worldwide Governance Indicators (WGI)* (Kaufmann et al.: 2010). These indicators are available for 212 countries and are used in several previous studies (Wernick et al.; 2009 Dollar and Kraay: 2002; Asterly and Levine 2003; Faccio: 2006, Gupta et al.: 2002, Demirguc-Kunt et al .: 2004, Li and Zhara: 2011).

The bivariate correlations between WGI indicators show values between 0.40 and 0.89. To establish whether there is dependence on a common dimension, an analysis of the main components is made (Ledesma and Valero-Mora 2007). The analysis reveals that a single component includes the 77.05% of the variance of the six indicators. After analyzing the relationship with the dependent variables, the results in the relationship is very similar to that obtained by the simple average of the six institutional quality dimensions.

A new variable named (Inst_Qual) is created; this measures institutional quality and is the average of the six dimensions for each country in a given year. Other researchers also use averages to explore the effect of institutional quality on VC and other phenomena (Li and Zhara: 2011; Wennekers et al.: 2005; Van Stel et al.: 2007; McMullen et al.: 2008).

The next explanatory variable is the FDI, which is measured as the net flow of foreign investment in the balance of payments, divided by gross domestic product (GDP). The data is extracted from the World Bank's *World Development Indicators* database. Finally, government spending is measured with government's final consumption, meaning all government expenditures for the purchase of goods and services, including wages. It also includes most of the national defense and security expenditures, but excludes military spending which is part of the government capital formation. This information is also obtained from the World Bank's *World Development Indicators* database and is expressed as a percentage of the gross domestic product.

As stated in the theoretical review, there are different views on the significance and direction of the relationship between FDI, government spending and the dependent variables. Furthermore, this type of empirical work doesn't exist for emerging countries; for this reason, a specific hypothesis is not proposed in this regard.

4.3. Control Variables

Five control variables are includes (Appendix 2).

Market Capitalization, many authors mention a positive relationship between start-ups and VC activity level (Black and Gleason, 1998; Megginson, 2004, Gompers, 1995, Gompers et al. 2008). The Gross Domestic Product (GDP) has a positive relationship on FCR activity (Li and Zahra: 2011; Salehizadeh: 2005, Gompers et al.: 1998, Jeng and Wells 2000).

There is a direct correlation between start-ups and VC activity level (Romain and van Pottelsberghe: 2004, Cumming and MacIntosh, 2006) because of this we include the freedom to start a business as another control variable. The number of scientific and engineering articles published in the previous year by researchers who are resident in the country. Scientific discoveries and technological opportunities can foster innovation and investment in the FCR tends to focus on companies in early stages of development that are looking to take advantage of such opportunities for innovation (Kortum and Lerner, 2000: Gompers et al.: 1998).

The amount of goods traded in the economy is another factor associated with the stimulation of VC markets. Since this factor affects the development of local industry and hence the VCF investment opportunities, it will also have an effect on the investment activity of these funds (Bartlett and Ghoshal: 1999, Sobel et al.: 2007). A positive relationship between international trade and VCF investment is expected.

4.4. Description of the data

Annex 1 shows that all the countries, with the exception of Qatar and Oman, have VC investments in companies that are in early stages of development. These two countries, as well as Bahrain and Kuwait, have no VC investments in high technology companies in the suggested time period (some considerations about the possibility of underreporting in the database are made later in this paper).

Close to one third of VC investment in emerging countries takes place in companies that in the early stages of development (31.28% of agreements and 23.5% of the amounts invested). The share of investment in high-tech companies is higher, 63.8% of agreements

and 45.32% of VC investment in emerging countries during the defined time period, takes place in companies in this category.

Annex 3 presents the descriptive statistics for the sample of all the variables, the data shows a level of variability that suggests exploring the time dimension of the observations and analyzing the control of the specific factors associated with each country.

Finally, Annex 2 describes the definitions and sources of all variables used in the models.

5. Analysis of results

5.1. Relationship between the Investment of FCR, Institutional Quality, Foreign direct investment and government spending in emerging

Table 1 establishes the relationship between the dynamics of the VC industry activity, institutional quality, the FDI and government spending in emerging countries. The first model uses the logarithm of the total number of VC investments scaled by the country's labor force; the second is the logarithm of the investment per capita, based on the economically active population; and the third and last model, the logarithm of the average amount of investment.

<center>Insert Table 1 here</center>

The variable measuring institutional quality is significant at 1% and positive in all cases, the significance allows us to conclude that institutional quality has great explanatory power of the differences in the VC market dynamics in emerging countries; higher levels of quality institutions have a positive effect on the VC activity. The results were confirmed using other institutional quality rates (Gwartney et al., 2011, Krause, 2010).

Government Expenditure has a negative and significant relationship (1%, 1% and 10% respectively) with VC investment in the three models for emerging countries. Further analysis was conducted to contrast institutional quality, a measure of the free market and government spending. Between 1999 and 2009, individual dimensions World Wide Governance Indicators (Kaufmann et al.: 2010) show that in most emerging countries (65.12%), higher government spending coincides with lower levels of institutional quality.

Low institutional quality is a sign of a weak government control spending and consequently, of the existence of conditions under which political motives unrelated to the well being of the population could be dominating government activity, which discourages VC activity.

By contrasting the free market rate, taken from *The Index of Economic Freedom* (IEF) *Heritage Foundation* (Beach and Kane 2007), with the government expenditure, the vast majority of emerging countries (62.8% for 1999 and 60.5% in 2009) show that increased government spending appears with lower levels of market freedom. This evidence supports the hypothesis that increased government spending reduces the space for private agents to operate. Additional tests are performed later in the paper in order to contrast these findings.

The FDI shows a positive and significant relationship at 5% with the VC investment in the three models; this supports the thesis that the FDI supports VC activity in emerging countries. There is abundant evidence favoring this result; annex 4 shows the 10 most dynamic emerging countries in the last four years (China, Brazil, Taiwan, Hong Kong, Mexico, Russia, South Korea, India, Singapore and Nigeria). By analyzing the full participation of foreign VC funds in each of these countries, we find that the contribution of foreign capital in these countries during the last four years ranges from 40% to 50%.

It is known that FDI is related to technology transfer levels that drive domestic investment, the creation of new firms seeking VC funds and the possibility of VCF outflows through the figure of *Trade Sales* (sales of a young, starting company to a larger company, known as strategic buyer). *Offshore* location index of A.T. Kearney[3], shows that out of the fifty most attractive countries for the year 2011, thirty-one are among the emerging countries analyzed in this work; the first fifteen in the A.T. Kearney list concide with the most dynamic in the VC market for the past five years, according to information from the *Thomson one private equity / Venture Capital* database.

The following refers to the behavior of some control variables used in the models described in Table 1. Market Capitalization is not significant in any of the models; as mentioned

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[3] A.T. Kearney, Op. Cit., consultaded on Julio 17, 2011 in the following webpage: http://www.atkearney.com/index.php/Publications/offshoring-opportunities-amid-economic-turbulence-the-at-kearney-global-services-location-index-gsli-2011.html

above, a characteristic of emerging countries is that their financial markets are small and underdeveloped. VCF may be aware of this condition when they decide to invest in emerging markets, and therefore use alternative mechanisms such selling of companies or structuring leveraged buyouts in order to return the property to the entrepreneurs and achieve both liquidity and the materialization of profits.

The freedom to start a business and the number of scientific and engineering articles published, show a positive and significant relationship with the number and amounts of investments in emerging FCR. Finally, a positive and significant relationship is also present between the variable measuring the volume of international trade and VCF investment activity for emerging countries.

5.2. Relationship between institutional quality, direct foreign investment, government spending and investment in companies FCR in early stages of development and high technology located in emerging

Table 2 shows four models that describe relationship between the dynamics of the VCF activity in high-tech companies and those in early stages of development, and the explanatory variables and control variables. Two models are used in each case to verify the robustness of these relationships; initially the number of agreements is used as the dependent variable in model 4, while in model 5 this variable is the amount of VC investment made in companies in early stage of development in emerging countries.

Insert Table 2 here

The increase in public expenditure has a negative effect on the FCR dynamics, while the ease of creating companies and the increase in the volume of imports and exports have the opposite effect. Institutional quality and FDI consistently show a positive result in the two models but alternate the degree of significance; institutional quality is significant when the number of agreements is used as dependent variable, while the FDI is significant when this variable is represented by the amount invested.

The VC activity analysis in high-tech companies in emerging countries is considered in models 6 and 7 of Table 2. The dependent variables are different in each model; in Model 6, it's the number of agreements, while in model 7 it's the level of investment in this type of enterprise. The increase in government spending negatively affects VC activity in high-tech companies, while the ease of creating a company, institutional quality, the FDI and the increase in the volume of imports and exports, all have a positive effect.

The results mentioned in the preceding paragraphs have a great significance for emerging countries. When considering investing in high-tech companies and those in early stages of development, it becomes clear how public policy decisions can strengthen the creation of, not only larger but also more effective, VC markets. Those who design public policies in emerging countries must not only seek to ensure the increase of the volume of VC activity, but also that this growth supports the types of businesses that depend and benefit most from the FCR activity, which are precisely the ones in early stage of development and in the high technology sector.

5.3.   Productivity of FDI in promoting FCR investment in emerging

In equation 8 found on Table 3, the 43 countries included in the study are divided into quartiles based on institutional quality. The first independent variable "int_qual" measures institutional quality; it's clear that it has a direct and significant relationship with the dependent variable, which in this case is the total amount invested by the VCF. The next independent variable "fdi * int_qual (upper quartile)" multiplies the FDI by one if the institutional quality of the country is in the top quartile, otherwise it's multiplied by zero; the third independent variable "fdi * int_qual (quartiles 2 and 3) " does the same for countries with an institutional quality on the second and third quartile; the fourth independent variable" fdi * int_qual (lower quartile)" repeats the process mentioned above for the countries whose institutional quality is located in the bottom quartile.

Insert Table 3 here

In equation 8 all explanatory control variables share behavior similar to those in previous models, the main difference of this regression is that it only the coefficient associated with the FDI whose institutional quality is located in the upper quartile. The conclusion is that the significance of the FDI coefficient depends on institutional quality, meaning that the positive impact of FDI on promoting VCF activity is more productive in emerging countries with higher levels of institutional quality.

To confirm the robustness of the result obtained in equation 8, equation 9 divides the 43 emerging countries into two groups and the process previously mentioned is repeated for both of these groups. As in the previous case, all control explanatory and control variables and maintain a proper behavior and the second independent variable "* int_qual fdi (upper half) "that multiplies the FDI by one if the country's institutional quality is in the upper half or by zero otherwise, shows a significant coefficient with a magnitude that exceeds several times the coefficient of the third variable "fdi * int_qual (lower half)" which does the same for countries whose institutional quality is in the lower half of the sample.

It should also be noted that the coefficient associated with the countries whose institutional quality is in the lower half, loses significance. Again, it demonstrates that FDI is only significant for the development of VC activity in the emerging countries with the highest institutional quality, but also that in these countries the FDI productivity to encourage VC investment is much higher.

The previous analysis is repeated for models 10 and 11, using the VC investment in companies that are in the early stages of development, as the dependent variable. The results are very similar to those found in the last paragraph. In model 10, the coefficient associated with FDI when institutional quality is in the bottom quartile loses significance; the coefficient of FDI when institutional quality is on the second and third quartile maintains significance, but its value is less than the half the FDI coefficient of countries whose institutional quality is in the upper quartile. In model 11, one can observe that the variable that accounts for the FDI in countries with an institutional quality in the upper half remains significant and has a coefficient that is more than seven times the coefficient associated with FDI in countries with an institutional quality located in the lower half, which loses its significance.

All this leads to the conclusion that FDI is more productive and meaningful to increase VC investment in companies in early stages of development for countries with higher institutional quality. The comparison of the FDI coefficient in model 5 against FDI coefficients for countries with institutional quality in the upper quartile (model 10) and upper half (Model 11) lead us to the same conclusion; in the last two cases the value of the coefficients is greater than the first (0.0583 and 0.0516, compared to 0.03877), which also means that there is greater productivity of FDI in generating VC investment in companies in early stage of development when there is greater institutional quality.

Finally, FDI productivity is analyzed in models 12 and 13, using VC investment in high-tech companies as the dependent variable. The results about FDI and institutional quality productivity to promote VC investment for these types of firms are more significant. In model 12, the coefficients associated with the FDI when institutional quality is in the lower quartile and in the quartiles two and three lose significance; the FDI coefficient for countries with an institutional quality in the upper quartile remains significant at 1 % and has a coefficient with a magnitude that is 7 times higher than the others. Model 13 shows that the variable that accounts for the FDI in countries whose institutional quality is in the upper half holds significance at 5% and has a coefficient with a value close to twice the coefficient associated with FDI in the countries with an institutional quality in the lower half, which also loses its significance.

When comparing FDI coefficient in model 6 against the FDI coefficients for countries with an institutional quality in the upper quartile (model 12) and upper half (model 13), the results show that, for the last two models, the value of the coefficients is much larger than the first (0.0663 and 0.0417, compared to 0.0180), this leads us to affirm that there is greater FDI productivity in generating VC investment in high-tech companies when there is a higher institutional quality to a greater extent than in companies in early stages of development

There is evidence that institutional quality has a decisive and positive effect in the FDI's level of significance and productivity, in this case in the generation of larger and more

effective VC markets emerging countries. The results suggest that institutional quality is a determining factor in for the FDI to serve as a vehicle to enhance the volume and effectiveness of the VC industry in emerging countries; this is mainly because it reduced the risks and costs of investing and increases the expected investors' return.

It may be concluded that institutional quality is vital for the new FDI in order to produce an economic, technological and real social development; a development that results in the well being of a society , through the funding of start-ups and high-tech companies. Otherwise, the FDI will not be significant for the creation of active VC markets in the host country.

5.4.   Productivity of Public Spending in promoting FCR investment in emerging

In Table 4, models 14 to 19 repeat the process that was undertaken to find the productivity of the FDI but in this case we delve into the government spending behavior in the VC dynamics with higher levels of institutional quality. In models 14 and 15, the dependent variable is the total amount of VC investment; in models 16 and 17 the dependent variable is the VC investment in companies that are in early stages of development; and in models 18 and 19, the dependent variable is the investment in high-tech companies.

As seen in all the models that appear in Table 4, the explanatory and control variables maintain a similar behavior to the one shown in the previous model. However, in this case, it's demonstrated that increases in government expenditure have a greater adverse effect on the quality and quantity of VC activity in countries with higher institutional quality. An analysis of the values of the coefficients indicates that for the six models in Table 4, the coefficients associated to public expenditure are negative but the absolute value increases as institutional quality improves.

This leads to the conclusion that the higher the institutional quality, the bigger adverse effect an increased government spending will have on VC investment dynamics. Given the significance of the coefficients in all the cases, this conclusion is valid when the total amount of VC investment, the investment in companies in an early development stage, and investment in high-tech companies, are used as dependent variables. Nonetheless, the value

of the coefficients indicates a higher critical nature in the case of investments made in high technology companies.

The results reveal that during the time period defined for the analysis, government spending in emerging countries generates a reduction of the space that is meant for the development of VC activity. In can be concluded that the adequate conditions in which private VC activity thrives in both in quality and quantity, are generated when there's high institutional quality. Thus, in these cases, government spending causes greater displacement. By increasing the government size, there will be a reduction on VC markets dynamics in emerging countries. This reduction is greater in countries with higher institutional quality, which is an important consideration for public policy makers.

6. Limitations of the study and future research

Even though some robustness tests have been made throughout this work as to identify the solidity of the findings, there are still some limitations that can be remedied by future research. As way of example, the construction of parsimonious models that combine economic and socio-cultural variables to explain the phenomenon of VC dynamics in emerging countries remains critical.

Government spending can also be classified in different categories so as to determine how each one behaves in relation to the VC dynamics; it is likely that different items show different levels of significance and interaction.

Another limitation is related to the fact that the models presented here are only considering the increase in investment, however the problem of encouraging the VC investment dynamics can be addressed with a balance model between supply and demand. To do so, the variables that only affect the supply and those who only affect the demand must be identified with absolute certainty; thereby avoiding potential endogeneity problems that remain despite the controls implemented in this work.

Another important aspect that must be addressed for emerging countries is related to the patterns associated with how VCF get financial resources; it is likely that this analysis also yields factors that encourage the VCF activity in these types of economies. The research of

the factors affecting emerging countries VCF investment decisions may also shed light on how to structure policies to promote investing in companies in early stages of development and high tech companies.

Finally, a lot has been said about how exchange rates' behavior of affects the flow of resources among economies. The theoretical approaches state that real exchange rate devaluation may result in an FDI income increase since foreign investors can take advantage of the relative decline in the value of local assets. Considering that this work establishes that there is a direct and significant relationship between FDI, international trade volumes and VC market dynamics, it is appropriate to determine how currency movements may be a factor affecting the dynamics of the VC activity in emerging countries.

7. Conclusions and policy implications

An ongoing concern of governments in emerging countries is to establish appropriate public policies in order to generate the adequate conditions that will allow for the creation of quality employment for its residents. However, this is a battle only a few have been able to overcome due to the lack of access to funding sources, the failure to generate market conditions, regulatory frameworks and socio-cultural conditions required for the emergence of new companies.

One of the main reasons why many of the initiatives undertaken is that you cannot propose a development model in which institutions are not present, there's a great level of uncertainty and there's market imperfections and of information asymmetry between economic agents. This paper contributes to the empirical literature on determinants of the revitalization of the VC industry in emerging countries through policy recommendations related to the development of the institutions and its interrelationship with other market variables that influence the VC market.

The results indicate a strong positive relationship between institutional quality and the increase in the volume and quality of VC activity in emerging economies. We conclude that institutional quality has great explanatory power of differences in market dynamics in emerging CR.

Government Spending also has a significant but inverse relationship with the increased in VCF activity in emerging countries. There's evidence that allows one to infer that in most emerging countries government spending is not directed at investments that attempt to increase the productivity of private investment and/or that boost institutional quality. This evidence also indicates that a higher government expenditure discourages private investment due to the fact that it reduces the space for private agents to operate.

FDI shows a positive and significant relationship with VCF investment in emerging countries. Evidence shows that this result is the product of FDI's direct contribution to the VC investment in emerging countries, but also in line with additional factors: i) When VCF want to liquidate their investments, FDI enables the output through the figure of *Trade Sales* (sales of a young, starting company to a larger company, known as strategic buyer); ii) FDI encourages the creation of new companies in emerging countries due to product and service *Offshoring* and to the delegation of functions ranked through *Outsourcing* processes performed by companies in developed countries.

Because public policy makers in emerging countries are interested in VC activity supporting the creation of new ventures, especially technology related, since they are essential element in the economic growth. This paper identifies how the FDI, institutional quality and government spending are related to VCF investment in companies in high tech companies and those in early stages of development. The results show the significance of FDI, institutional quality and government spending as effective public policy tools for strengthening the creation of VC markets which will later invest in these types of organizations.

It also stated that the positive impact the FDI has on the promotion of VCF activity is more productive in emerging countries with higher levels of institutional quality and this higher productivity remains for VC investment promotion in companies in early development stages of and high-tech organizations, although it is more important for these last ones.

It is demonstrated that in a given level, the FDI has a greater productivity and significance in the VC industry in emerging countries with higher institutional quality. Institutional quality is crucial for the FDI to help generate larger and more effective VC markets in

emerging countries. Conversely, the increases in government expenditure have greater adverse effect on the quantity and quality of VC activity in countries with higher institutional quality. The negative effect of government spending in countries with higher institutional quality is more critical when investing in high technology companies.

In terms of the relationship between VC investment and government spending, the results of this study support the 'crowding out' hypothesis. For the defined time period and the countries studied, the higher institutional quality, the greater negative effect an increased in government spending will have on VC activity. The evidence indicates that when institutional quality is high, the conditions necessary for private VC activity thrive, both in quality and quantity and it requires less intervention of public investment.

When institutional instability is reduced, it also reduces the market uncertainty and therefore the risk of VC investors who are willing to occupy more space in the markets and, in those cases, further intervention is not only not required, it also reduces the space for the development of the private market dynamics. Consequently, increasing the size of the government reduces the VC market dynamics in emerging countries, but this reduction is greater in countries with higher institutional quality. This is another important consideration for public policy makers: the higher the institutional quality, the less government intervention is required.

The findings also indicate that the market capitalization is not significant for the increase in VC investment in emerging countries, this may be due to the VCF being aware of the lack large capital markets in these countries and their use of alternative mechanisms such as the sale of firms or structuring leveraged buyouts to return the property to entrepreneurs to achieve liquidity and bring profits to fruition.

The freedom to start a business, the number of scientific and engineering articles published and the volume of international trade show a positive and significant relationship with the dynamics of VC activity in emerging countries. Public policy makers should be aware that the following policies are key to the promotion of VC activity: i) Facilitate the registration of new companies. Ii) Strengthen the scientific development and the creation and exploitation of innovation opportunities that result in new or improved processes, products

or services. iii) Take advantage of opportunities that globalization offers through free international transaction of goods and services.

Finally it is recognized that this is only a small contribution to unveil the determinants of promotion of entrepreneurship and VC activity in emerging countries. This study is just an early step in what promises to be a fruitful line of research in the creation of public policies in order to orientate foreign investment, market freedom and institutions towards the creation of local VC markets.

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Annex 1 Average number of agreements and average value of VC investments made from 1996-2010 in millions of dollars in emerging countries included in the sample.

Country	Data Years	Annual Average - All VC Activity		Activity in companies in early stages		Activity in high tech companies		Country	Data Years	Annual Average - All VC Activity		Activity in companies in early stages		Activity in high tech companies	
		VC Agreements	VC Investment	VC Agreements	VC Investment	VC Agreements	VC Investment			VC Agreements	VC Investment	VC Agreements	VC Investment	VC Agreements	VC Investment
Argentina	15	10,33	163,17	5	64,83	8,06	120,32	Nigeria	15	5,26	140,20	0,193	6,6	2,06	129,61
Brazil	15	37,26	668,18	12	191,17	24,86	458,21	Oman	15	0,07	0,73	0	0	0	0
Bulgaria	15	2,13	5,99	0,46	0,162	1,4	4,85	Pakistan	15	0,93	0,915	0,47	0,07	0,73	0,57
Chile	15	2,93	18,78	1,47	6,96	2	11,34	Peru	15	0,43	1,39	0,2	0,67	0	0
China	15	378,60	7110,09	96,2	1691,31	224,47	2671,57	Philippines	15	1,4	4,6	0,07	0,07	0,73	0,47
Colombia	15	1,00	12,91	0,07	0,67	0,2	0,068	Poland	15	12,66	34,49	2,67	2,59	5	15,52
Czech Republic	15	6,4	113,28	1,47	1,9	4,33	94,23	Qatar	15	0,07	1,01	0	0	0	0
Egypt	15	0,67	4,9	0,07	0,67	0,2	2,29	Romania	15	7,73	30,89	1,93	2,53	2,27	18,87
Estonia	15	2,33	8,64	0,93	0,94	1,13	2,8	Russia	15	15,47	89,03	3,87	11,38	5,93	37,59
Hong Kong, China	15	27,20	681,62	7,67	55,06	17,4	11,7	Saudi Arabia	15	0,33	0,8	0,07	0,089	0,07	0,089
Hungary	15	15,33,	58,84	3,27	1,67	8,53	41,26	Singapore	15	40,07	528,2	16,67	358,26	32,45	200,75
India	15	145,06	1480,99	50,87	224,04	89,67	835,53	Slovakia	15	1,93	4,62	0,33	0,68	0,87	2,01
Indonesia	15	2,86	35,98	0,67	4,46	1,13	16,6	South Africa	15	8,13	62,56	2	6,89	3,33	87,6
Korea, South	15	318,86	741,09	117,33	167,57	228,47	387,01	Sri Lanka	15	1,27	3,08	0,67	0,86	0,53	1,18
Kuwait	15	0,13	1,81	0	0	0,07	1,33	Taiwan, China	15	35,47	220,37	12,2	92,57	32,13	208,48
Latvia	15	2,07	1,67	0,53	0,14	0,27	0,12	Thailand	15	5,86	14,28	1,53	3,05	1,93	2,79
Lithuania	15	1,47	16,44	0,33	0,315	0,47	3,61	Turkey	15	1,73	7,94	0,13	0,13	0,67	0,43
Malaysia	15	10,33	43,68	3,6	oct-94	7,2	21,49	United Arab Emirates	15	2,27	17,26	0,73	1,64	1,47	8,93
Mauritius	15	0,80	1,46	0,4	0,58	0,13	0,03	Vietnam	15	5	25,18	1,33	2,3	1,87	6,58
Mexico	15	5,66	52,56	1,6	10,17	2,4	21,58	Bahrain	15	0,13	12,29	0,07	11,47	0	0
Morocco	15	1,4	4,53	0,27	0,2	0,2	0,9	Bangladesh	15	0,13	0,24	0,13	1,24	0,13	1,24
								Jordan	15	0,53	0,93	0,27	0,46	0,46	0,86

Annex 2 Description of the variables used in the models built for the study.

Variable	Descripción	Fuente
Venture Capital or Capital Risk (CR_{it})	Total value of investments made by venture capital funds in the country in the year i for country j, measured in millions of dollars and standarized by the economically active population	Thomson one private equity/ Venture Capital database
High Technology (HT_CR_{it})	Total value of investments made by venture capital funds in the country in the year i for country j in companies in the communication sector, computer and related, biotechnology, electronics and related medical and related; measured in millions of dollars and standardized by the economically active population	Thomson one private equity/ Venture Capital database
Early Stages (ES_CR_{it})	Total value of investments made by venture capital funds in the country in the year i for country j in companies in early stages of development, measured in millions of dollars and normalized by the economically active population	Thomson one private equity/ Venture Capital database
Venture Capital Investment Agreements ($Deals_{it}$)	Total investment contracts signed by the venture capital funds in the country in the year i for country j	Thomson one private equity/ Venture Capital database
High Technology Investment Agreements (HT_Deals_{it})	Total investment contracts signed by the venture capital funds in the country in the year i for country j in companies in the followings sectors: communications, computer and related, biotechnology, and related electronics, medicine and related.	Thomson one private equity/ Venture Capital database
Early Stages Investment Agreements (ES_Deals_{it})	Total investment contracts signed by the venture capital funds in the country in the year i for country j in companies in early stages of development,	Thomson one private equity/ Venture Capital database
Venture Capital Average Investment ($Prom\_CR_{it}$)	Average value of investment by venture capital funds in the country in the year i for country j, measured in millions of dollars.	Thomson one private equity/ Venture Capital database

Institutional Quality (Ins_Qual_{it-1})	Indicates the perception of institutional quality in a country and it is the average of the six dimensions of "Worldwide Governance Indicators (WGI)" of the previous year.	World Wide Governance Indicators Daniel Kaufmann, Brookings Institution, Aart Kraay, World Bank Development Economics Research Group, Massimo Mastruzzi, World Bank Institute. http://info.worldbank.org/governance/wgi/index.asp Consulted on February 2 of 2011.
Business creation freedom (Bus_Free_{it-1})	It's a quantitative measure of the ease to start, operate, and close a business in the previous year.	The Heritage fundation, index of economic fredoom. http://www.heritage.org/index/explore?view=by-region-country-year Consulted on February 9 of 2011.
Gross Domestic Product (GDP_{it-1})	Total real gross domestic product of the previous year in dollars, multiplied by 10E-06.	United Nations: UNCTAD, UNCTADstat. http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx Consulted on February 15 of 2011.
Published Cientific Articles (Art_Pub_{it-1})	Scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, by authors from a country in the previous year.	National Science Foundation, Science and Engineering Indicators http://www.nsf.gov/statistics/seind10/appendix.htm Consulted on March 17 of 2011.
Foreign Direct Investment (FDI_{it-2})	Net flow of foreign investment divided by gross domestic product of two years ago.	The World Bank, World Development Indicators http://search.worldbank.org/data?qterm=foreign+direct+in

		vestment&language=EN&format=html
		Consulted on February 16 of 2011.
Trade$_{it-1}$	Trade of goods as a share of last year's gross domestic product: it is the sum of exports and imports divided by the value of gross domestic product in current dollars.	The World Bank, World Development Indicators http://search.worldbank.org/data?qterm=trade%20in%20goods&language=EN&format=html Consulted on February 16 of 2011.
Mar_Cap$_{it-1}$	Market capitalization is the share price multiplied by the number of issued shares of domestic companies listed in the stock market in the previous year; nvestment companies, mutual funds or other forms of collective investment are not included.	The World Bank, World Development Indicators http://data.worldbank.org/indicator/CM.MKT.LCAP.CD Consulted on February 16 of 2011.
Gov_Exp$_{it-1}$	Government expenditure in the previous year as a percentage of gross domestic product; includes all government expenditures for the purchase of goods, services and compensation of employees, excluding military spending.	The World Bank, World Development Indicators http://data.worldbank.org/indicator/NE.CON.GOVT.CD Consultado en Febrero 16 de 2011

Annex 3 Descriptive statistics for the variable sample used in the models.

Variable	Mean	Deviation	Minimum	Maximum	Observations	Type
Deals	0.4445019	0.7197617	0	4.365648	643	Dependent
Es_Deals	0.1996466	0.4748617	0	3.595963	643	Dependent
Ht_Deals	0.2852441	0.6119559	0	4.288716	643	Dependent
VC	0.931489	1.367958	0	7.455757	599	Dependent
ES_VC	0.3337071	0.8651638	0	7.383477	627	Dependent
HT_VC	0.5756618	1.110095	0	6.732348	619	Dependent
Prom_VC	0.3571682	0.7090796	0	6.162952	599	Dependent
Ins_qual	0.1362838	0.6324969	-1.404543	1.511143	473	Explanatory
Fdi	4.089779	5.253924	-2.757439	51.05552	633	Explanatory
Gov_Exp	14.87011	5.463092	4.36433	33.01189	645	Explanatory
Trade	95.8632	72.4053	0.9205211	445.9112	639	Control
Mar_Cap	57.60194	83.25881	0.0198936	1094.965	624	Control
GDP	0.2232152	0.4197569	0.0040424	4.984426	645	Control
Art_Pub	2824.728	5715.057	3.3	56805.8	546	Control
Bus_Free	68.49051	13.72661	39.8	100	632	Control

Table 1

Dynamics of the Venture Capital activity industry, Institutional Quality, Foreign Investment and Government Spending in Emerging Countries					
Independent Variables	Dependent Variable				
	Number of Agreements		Amount Invested		Average Investment
	(1)		(2)		(3)
int_qual	0,4463 (0.0674)***		0,5282 (0.1298)***		0,2694 (0.0767)***
fdi	0,0152 (0.0072)**		0,0518 (0.0255)**		0,0411 (0.0195)**
govexp	-0,0332 (0.0026)***		-0,0533 (0.0098)***		-0,0109 (0.0066)*
gdp	-0,0696 (0.1033)		0,6673 (0.2862)**		0,1097 (0.1316)
art_pub	3,39E-05 (5.59E-06)***		4,33E-05 (1.82E-5)**		-9,79E-06 (6.48E-06)
mar_cap	-0,0007 (0.0005)		0,0006 (0.0010)		0,0002 (0.0007)
bus_free	0,0083 (0.00318)***		0,0152 (0.0056)***		0,0013 (0.0047)
trade	0,0026 (0.0004)***		0,0036 (0.0014)***		0,0015 (0.0011)
constant	-0,1405 (0.2068)		-0,4172 (0.3229)		0,1305 (0.2952)
Dummies time	Si		Si		No
R²	0,5112		0,4493		0,3017
Observations	365		340		340
Number of countries	42		42		42
Test	Est.	P-value	Est.	P-value	Est.	P-value
Wald chi²(11)	2,34E+06	0,0000	698,18	0,0000	128,74	0,0000
Hausman	21,34	0,0033	3,59	0,8254	7,47	38,15
Breusch-Pagan			15,02	0,0001	0,56	45,47
Pesaran CSD	3,186	0,0014				
Modified Wald het.	2,30E+05	0,0000	8380,82	0,0000	1,60E+05	0,0000
LM Serial Corr	0,023	0,8808	2,352	0,1336	4,422	0,0423
Model	PCSE		PCSE		PCSE c(ar1)	

Anexo 4 VC foreign investment in the 10 fastest growing countries in the CR market in recent years.

Year	Country	China	India	Corea del Sur	Hong Kong	Brazil	Singapur	Taiwan	Rusia	Nigeria	Mexico	Total
2007	Total VC Investment	18.446,5	2.171,2	488,3	3.290,2	660,8	122,2	11,1	32,0	32,0	15,0	25.269,12
	VC Foreign Funds	7.308,8	1.305,3	58,8	3.290,2	650,2	114,0	11,1	9,6	9,6	15,0	12.772,48
	Percentage	39,6%	60,1%	12,0%	100,0%	98,4%	93,3%	100,0%	29,9%	0,0%	100,0%	50,5%
2008	Total VC Investment	21.106,9	4.009,1	176,2	141,5	1.418,0	174,4	12,8	409,0	20,0	12,0	27.479,86
	VC Foreign Funds	10.978,8	3.022,7	91,1	117,5	1.248,0	148,4	12,8	310,7	20,0	6,0	15.956,00
	Percentage	52,0%	75,4%	51,7%	83,1%	88,0%	85,1%	100,0%	76,0%	100,0%	50,0%	58,1%
2009	Total VC Investment	8.923,6	1.427,6	163,5	159,6	84,0	123,9	352,1	26,8	1.750,0	13,0	13.024,13
	VC Foreign Funds	2.337,6	851,5	72,4	148,6	81,8	111,3	352,1	13,7	1.750,0	10,0	5.728,99
	Percentage	26,2%	59,6%	44,3%	93,1%	97,4%	89,8%	100,0%	51,0%	100,0%	76,9%	44,0%
2010	Total VC Investment	12.339,6	2.543,6	386,2	147,6	1.006,1	138,0	76,5	280,6	10,0	162,9	17.091,03
	VC Foreign Funds	4.168,7	1.571,3	185,4	147,6	481,4	131,0	65,9	115,9	10,0	141,5	7.018,64
	Percentage	33,8%	61,8%	48,0%	100,0%	47,9%	94,9%	86,1%	41,3%	100,0%	86,9%	41,1%
Total	Total VC Investment	60.816,6	10.151,5	1.214,2	3.738,9	3.168,8	558,5	452,5	748,4	1.812,0	202,9	82.864,14
	VC Foreign Funds	24.793,9	6.750,8	407,6	3.703,9	2.461,4	504,7	441,9	449,8	1.789,6	172,5	41.476,11
	Percentage	40,8%	66,5%	33,6%	99,1%	77,7%	90,4%	97,7%	60,1%	98,8%	85,0%	50,1%

Table 10 shows the most dynamic emerging countries in the last four years (China, Brazil, Taiwan, Hong Kong, Mexico, Russia, South Korea, India, Singapore and Nigeria). Each row shows the total VC investment, VC investment by foreign funds and the percentage of the first over the second. The analysis was repeated for all the years from 2007 to 2010. The last row is the total of each country for each year. The last column adds the total of each row for each year in all countries. One can observe that the contribution of foreign capital to the VC investment in the last four years in these countries has been fluctuating between 40% and 50%.

Table 2

	Dependent Variables			
Independent Variables	Number of agreements in companies in early stages	Amount invested in companies in early stages	Number of agreements in high tech companies	Amount invested in high tech companies
	(4)	(5)	(6)	(7)
int_qual	0,1953 (0.0342)***	0,1118178 (0.0826)	0,3506 (0.0601)***	0,4328 (0.1013)***
fdi	0,0066 (0.0049)	0,0387737 (0.0128)***	0,0180 (0.0058)***	0,0358 (0.0176)**
govexp	-0,0227 (0.0018)***	-0,0389522 (0.0071)***	-0,0322 (0.0032)***	-0,0577 (0.0081)***
gdp	-0,0746 (0.0550)	0,3632474 (0.2044)*	0,2474 (0.1328)*	0,5580 (0.2579)**
art_pub	1,93E-05 (3.03E-07)***	0,0000221 (1.39E-05)	3,56E-05 (8.98E06)***	3,69E-05 (1.54E-05)**
mar_cap	-0,0001 (0.0003)	0,0018443 (6.04E-04)***	-0,0001 (0.0003)	0,0001 (0.0007)
bus_free	0,0074 (0.0022)***	0,0156831 (0.0050)***	0,0066 (0.00245)***	0,0189 (0.0040)***
trade	0,0016 (0.0003)***	0,0019942 (0.0009)**	0,0028 (0.0005)***	0,0024 (0.0009)***
constant	-0,2253 (0.1622)	-0,7889917 (0.3657)**	-0,3369 (0.1768)*	-0,6600 (0.2726)**
Dummies time	Si	Si	Si	Si
R²	0,4071	0,3738	0,6275	0,4488
Observations	365	355	365	352
Number of countries	42	42	42	42

Test	Est.	P-value	Est.	P-value	Est.	P-value	Est.	P-value
Wald chi²(11)	761,60	0,0000	785,69	0,0000	644,84	644,84	592,33	0,0000
Hausman	25,58	0,0006	6,04	0,5355	49,66	0,0000	15,82	0,0708
Breusch-Pagan			4,91	0,0266			106,52	0,0000
Pesaran CSD	6,607	0,0000	8,642	0,0000	6,790	0,0000	6,501	0,0000
Modified Wald het.	2,79E+04	0,0000	7,50E+05	0,0000	4124,90	0,0000	9124,08	0,0000
LM Serial Corr	0,3320	0,5674	2,270	0,1398	3,039	0,0888	3,237	0,0793
Model	PCSE		PCSE		PCSE c(ar1)		PCSE c(ar1)	

Dynamics of the Venture Capital activity industry in high tech companies and those in early development stages, Institutional Quality, Foreign Investment and Government Spending in Emerging Countries

Table 3

FDI and Institutional Quality productivity on the Dynamics of the Venture Capital industry activity in Emerging Countries												

	Dependent Variables											
Independent Variables	Total Amount Intvested				Amount invested in companies in early development stages				Amount invested in high tech companies			
	(8)		(9)		(10)		(11)		(12)		(13)	
int_qual	0,5312	(0.1526)***	0,4331	(0.1532)***	0,0558	(0.1202)	0,0392	(0.0980)	0,3301	(0.1133)***	0,3669	(0.10192)***
fdi*int_qual (mitad superior)			**0,0699**	(0.0294)**			**0,0516**	(0.0162)***			**0,0417**	(0.0181)**
fdi*int_qual (mitad inferior)			0,0122	(0.0263)			0,0066	(0.0129)			0,0221	(0.0195)
fdi*int_qual (cuartil superior)	**0,0525**	(0.0307)*			**0,0583**	(0.0245)**			**0,0663**	(0.0248)***		
fdi*int_qual (cuartiles 2 y 3)	0,0503	(0.0319)			0,0269	(0.0122)**			0,0096	(0.0177)		
fdi*int_qual (cuartil inferior)	0,0556	(0.0389)			0,0222	(0.0219)			0,0246	(0.0348)		
govexp	-0,0531	(0.0103)***	-0,0534	(0.0102)***	-0,0353	(0.0064)***	-0,0374	(0.0075)***	-0,0516	(0.0093)***	-0,0572	(0.0077)***
gdp	0,6686	(0.2814)**	0,8309	(0.2994)***	0,3583	(0.1983)***	0,3911	(0.2043)*	0,4581	(0.2428)*	0,4358	(0.2469)*
art_pub	4,29E-05	(1.79E-05)**	3,58E-05	(19.1E-05)***	2,09E-05	(1.33E-05)	2,05E-05	(1.41E-05)	3,86E-05	(1.46E-05)***	4,27E-05	(1.47E-05)**
mar_cap	0,0007	(0.0010)	0,0012	(0.0011)	0,0021	(0.0006)***	0,0021	(0.0007)***	0,0008	(0.0007)	0,0004	(0.0006)
bus_free	0,0152	(0.0058)***	0,0142	(0.0056)**	0,0144	(0.0047)***	0,0148	(0.0050)*	0,0150	(0.00421)***	0,0172	(0.0036)***
trade	0,0036	(0.0013)***	0,0032	(0.0014)**	0,0016	(0.0008)**	0,0016	(0.0009)***	0,0020	(0.0007)***	0,0025	(0.0007)***
constant	-0,4153	(0.3247)	-0,4124	(0.3016)	-0,7328	(0.3418)	-0,7303	(0.3632)**	-0,4565	(0.2671)*	-0,5477	(0.2507)**
Dummies time	si		si		si		si		si		si	
R²	0,4493		0,4626		0,3757		0,3784		0,4923		0,4821	
Observations	340		340		355		355		352		352	
Number of countries	42		42		42		42		42		42	
Test	Est.	P-value	Est.	P-value	Est.	P-value	Est.	P-value	Est.	P-value	Est.	P-value
Wald chi²(11)	903,22	0,0000	868,93	0,0000	132,24	0,0000	104,39	0,0000	995,33	0,0000	846,76	0,0000
Hausman	12,18	0,5918	6,98	0,8591	7,84	0,7274	8,79	0,552	11,31	0,5030	13,11	0,2178
Breusch-Pagan	19,37	0,0000	20,03	0,0000	4,17	0,0411	5,86	0,0155	64,46	0,0000	105,39	0,0000
Modified Wald het.	7065,75	0,0000	8852,77	0,0000	96267,12	0,0000	54098,32	0,0000	7846,84	0,0000	8770,99	0,0000
Pesaran CSD					6,611	0,0000	7,157	0,0000	5,642	0,0000	6,416	0,0000
LM Serial Corr	3,097	0,8670	1,810	0,1867	2,052	0,1598	2,398	0,1294	3,436	0,071	3,231	0,0796
Model	PCSE		PCSE		PCSE		PCSE		PCSE		PCSE	

Table 4

Productivity of state intervention and Institutional Quality in the Dynamics of the Venture Capital industry activity in Emerging Countries

Independent Variables	Dependent Variables											
	Total amount invested				Amount invested in companies in early development stages				Amount invested in high tech companies			
	(14)		(15)		(16)		(17)		(18)		(19)	
int_qual	0,6029	(0.1752)***	0,5128	(0.1521)***	0,1817	(0.1334)	0,1509	(0.1085)	0,5396	(0.1311)***	0,5235	(0.1238)***
Fdi	0,0497	(0.0253)**	0,0515	(0.0248)**	0,0373	(0.0132)***	0,0367	(0.0129)***	0,0339	(0.0159)**	0,0308	(0.0163)*
govexp*int_qual (mitad superior)			-0,0532	(0.0115)***			-0,0404	(0.0088)***			-0,0641	(0.0078)***
govexp*int_qual (mitad inferior)			-0,0545	(0.0092)***			-0,0357	(0.0063)***			-0,0518	(0.0072)***
govexp*int_qual (cuartil superior)	-0,0559	(0.0217)***			-0,0432	(0.0104)***			-0,0677	(0.0174)***		
govexp*int_qual (cuartiles 2 y 3)	-0,0547	(0.0097)***			-0,0390	(0.0075)***			-0,0594	(0.0078)***		
govexp*int_qual (cuartil inferior)	-0,0449	(0.0127)***			-0,0324	(0.0070)***			-0,0478	(0.0091)***		
gdp	0,7221	(0.3028)**	0,6936	(0.2856)**	0,3283	(0.2062)	0,2948	(0.1971)	0,4217	(0.2484)*	0,3632	(0.2481)
art_pub	3,90E-05	(2.02E-05)*	4,27E-05	(1.83E-05)**	2,22E-05	(1.41E-05)	2,45E-05	(1.39E-05)*	4,14E-05	(1.54E-05)***	4,48E-05	(1.47E-05)***
mar_cap	0,0008	(0.0011)	0,0008	(0.0010)	0,0015	(0.0007)**	0,0016	(0.0006)***	1,63E-05	(0.0007)	0,0003	(0.0006)
bus_free	0,0142	(0.0059)**	0,0147	(0.0056)***	0,0166	(0.0051)***	0,0165	(0.0049)***	0,0174	(0.0036)***	0,0167	(0.0038)***
trade	0,0037	(0.0014)***	0,0038	(0.0014)***	0,0019	(0.0009)**	0,0020	(0.0009)**	0,0025	(0.0008)***	0,0027	(0.0008)***
constant	-0,2499	(0.3392)	-0,2780	(0.3409)	-0,8146	(0.3711)**	-0,8177	(0.3603)**	-0,5329	(0.2670)**	-0,5261	(0.2694)*
Dummies Time	si		si		si		si		si		si	
R²	0,4520		0,4512		0,3675		0,3672		0,4836		0,4858	
Observations	340		340		355		355		352		352	
Number of countries	42		42		42		42		42		42	

Test	Est.	P-value	Est.	P-value	Est.	P-value	Est.	P-value	Est.	P-value	Est.	P-value
Wald chi²(11)	949,9	0,0000	848,39	0,0000	89,85	0,0000	111,42	0,0000	958,31	0,0000	918,11	0,0000
Hausman	7,81	0,8001	7,26	0,7774	6,61	0,7621	8,63	0,4720	10,53	0,5694	14,67	0,198
Breusch-Pagan	20,01	0,0000	19,18	0,0000	5,24	0,0220	4,73	0,0296	107,64	0,0000	100,6	0,0000
Modified Wald het.	6475,47	0,0000	6962,38	0,0000	54368,19	0,0000	53513,7	0,0000	9406,07	0,0000	9749,95	0,0000
Pesaran CSD					9,495	0,0000	9,132	0,0000	6,615	0,0000	5,931	0,0000
LM Serial Corr	2,236	0,1433	1,782	0,1901	1,970	0,1682	2,267	0,1400	3,043	0,0886	3,188	0,0816
Model	PCSE		PCSE		PCSE		PCSE		PCSE		PCSE	