# An Empirical Examination of the Determinants of Foreign Direct Investment: A firm-level analysis for the Colombian economy

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## Abstract

*We use a large firm level data set to investigate the determinants of foreign direct investment (FDI) in Colombia. We estimate econometric models for the determinants of the probability that a firm receives FDI, as well as for the factors that help to explain the foreign share in a firm's capital. The results show that firms listed on the stock market, involved in foreign trade activities, and operating in sectors with greater capital intensity are more likely to be recipients of FDI. Also, the probability of a firm receiving FDI is directly related to its size.*

Key words: foreign direct investment (FDI), panel probit, database at firm level, Colombia.

JEL classification: C23, C25, F20, F21

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## 1. Introduction

During the last three decades or so, economic integration among countries have deepened through increased participation in world markets for capital, goods and services. In this context, transnational corporate investments have played a key role in financing new economic structures both at the regional and country levels. In particular, foreign direct investment (FDI) is essential to an economy as a source of external funding and, given the effect it can have on a country's balance of payments, long-term economic growth and productivity. Moreover, FDI helps increase the transfer of technology, capital formation, competitiveness and qualification of the local labor force, in addition to reducing a firm's costs. Taking the above considerations into account, it is relevant to analyze the economic features that make firms attractive to foreign investors.

In recent years, Colombia, like many other emerging market economies, has been a recipient of increasing inflows in the form of FDI. It has been argued that investment inflows to the various sectors of the Colombian economy have been partly the result of a regulatory framework favorable to foreign investors, as it has been designed to provide them with both stability and certainty in legal terms.[1]

Literature on FDI in Colombia has examined numerous subjects both at the macro and the micro levels. Focusing on the latter, topics such as the effectiveness of the regulatory framework designed to attract FDI, the relationship among foreign investment, exports and innovation, as well as among FDI, growth and productivity have been the subject of attention (see, inter alia, Steiner and Giedion (1995), Echavarria and Zodrow

[1] For details on the recent evolution of Colombian FDI and its regulatory framework, see Garavito et al. (2012).

(2005), Atallah (2006), Kugler ( 2006), Kalin (2009), De Lombaerde and Garay (2009)). However, to our knowledge the study of the drivers that make firms more likely to receive FDI has not received enough attention. Moreover, it appears that the scarcity of this strand of the literature is not exclusive to Colombia, as it applies to other emerging economies as well.

In an attempt to contribute to the literature, the aim of this paper is to study the determinants of FDI in Colombia, for which we take advantage of a unique and large dataset at the firm level. The dataset, which has been collected by the authors, consists of annual observations over the period 2000 to 2010, and comprises more than 5.300 firms from a large spectrum of economic sectors, some of which of strategic importance for the economy as a whole (such as petroleum and electricity, gas and water. An interesting feature of the dataset is that the level of disaggregation is such that we are able to examine firms of different sizes, not only in the main cities, but also all over the country. Moreover, the dataset lends itself to analyze the characteristics of the firms that received FDI and compare them to those which did not receive it. To accomplish this objective, we perform two econometric exercises: the first one involves the specification and estimation of a model to find the factors that determine the probability that a firm is recipient of FDI; the second one focuses on a model to help explain the foreign share of the firm's capital.

Our findings suggest that firms that are more likely to attract FDI are capital intensive ones, of greater size, with well-established business structures, and that are involved in activities related to foreign trade. Interestingly, the results also show that the probability of a firm receiving FDI decreases for companies located outside of Bogota, the country's capital, and for those operating in economic sectors different from petroleum.

The paper is divided into four sections, in addition to the introduction. The second one reviews the economic literature on FDI. In the third section, we characterize the firms that receive FDI and compared them to those that do not receive this type of investment. In the fourth section, the results of the econometric estimations are presented. The final section offers some concluding remarks.

## 2. Literature Review on FDI

The economic literature on FDI determinants has concentrated mainly on analyzing why firms invest abroad. This literature can be divided into at least three groups. The first one, where there is abundant literature, examines the determinants of FDI at the macroeconomic level; the second group, where studies are scarcer, analyses the determinants of FDI at industry or firm level, while the third, using surveys, asks entrepreneurs what reasons influence their decision to invest abroad.

Regarding the first group of studies, the literature has found that FDI is mainly determined by relative real wages, the relative exchange rate, economic integration, market size, cultural differences, infrastructure, credit access and economic stability[2].

In the second group, which is more relevant to the present study, Karpaty and Poldahl (2006) examined at the sector and firm level, the determinants of FDI flows in the manufacturing and services sectors in Sweden. The authors found that the factors

[2] In this group there are studies for groups of countries (i.e. Blonigen and Piger, 2011; Walsh and Yu, 2010; Demirhan and Masca, 2008; Bénassy-Quéré, Couper and Mayer, 2007; Albuquerque, Loayza and Serven, 2005; Liu, Song, Wei and Romilly, 1997), for regions (i.e. Ramirez, 2010 for Latin America; Sahoo, 2006 for Asia and Abor, 2010; Oladipo, 2010; Abor, Adjasi and Hayford, 2008; Ajayi, 2006; Asiedu, 2002 for Africa) and for individual countries (i.e. Grosse and Trevino, 1996 for the USA; Garcia-Herrero, Iizaka and Siu, 2005 and Wang and Swain, 1995, 1997 for China; Kimino, Saal and Driffield, 2007 for Japan; Love and Lage-Hidalgo, 2000 for México; Ramírez, 2006 for Chile; Aqeel and Nishat, 2004 for Pakistan and Aw and Tang 2009 for Malaysia.

associated with firms' ownership and variables such as human capital, capital intensity and the intensity in the use of energy positively affect a firm's decision to invest in such sectors. Similarly, Giulietti, Mccorriston and Osborne (2004) found that the property of the firm and the market structure are important variables foreign companies considered when deciding to invest in the food processing industry in the United Kingdom. Moreover, Buch, Kleinert, Lipponer and Toubal (2005) examined the determinants of the activities of German multinationals abroad and concluded that German companies mainly moved overseas to gain better access to international markets. Todo (2009) found evidence that the cost of entry into foreign markets plays an important role in the decision to invest abroad by Japanese firms.

Bellak, Leibrecht and Stehrer (2008) analyzed public policies to attract FDI, using a sample of countries, at the manufacturing industry level. The results showed that expenditure on research and development, unit labor costs, worker's ability, institutional environment and tax policy contribute to closing the gap between estimated FDI and its potential. Alfaro and Charlton (2009) used a detailed database to characterize global patterns of multinational activity; they found that among the main determinants of vertical FDI, GDP has a positive and significant effect, while bilateral distance, as a proxy for costs, and the increase in the level of skills in the subsidiary country have a negative effect on the multinational activity. Recently, Wang, Alba and Park (2013) empirically analyzed the extent to which the determinants of FDI influence the choice of the type of FDI Japanese firms want to implement in the United States.

Finally, in the third group, Hogenbirk (2002) conducted a survey among eighty six foreign electronics firms in the Netherlands. The survey asked the companies the reason why they set up business in the country. According to the results, factors associated with

the ownership of the firms, location, and the benefits of internationalization affect the decision to locate in the Netherlands. Moreover, Ali and Guo (2005) analyzed the response of twenty two foreign firms operating in China on what they perceive as the most important factors for investing in that country. The survey results show market size is the main motivation for American firms, while low labor costs are the key determinant for Asian companies.

In summary, there is a wide range of methodologies and databases that include different samples of countries and time periods, making it difficult to identify the most important factors affecting a firm's decision to invest abroad. However, in general, market size, economic growth, the exchange rate, the tax structure, trade agreements, financial costs and macroeconomic stability are the most relevant factors from a macroeconomic perspective. Moreover, the ownership structure of the firm, product differentiation, economies of scale and the firm's size are the most important aspects from a microeconomic point of view.

In Colombia, the studies on FDI cover a variety of aspects;[3] however, the study of FDI determinants has not received enough attention. Steiner and Giedion (1995) and Corral and Anzola (1998) studied FDI regulations, whereas the role of taxes to attract FDI was analyzed by Echavarria and Zodrow (2005). Moreover, Kalin (2009) and De Lombaerde and Garay (2009) analyzed the opportunities and obstacles to attracting FDI and the policies used by the government to that end.

Another subject analyzed is the relationship between foreign investment, manufacturing exports and innovation (Fatat, 1998). In turn, Echavarria and Esguerra (1990) and Kalin (2009) examined the impact the presence of foreign companies in the

[3] Garavito et al. (2012) present a detailed literature review.

country has on employment, wages, production and exports. Other authors have studied the relationship between FDI, productivity, externalities and technology diffusion in the manufacturing sector (i.e. Atallah, 2006; Kugler, 2006; De Lombaerde and Pedraza, 2004; Pedraza, 2003; Kugler, 1998 and Steiner and Giedion, 1995).

Finally, Rowland (2006) compared foreign and domestic firms in terms of sales, the evolution in earnings, leverage, exports, imports and foreign debt. In addition, Pedraza (2003) explored how FDI flows directed to the Colombian industrial sector affect the productive performance of recipient firms and compared the productive performance of firms with foreign investment to the productivity achieved by local firms.

## 3. Characterization of Firms Receiving FDI

In this section, we analyze whether firms receiving FDI have characteristics different from those that do not receive this type of investment. To perform this analysis, we use a database consisting of 5,364 firms, mainly in the manufacturing sector (28%), trade (26%) and financial services (19%), during the 2000-2010 period.[4] 30% of the firms in the entire sample have FDI. It is important to point out that 96% of the firms in the petroleum sector and 41% in mining receive FDI (Table 1). The development of petroleum and mining projects in particular requires the involvement of foreign firms that can afford the high capital investment, technology and risks associated with this type of business.

In the electricity, gas and water sector, 47% of the firms received FDI. Since the beginning of the nineties, with the change in the international investment regime, foreign investors have been allowed to participate in most economic sectors, including the

[4] See Garavito et al. (2012) for a detailed description of the assembling process and the sources of the dataset.

provision of public utilities. This, combined with the high amounts of investment required to develop infrastructure projects and the monopoly the investor can exploit in this sector, encouraged the arrival of foreign capital to this branch of economic activity.

In contrast, the sectors with the lowest percentage of firms with FDI are construction (16%), agriculture (25%) and trade (26%) (Table 1). Although foreign participation is, in general, relatively low for firms in those sectors, it is important to mention that FDI is significant for some subsectors within these activities (i.e. production and export of bananas and wholesale trade).

In terms of the size of the firms with FDI, 77% were classified as large, 14% as medium and 9% as small. Furthermore, 73% of the firms with FDI are registered in Bogota, 9% in Medellin, 7% in Cali, 4% in Barranquilla and 7% in the rest of the country. It is important to mention that 78% of the firms receiving FDI conducted some foreign trade activity. Moreover, in Colombia, an important amount of FDI is in the form of acquisitions of existing companies. Investors generally prefer to acquire large and well-established firms that allow them to participate in a relevant market share and well-established trade channels.

As seen in Table 2, over 60% of the firms receiving FDI have had more than 90% a foreign equity, which confirms that foreign investors prefer to have total control of the company at the time of acquisition or merger.[5] It should be noted that 3.1% of the firms receiving FDI issue securities, while only 1.1% of those that are not receiving this type of investment are.

Additionally, over 30% of the firms from the sample are headquartered in the United States, 7% in Spain, 6% in Germany, 6% in France and 5% in the United Kingdom. It is important to mention that a significant share of companies are headquartered at offshore

[5] It is considered that a firm receives FDI if its foreign equity is greater than or equal to 10%.

financial centers (15%), because international investors seek such countries to manage their foreign investments as a way to reduce certain transaction costs. Among these countries are Panama (8%), Cayman Islands (2%), Bermuda (1.2%) and the British Virgin Islands (1.2%).

Regarding capital intensity, measured as the value of fixed assets divided by the total working population, firms receiving FDI are more physical capital intensive than other firms (Table 3). This is because some of the main sectors that receive FDI (petroleum, mining and manufacturing) are capital intensive.

## 4. Determinants of FDI in Colombia: An Econometric Estimation

In the economic literature, there is a wide variety of theoretical models to explain the determinants of FDI and the location decision of multinational firms. According to Faeth (2009), these models are not necessarily substitutes, but generally are complementary and explain different aspects of FDI. Therefore, FDI should not be explained by a single model, but through a combination of them; see also Blanchard, Gaigné and Mathieu (2008).

Faeth (2009) carries out a comprehensive review of the theoretical models and the FDI determinants deriving from them.[6] To this end, the author classifies the models into nine groups. The first includes those dating back to the 1960s. In these models, market size and growth, political stability and factor costs are the main determinants of FDI. The second group considers models derived from the neoclassical theory, which is based on the international trade theory, particularly the Heckscher-Ohlin model. The third group of models, developed in the seventies, assumes imperfect markets; in these models

[6] For further details see the references mentioned in Faeth (2009).

monopolistic advantage, product differentiation, business management experience, economies of scale and patents are the main determinants of FDI. In the fourth group, the effect of aggregate variables on FDI, such as market size and trade barriers, is incorporated into the models.

However, the model of perhaps greater importance in literature is in the fifth group. It is known as Dunning's eclectic paradigm of international production and combines the theory of international trade and the theory of internalization.[7] In this model, FDI is explained by three types of advantages: ownership specific advantages of the company (Ownership), location advantages of FDI host countries (Location) and internalization advantages of the firm's production process (Internalization). This model is known in literature as the OLI paradigm. As Faeth (2009) summarizes it, the advantages of business ownership include patents, know-how, management skills and reputation. The location is related to market access, favorable tax treatment and lower costs for production and transportation, while internalization is associated with benefits a company derives by replacing external markets with FDI.

The sixth group of models combines the advantages of ownership and location with technology and country characteristics. Another relevant model is the Knowledge-Capital model developed by Markusen, Venables, Konan and Zhang (1996). It combines both horizontal and vertical FDI determinants in a model that allows firms the option to build multiple plants and geographically separate headquarters and production; see also Markusen y Maskus (2002).

The eighth group is composed of models that assume firms are risk averse. Therefore, market and macroeconomic risks factors, such as exchange rate and interest rate

[7] For more details, see Dunning (1979, 1988, 1998, 2000).

volatility are considered as determinants of FDI. Finally, the last group includes theoretical models and policy variables such as tax and financial incentives, as well as subsidies.

Based on the aforementioned and considering that the empirical analysis of FDI determinants is eclectic in nature, we estimate in this paper a model for the probability that a firm receives FDI, where the dependent variable takes the value of 1 if the company received FDI and 0 if not. Among the explanatory variables, we included a set of variables that change by firm *i* at time *t*, variables that change depending on sector *j* to which firm *i* belongs at time *t* and macroeconomic and institutional variables that change only at time *t*.

Specifically, variables that capture factors particular to firms, were included as dummy variables to identify whether the company is listed on the National Stock Market, the economic sector to which it belongs, the city where it is located, its size, and if the company exports and / or imports goods and services. The number of years the firm has been in business and financial indicators are also included. Regarding sectoral variables, we consider indicators of profitability, capital intensity, labor productivity and labor remuneration. In the vector of macroeconomic variables, we include real exchange rate volatility and volatility in terms of trade, as factors that capture macroeconomic risk; the income tax rate was included as well to capture tax incentives. Finally, we included a measure of the rule of law as a proxy for the quality of institutions.[8]

Given the binary nature of the dependent variable, we estimated a discrete choice model; that is, a panel probit for the period 2000-2010, with information on 5,364 firms. We used the Population Averaged (PA) model, widely employed to estimate nonlinear models with panel data. The model assumes that the individual effects have been averaged,

[8]Appendix A presents the summary statistics of the variables, and Appendix B presents their sources and definitions.

which facilitates estimating and interpreting the marginal effects (Cameron and Trivedi, 2005, 2009).

Table 4 shows the marginal effects from estimation of the PA model. The results indicate the probability that a firm has FDI decreases for companies located outside the reference city; namely, the Bogotá metropolitan area. The same applies to all economic sectors in relation to the petroleum sector, which was considered as the reference category.[9] This can be explained by the fact that to petroleum exploitation requires, in most cases, foreign capital investment, given the high amounts of investment and risk involved in such activities.[10]

In terms of size, the probability also declines for small and medium sized firms in relation to large companies. Likewise, the probability of a firm having FDI increases if it is listed on the National Stock Market and if it conducts foreign trade activities. In this case, foreign investors are looking to invest in major companies as a way to gain quick access to representative market shares and to well-established business structures and marketing channels to obtain operating results in the short term. Moreover, the greater capital intensity, both at sectoral and firm level, the more likely it is for firms to have FDI. The results also show firms are risk averse, because the higher the volatility in the terms of trade, the less likelihood of a firm having FDI.[11]

[9] For the econometric estimation, the agriculture, forestry and fishing, mining, electricity, gas and water, construction and social services sectors were grouped into a sector called "other sectors".
[10] As an additional exercise, we attempted to estimate the model by sector. However, due to numerical problems in the optimization, estimation was not possible given the low variability of the dependent variable at this level.
[11] In an additional estimation, we replaced volatility in terms of trade with real exchange rate volatility and found the likelihood of a company having FDI declines when this volatility increases; the result is consistent with the risk aversion of entrepreneurs. Firms' profitability indicators also were included as explanatory variables, but were not significant in the estimations. These results are not reported here to save space, but are available on request.

We also performed an exercise considering the foreign share of firms' capital as a dependent variable, using the same set of explanatory variables. In this case, the dependent variable takes values in the interval between 0 and 1; it is bound at both ends and presents excess zeros. To overcome these drawbacks, the usual practice is to transform the variable using the logistic transformation, so the modified series takes values in the real line, allowing us to use the standard regression analysis (Cribari-Neto and Zeileis, 2010). Additionally, due to the presence of extreme values, it was necessary to do the following transformation before performing the logistic transformation:

$$(y(n-1)+0.5)/n \tag{1}$$

Where $y$ and $n$ are the variable to be transformed and the number of observations, respectively.

Table 5 shows the results of the determinants of the foreign share of the firms' capital for the 2000-2010 period, using panel data with random effects. The estimated parameters only provide information about the sign and the significance of the variables, as these are interpreted in terms of the average of $\tilde{y}$ (transformed variable) rather than the mean of $y$. The results indicate the percentage of foreign ownership in firms belonging to the petroleum sector, located in Bogota, large in size and engaged in foreign trade activities is higher than for other companies. Regarding the age of the firms, we found foreign interest in firms' capital is lower for older firms than for newer ones. In turn, the higher the firm's capital intensity, the greater the share of foreign capital.

Regarding the sectoral variables, the results show labor remuneration, capital intensity, labor productivity and profitability have a positive and significant effect on firms' foreign ownership. Moreover, volatility in terms of trade and the income tax rate negatively affect foreign ownership interest. Finally, foreign ownership interest is favored by an

improvement in the rule of law indicator, as well as by a higher implicit FDI profitability (interest rate differential).

Then, we calculated the expected effect on the dependent variable of a change in some of the independent variables, keeping the other variables constant. The expected change in $y$, $\Delta y$, associated with a change in $x_1$ (explanatory variables), $\Delta x_1$, keeping $x_2$,…, $x_k$ constant, is the difference between the value obtained from the regression before and after the change in $x_1$, maintaining the other variables constant (Stock and Watson, 2007, Chapter 8). These effects can be calculated at different points of the variables, the average being the most used. Table 6 presents some examples of the expected effect on the dependent variable of the change in some of the explanatory variables, which are not dichotomous, relative to the baseline scenario.[12] In particular, we considered a 1% change in each of the independent variables, keeping the other constant.

The results show the 1% increase in labor remuneration would raise foreign participation by 1.6%. Increasing sectoral capital intensity, labor productivity and profitability would raise the foreign share by 0.1%, 0.13% and 1.1%, respectively. Similarly, improving the rule of law indicator, the interest rate differential and the firms' capital intensity by 1%, the foreign share would increase by 0.6%, 0.08% and 0.04%, respectively. In contrast, an increase in the income tax rate would lower the foreign share by 0.7%, while an increase in terms of trade volatility would reduce it by 0.1%.

It is important to note that the determinants of the foreign share in the firms' capital may differ, depending on the sector where the investment is made. In general, we find there

[12] To save space, the results for all dummy variables are not presented due to the large number of possible combinations and interactions, but are available on request.

are no significant differences at sectoral level.[13] For example, an improvement in the rule of law indicator, the fact that the firm is engaged in foreign trade activities, is located in Bogota and has a higher capital intensity encourage foreign participation in the firms' capital in most sectors. Moreover, a higher interest rate differential is important for firms in the agricultural sector, trade, manufacturing, and in social and personal services. In large companies, foreign participation is higher for firms belonging to the trade sector, manufacturing, transport, storage, and communications and financial services.

Regarding the firms' age, the results suggest older firms would have a minor foreign involvement in the mining and quarrying, transport, storage and communications, financial services, and trade sectors while this share increases with the age of the firm in the manufacturing sector. With respect to income taxes, they negatively affect foreign participation in the trade, manufacturing and financial services sectors.

Table 7 shows several examples of the expected effect a change in some of the explanatory variables, which are not dichotomous in relation to the baseline scenario, would have on the foreign share of the capital of companies, by economic sector. A 1% change in each of the independent variables, keeping the other variables constant, is considered. The results show an increase in the income tax rate would decrease foreign participation by 0.9% in manufacturing and 1.3% in financial services. By improving the indicator of the rule of law, the marginal effect is greater in the mining and quarrying and petroleum than in the other sectors. Likewise, an increase in the interest rate differential, would raise foreign participation by 0.1% in the trade sector and by 0.25% in social, personal and community services. Finally, the highest marginal effect on foreign

[13] These results are not reported here to save space, but are available on request.

participation from an increase in the firms' capital intensity is found in social, personal and community services (0.3%).

## 5. Conclusions

We put together a panel data containing information on company characteristics, macroeconomic variables and sectorial variables to investigate the determinants of FDI in Colombia at the firm level, during a period characterized by increasing capital inflows.

Our empirical analysis involves two econometric exercises: in the first one, we estimate a model for the determinants of the probability that a firm receives FDI, while in the second one we focus on the factors that could explain the foreign share in a firm's capital.

Overall, the results of both estimations are qualitatively similar. We find that the probability that a firm receives FDI reduces for firms located outside of Bogota, in economic sectors other than petroleum, and for small- and medium-sized companies. In contrast, the probability of receiving FDI increases for firms involved in foreign trade activities, those in sectors with higher capital intensity, and in companies listed on the stock market. We also found firms are risk averse, because the higher the volatility of terms of trade the less likely it is that a company receives FDI.

Regarding the results of the determinants of the foreign share of company capital, it is worth pointing out that sectorial variables, such as labor remuneration, capital intensity, labor productivity and profitability, have a positive and statistically significant effect on this share. Also, the income tax rate negatively affects the foreign share, while an improvement in the indicator of the rule of law encourages it. In summary, our results

suggest that in the interest of obtaining operating results in the short term, foreign investors' decisions appear to be biased in favor of major companies with an already significant access to important market shares, well-established business structures and marketing channels. An important institutional aspect is related to the fact that firms that issue securities look appealing to market participants, because this financing method is employed by firms with a transparent code of governance, and supervised by a financial regulator. Lastly, it would be interesting to compare whether the factors that appear to drive foreign investors' decisions on Colombian firms are similar to those that are considered in other countries. This, however, is a topic for future research.

**References**


Abor, Joshua. 2010. "Foreign Direct Investment and Firm Productivity: Evidence from Firm-level Data." *Global Business and Economics Review* 12, no. 4: 267-285.

Abor, Joshua; Charles K. D. Adjasi; and Mac-Clara Hayford, M. 2008. "How Does Foreign Direct Investment Affect the Export Decisions of Firms in Ghana?." *African Development Review* 20, no. 3: 446–465.

Ajayi, S. Ibi . 2006. *Foreign Direct Investment in Sub-Saharan Africa: Origins, Targets, Impact and Potential*. African Economic Research Consortium, Nairobi, Kenya.

Albuquerque, Rui; Norman Loayza; and Luis Servén. 2005. "World Market Integration through the Lens of Foreign Direct Investors." *Journal of International Economics* 66, no. 2:267-295.

Alfaro, Laura, and Andrew Charlton. 2009. "Intra-industry Foreign Direct Investment." *American Economic Review* 99, no. 5: 2096–2119.

Ali, Shaukat, and Wei Guo. 2005. "Determinants of FDI in China." *Journal of Global Business and Technology* 1, no. 2: 21-33.

Aqeel, Anjum, and Mohammed Nishat. 2004. "The Determinants of Foreign Direct Investment in Pakistan." *The Pakistan Development Review* 43, no. 4 Part II: 651-664.

Asiedu, Elizabeth. 2002. "On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?." *World Development* 30, no. 1:107-119.

Atallah, Sonia. 2006. "Revaluando la transmisión de spillovers de la IED: un estudio de productividad para Colombia." *Revista Desarrollo y Sociedad* 57: 163-213.

Aw, Yong Ting, and Tuck Cheong Tang. 2009. "The Determinants of Inward Foreign Direct Investment: The Case of Malaysia." Monash Economics Working Papers 22-09, Monash University.

Bellak. Christian; Markus Leibrecht; and Robert Stehrer. 2008. "The Role of Public Policy in Closing the FDI Gaps: An Empirical Analysis." The Vienna Institute for International Economic Studies, Working Paper # 48.

Bénassy-Quéré, Agnès; Maylis Coupet; and Thierry Mayer. 2007. "Institutional Determinants of Foreign Direct Investment". *The World Economy* 30, no. 5: 764-782.

Blanchard, Pierre; Carl Gaigné; and Claude Mathieu. 2008. "Foreign Direct Investment: Lessons from Panel Data." In *The Econometrics of Panel Data*, ed. László Mátyás and Patrick Sevestre. Advanced Studies in Theoretical and Applied Econometrics (3rd ed.), Springer.

Blonigen, Bruce A., and Jeremy Piger. 2011. "Determinants of Foreign Direct Investment." NBER Working Paper # 16704. Retrieved on April 12, 2011, from http://www.nber.org/papers/w16704.

Buch, Claudia; Jörn Kleinert; Alexander Lipponer; and Farid Toubal. 2005. "Determinants and Effects of Foreign Direct Investment: Evidence from German Firm-level Data." *Economic Policy* 20: 52-110.

Cameron, A. Colin, and Pravin K. Trivedi. 2005. *Microeconometrics Methods and Applications*, Cambridge University Press, New York, (Chapters 21, 23).

Cameron, A. Colin, and Pravin K. Trivedi. 2009. *Microeconometrics using Stata.*, Stata Press, StataCorp LP Texas, (Chapters 8, 10).

Corral, Luis Carlos, and Marcela Anzola. 1998. "Inversión extranjera directa en Colombia, 1990-1998." *Revista de Planeación y Desarrollo* 29:149-176.

Cribari-Neto, Francisco, and Achim Zeileis. 2010. "Beta Regression in R." *Journal of Statistical Software* 34: 1-24.

Demirhan, Erdal, and Mahmut Masca. 2008. "Determinants of Foreign Direct Investment Flows to Developing Countries: A Cross-sectional Analysis." *Prague Economic Papers* 2008, no. 4:356-369.

De Lombaerde, Philippe, and Luis Jorge Garay. 2009. "FDI Policies in Times of Conflict: The Case of Colombia." *UNU-CRIS Working Papers*, No W-2009/23.

De Lombaerde, Philippe, and Erika B. Pedraza. 2004. "FDI Productivity Spillovers in the Andean Region: Econometric Evidence from Colombian Firm-level Panel Data." *UNU-CRIS Occasional Papers*, No. 0-2004/14.

Dunning, John H. 1979. "Explaining Changing Patterns of International Production: In Defence of Eclectic Theory." *Oxford Bulletin of Economics and Statistics* 41, no. 4: 269-296.

Dunning, John H. 1988. "The Eclectic Paradigm of International Production: A Restatement and Some Possible Extensions." *Journal of International Business Studies* 19, no. 1: 1-31.

Dunning, John H. 1998. "Location and the Multinational Enterprise: A Neglected Factor?." *Journal of International Business Studies* 29, no. 1: 45-66.

Dunning, John H. 2000. "The eclectic paradigm as an envelope for economic and business theories of MNE activity." *International Business Review* 9, no. 2: 163-190.

Echavarría, Juan José, and Pilar Esguerra. 1990. "Empresas transnacionales y reestructuración industrial en Colombia." *Revista de Planeación y Desarrollo* 22: 41-90.

Echavarría, Juan José, and George R. Zodrow. 2005. "Foreign Direct Investment and the Business Tax in Colombia." In *Fiscal Reform in Colombia: Problems and Prospects*, ed. Richard Bird, James Poterba and Joel Slemrod. MIT Press.

Faeth, Isabel. 2009. "Determinants of Foreign Direct Investment - A Tale of Nine Theoretical Models." *Journal of Economic Surveys* 23, no. 1: 165-196.

Fatat, Abdul. 1998. "Inversión extranjera, exportaciones e innovación tecnológica en la industria colombiana, 1992-1997." *Revista de Planeación y Desarrollo* 29: 117-147.

Fung, K. C; Alicia Garcia-Herrero; Hitomi Iizaka; and Alan Siu. 2005. "Hard or Soft? Institutional Reforms and Infrastructure Spending as Determinants of Foreign Direct Investment in China." *The Japanese Economic Review* 56, no. 4: 408-416.

Garavito, Aarón; Ana María Iregui; and María Teresa Ramírez. 2012. "Inversión extranjera directa en Colombia: evolución reciente y marco normativo." *Borradores de Economía*, No. 713, Banco de la República, Bogotá.

Giulietti, Monica; Steven McCorriston; and Peter Osborne. 2004. "Foreign Direct Investment in the UK: Evidence from a Disaggregated Panel of the UK Food Sector." *Applied Economics* 36, no. 7: 653-663.

Grosse, Robert, and Lens Trevino. 1996. "Foreign Direct Investment in the United States: An Analysis by Country of Origin." *Journal of International Business Studies* 27, no. 1: 139-155.

Hogenbirk, Anne Elisabeth. 2002. *Determinants of Inward Foreign Direct Investment: The Case of the Netherlands*. Doctoral dissertation, Universidad de Maastricht, Netherlands.

International Monetary Fund. 1993. *Balance of Payments Manual*. V edition. Washington D.C.

Kalin, Ylva. 2009. "FDI in Colombia: Policy and Economic Effects." *Minor Field Studies* No. 196 (October), Department of Economics, Lund University, Lund, Sweden. Retrieved on May 25, 2011, from http://www.nek.lu.se/Publ/mfs/196.pdf.

Karpaty, Patrik, and Andreas Poldahl. 2006. "The Determinants of FDI Flows Evidence from Swedish manufacturing and service sector." *The Swedish Network for European Studies in Economics and Business*, Discussion paper No. 339. Retrieved on April 12, 2011, from http://www.snee.org/filer/papers/339.pdf.

Kimino, Satomi; David Saal; and Nigel Driffield. 2007. "Macro Determinants of FDI Inflows to Japan: An Analysis of Source Country Characteristics." *The World Economy* 30, no. 3: 446–469.

Kugler, Maurice. 1998. #Dinámica de la productividad multisectorial: la inversión extranjera directa como canal de difusión tecnológica." *Revista Desarrollo y Sociedad* 42: 43-79.

Kugler, Maurice. 2006. "Spillovers from Foreign Direct Investment: Within or Between Industries." *Journal of Development Economics* 80, no. 2: 444–477.

Liu, Xiaming; Haiyan Song; Yingqi Wei; and Peter Romilly. 1997. "Country Characteristics and Foreign Direct Investment in China: A Panel Data Analysis." *Review of World Economics* (Weltwirtschaftliches Archiv) 133, no. 2: 313-329.

Love, James and Francisco Lage-Hidalgo. 2000. "Analysing the Determinants of US Direct Investment in Mexico." *Applied Economics*, 32, no. 10:1259-1267.

Markusen, James; Anthony Venables; Denis Konan; and Kevin Zhang. 1996. "A Unified Treatment of Horizontal Direct Investment, Vertical Direct Investment, and the Pattern of Trade in Goods and Services." NBER Working Paper 5696, Cambridge, MA.

Markusen, James, and Keith Maskus. 2002. "Discriminating among Alternative Theories of the Multinational Enterprise." *Review of International Economics* 10, no. 4: 394-707.

Oladipo, Olajide S. 2010. "Foreign Direct Investment (FDI): Determinants and Growth Effects in a Small Open Economy." *The International Journal of Business and Finance Research* 4, no. 4: 75-88.

Pedraza, Erika. 2003. "Desempeño económico por tipo de firma: Empresas nacionales vs. grandes y pequeñas receptoras de inversión extranjera." *Archivos de Economía*, No. 225, Departamento Nacional de Planeación, Bogotá.

Ramírez, Miguel. 2006. "Economic and Institutional Determinants of Foreign Direct Investment in Chile: A Time-series Analysis, 1960-2001." *Contemporary Economic Policy* 24, no. 3: 459-471.

Ramírez, Miguel. 2010. "Economic and Institutional Determinants of FDI Flows to Latin America: A Panel Study." Working Papers, No. 1003, Trinity College, Department of Economics. Retrieved on August 30, 2011, from http://internet2.trincoll.edu/repec/WorkingPapers2010/wp10-03.pdf.

Rowland, Peter. 2006. "Foreign and Domestic Firms in Colombia: How Do They Differ?" *Borradores de Economía*, No. 375, Banco de la República, Bogotá.

Sahoo, Pravakar. 2006. "Foreign Direct Investment in South Asia: Policy, Trends, Impact and Determinants." *Asian Development Bank Institute Discussion Paper*, No. 56. Retrieved August 30, 2011, from http://www.adbi.org/files/dp56_fdi_in_south_asia.pdf.

Steiner, Roberto, and Úrsula Giedión. 1995. "Characteristics, Determinants and Effects of Foreign Direct Investment in Colombia." In *Foreign Direct Investment in Latin America*, ed. Manuel R. Agosín. Inter-American Development Bank and Universidad de Chile, Washington D. C.

Stock, James H., and Mark W. Watson. 2007. *Introduction to Econometrics* (2nd Ed), Pearson Education, New York, (Chapter 8).

Todo, Yasuyuki. 2009. "Quantitative Evaluation of Determinants of Export and FDI: Firm-level Evidence from Japan." *Research Institute of Economy, Trade and Industry (RIETI) Discussion papers*, No 09019. Retrieved on April 12, 2011, from http://www.rieti.go.jp/jp/publications/dp/09e019.pdf.

Walsh, James, and Jiangyan Yu. 2010. "Determinants of Foreign Direct Investment: A Sectoral and Institutional Approach." *IMF Working Paper* No. 10/187. International Monetary Fund. Retrieved on April 12, 2011, from http://econpapers.repec.org/RePEc:imf:imfwpa:10/187.

Wang, Peiming; Joseph Alba; and Donghyun Park. 2013. "Determinants of Different Modes of FDI: Firm-level Evidence from Japanese FDI into the US." *Open Economies Review* 24, no. 3: 425-446. DOI 10.1007/s11079-012-9244-6.

Wang, Zhen, and Nigel Swain. 1995. “The Determinants of Foreign Direct Investment in Transforming Economies: Empirical Evidence from Hungary and China.” *Review of World Economics* (Weltwirtschaftliches Archiv) 131, no. 2: 359-382.

Wang, Zhen, and Nigel Swain. 1997. “Determinants of Inflow of Foreign Direct Investment in Hungary and China: Time-series Approach.” *Journal of International Development* 9, no. 5: 695-726.

**Table 1**

Sectoral Distribution of Firms, 2000-2010

| Sector | Number of firms | Percentage of firms | Firms without FDI | | Firms with FDI | |
|---|---|---|---|---|---|---|
| | | | Number of firms | Percentage of firms | Number of firms | Percentage of firms |
| Agriculture, forestry and fishing | 543 | 10.12 | 409 | 75.32 | 134 | 24.68 |
| Mining | 39 | 0.73 | 23 | 58.97 | 16 | 41.03 |
| Manufacturing | 1,516 | 28.26 | 999 | 65.90 | 517 | 34.10 |
| Electricity, gas and water | 30 | 0.56 | 16 | 53.33 | 14 | 46.67 |
| Construction | 478 | 8.91 | 401 | 83.89 | 77 | 16.11 |
| Trade | 1,396 | 26.03 | 1,030 | 73.78 | 366 | 26.22 |
| Transport, storage and communication | 153 | 2.85 | 92 | 60.13 | 61 | 39.87 |
| Financial services | 1,024 | 19.09 | 697 | 68.07 | 327 | 31.93 |
| Other services | 115 | 2.14 | 72 | 62.61 | 43 | 37.39 |
| Petroleum | 70 | 1.30 | 3 | 4.29 | 67 | 95.71 |
| Total | 5,364 | 100.00 | 3,742 | 69.76 | 1,622 | 30.24 |

Source: Superintendencia de Sociedades, Superintendencia Financiera, Superintencia de Servicios Públicos Domiciliarios, Banco de la República; Own calculations.

**Table 2**

Foreign Capital: Percentage of firms by rank

| Year | 10% - 19.99% | 20% - 29.99% | 30% - 39.99% | 40% - 49.99% | 50% - 59.99% | 60% - 69.99% | 70% - 79.99% | 80% - 89.99% | 90% - 100% | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 5.5 | 3.8 | 3.6 | 6.1 | 6.1 | 3.1 | 3.6 | 5.9 | 62.3 | 100.0 |
| 2001 | 4.7 | 4.2 | 4.3 | 6.0 | 5.6 | 3.8 | 3.8 | 5.5 | 62.2 | 100.0 |
| 2002 | 4.4 | 3.8 | 4.5 | 5.6 | 5.7 | 3.7 | 3.8 | 5.5 | 63.1 | 100.0 |
| 2003 | 4.9 | 3.5 | 4.1 | 5.5 | 6.2 | 3.4 | 3.5 | 4.8 | 64.0 | 100.0 |
| 2004 | 5.0 | 3.5 | 4.3 | 5.3 | 6.0 | 3.4 | 4.1 | 4.6 | 63.9 | 100.0 |
| 2005 | 5.2 | 3.6 | 3.8 | 5.8 | 6.0 | 3.0 | 3.9 | 4.7 | 63.8 | 100.0 |
| 2006 | 5.1 | 4.0 | 3.6 | 5.6 | 6.1 | 3.2 | 3.9 | 4.5 | 64.0 | 100.0 |
| 2007 | 5.1 | 4.6 | 4.4 | 5.4 | 5.8 | 3.1 | 4.2 | 4.9 | 62.5 | 100.0 |
| 2008 | 5.5 | 4.1 | 4.1 | 5.7 | 5.9 | 3.2 | 4.1 | 5.2 | 62.1 | 100.0 |
| 2009 | 5.2 | 3.7 | 3.8 | 5.8 | 6.2 | 3.5 | 4.4 | 4.7 | 62.8 | 100.0 |
| 2010 | 5.0 | 3.7 | 3.8 | 5.8 | 6.1 | 3.5 | 4.7 | 5.1 | 62.4 | 100.0 |
| Average | 5.1 | 3.9 | 4.0 | 5.7 | 6.0 | 3.4 | 4.0 | 5.0 | 63.0 | 100.0 |

Source: Superintendencia de Sociedades, Superintendencia Financiera, firms' web pages.
Own calculations.

**Table 3**

Firms' Average Capital Intensity *

(USD)

| Year | Firms without FDI | Firms with FDI | Mean difference tests *p- value* |
|---|---|---|---|
| 2000 | 29,061 | 74,603 | 0.000 |
| 2001 | 27,621 | 74,336 | 0.000 |
| 2002 | 25,421 | 69,232 | 0.000 |
| 2003 | 23,435 | 64,952 | 0.000 |
| 2004 | 29,232 | 72,148 | 0.000 |
| 2005 | 32,680 | 86,419 | 0.000 |
| 2006 | 34,213 | 84,184 | 0.000 |
| 2007 | 40,368 | 99,882 | 0.000 |
| 2008 | 46,802 | 108,114 | 0.000 |
| 2009 | 43,919 | 106,836 | 0.000 |
| 2010 | 52,261 | 118,290 | 0.000 |

*Capital intensity = Property, plant and equipment (net) / total employees.

Source: Superintendencia de Sociedades, Superintendencia Financiera, Superintencia de Servicios Públicos Domiciliarios, Banco de la República; Own calculations.

**Table 4**
**Probability of a Firm Receiving FDI, 2000-2010**
(Marginal Effects Obtained from a Population Averaged Model)

Estimation Method: Panel probit
Dependent variable: 1 if the firm receives FDI, 0 otherwise.

| Variables | Marginal effects (*dy*/*dx*)* | Standard error | *p*-value | Confidence Interval (95%) | | $\bar{X}$ |
|---|---|---|---|---|---|---|
| d_Listed on the stock market | 0.2510 | 0.0911 | 0.0060 | 0.0726 | 0.4295 | 0.0077 |
| Firm's age | -0.0004 | 0.0006 | 0.4940 | -0.0015 | 0.0007 | 30.1053 |
| d_Manufacturing | -0.3271 | 0.0332 | 0.0000 | -0.3921 | -0.2621 | 0.3198 |
| d_Trade | -0.3432 | -0.0299 | 0.0000 | -0.4018 | -0.2846 | 0.2886 |
| d_Transport | -0.2198 | 0.0250 | 0.0000 | -0.2688 | -0.1707 | 0.0303 |
| d_Financial services | -0.2136 | 0.0299 | 0.0000 | -0.2723 | -0.1549 | 0.1202 |
| d_Other sectors | -0.3149 | -0.0264 | 0.0000 | -0.3667 | -0.2631 | 0.2210 |
| d_Medellín | -0.1634 | -0.0158 | 0.0000 | -0.1944 | -0.1324 | 0.1280 |
| d_Cali | -0.1624 | 0.0164 | 0.0000 | -0.1946 | -0.1303 | 0.1098 |
| d_Barranquilla | -0.1157 | 0.0271 | 0.0000 | -0.1688 | -0.0626 | 0.0430 |
| d_Bucaramanga | -0.2479 | -0.0179 | 0.0000 | -0.2829 | -0.2130 | 0.0255 |
| d_Manizales | -0.1385 | 0.0416 | 0.0010 | -0.2200 | -0.0570 | 0.0141 |
| d_Pereira | -0.2322 | 0.0248 | 0.0000 | -0.2808 | -0.1836 | 0.0128 |
| d_Rest of the country | -0.1449 | 0.0200 | 0.0000 | -0.1841 | -0.1058 | 0.0829 |
| d_Openness | 0.1594 | 0.0160 | 0.0000 | 0.1280 | 0.1908 | 0.7120 |
| d_Small | -0.1819 | -0.0153 | 0.0000 | -0.2118 | -0.1520 | 0.1332 |
| d_Medium | -0.1941 | -0.0133 | 0.0000 | -0.2202 | -0.1679 | 0.2508 |
| Sectoral labor remuneration | 0.0016 | 0.0011 | 0.1190 | -0.0004 | 0.0037 | 0.3321 |
| Sectoral labor productivity | 0.0000 | 0.0000 | 0.0140 | 0.0000 | 0.0000 | 2.3E+07 |
| Sectoral capital intensity | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0001 | 1.1909 |
| Sectoral profitability | 0.0001 | 0.0006 | 0.8310 | -0.0011 | 0.0014 | 0.3232 |
| Terms of trade - volatility | -0.0002 | 0.0001 | 0.0000 | -0.0003 | -0.0001 | 0.0367 |
| Firms' capital intensity | 0.0000 | 0.0000 | 0.0010 | 0.0000 | 0.0000 | 1.1E+05 |
| Number of observations | 50,861 | | | | | |
| Wald Test | chi2( 22) = 850.75<br>Prob > chi2 = 0.0000 | | | | | |

(*) *dy*/*dx* is for discrete change of dummy variable from 0 to 1.
Source: own estimations.

**Table 5**
**Estimation Results of the Foreign Share in the Firms' Capital Model: 2000-2010**
(Random Effects)

| Variables | Coefficients | Standard error | *p*-value |
|---|---|---|---|
| d_Listed on the stock market | 0.8005 | 1.1817 | 0.4980 |
| Firms' age | -0.0403 | 0.0081 | 0.0000 |
| d_Manufacturing | -8.4818 | 0.7828 | 0.0000 |
| d_Trade | -6.7864 | 0.8291 | 0.0000 |
| d_Transport | -6.3791 | 0.9793 | 0.0000 |
| d_Financial services | -6.1556 | 0.8162 | 0.0000 |
| d_Other sectors | -7.5285 | 0.8245 | 0.0000 |
| d_Medellín | -3.2781 | 0.3209 | 0.0000 |
| d_Cali | -2.7940 | 0.3415 | 0.0000 |
| d_Barranquilla | -2.8870 | 0.5135 | 0.0000 |
| d_Bucaramanga | -4.7222 | 0.6587 | 0.0000 |
| d_Manizales | -1.7346 | 0.8835 | 0.0500 |
| d_Pereira | -4.2237 | 0.9239 | 0.0000 |
| d_Rest of the country | -3.0675 | 0.3857 | 0.0000 |
| d_Openness | 3.1868 | 0.2692 | 0.0000 |
| d_Small | -2.6180 | 0.3165 | 0.0000 |
| d_Medium | -2.7234 | 0.2475 | 0.0000 |
| Sectoral labor remuneration | 0.0463 | 0.0091 | 0.0000 |
| Sectoral capital intensity | 0.0009 | 0.0003 | 0.0100 |
| Sectoral labor productivity | 0.0000 | 0.0000 | 0.0450 |
| Sectoral profitability | 0.0345 | 0.0059 | 0.0000 |
| Terms of trade – volatility | -2.3392 | 1.1571 | 0.0430 |
| Income tax | -2.1150 | 0.6116 | 0.0010 |
| Rule of Law | 0.8783 | 0.0766 | 0.0000 |
| Firms' capital intensity | 0.0000 | 0.0000 | 0.0000 |
| Interest rate differential | 0.0226 | 0.0043 | 0.0000 |
| Constant | -0.5399 | 1.0540 | 0.6080 |
| Number of observations | 50,861 | | |
| Wald test | $chi^2(26) = 1,974.85$ | | |
| | $Prob > chi^2 = 0.0000$ | | |
| Breusch and Pagan Test ( Lagrange multiplier for random effects) | | | |
| | $chibar^2(01) = 2.1e+05$ | | |
| | $Prob > chibar^2 = 0.0000$ | | |

Source: Own estimations.

**Table 6**
**Expected Impact of Several Factors that Help to Explain the Foreign Share in the Firms' Capital: 2000-2010**
(Percentage Change in the Dependent Variable)

| Variables | Marginal effect* | $\bar{X}$ |
|---|---|---|
| Sectoral labor remuneration | 1.5502 | 0.3321 |
| Sectoral capital intensity | 0.1025 | 1.1909 |
| Sectoral labor productivity | 0.1270 | 2.3E+07 |
| Sectoral profitability | 1.1202 | 0.3232 |
| Terms of trade volatility | -0.0857 | 0.0367 |
| Tax income | -0.7440 | 0.3531 |
| Rule of Law | 0.5725 | -0.6500 |
| Interest rate differential | 0.0796 | 3.5211 |
| Firms' capital intensity | 0.0382 | 113,926 |

* 1% change in independent variables.
Source: Own calculations.

**Table 7**
**Expected Impact of Several Factors that Help Explain the Foreign Share in the Firms' Capital, by Sector: 2000-2010**
(Percentage Change in the Dependent Variable)

| Sector | **Income tax** | | **Rule of law** | | **Interest rate differentials** | | **Firm's capital intensity** | |
|---|---|---|---|---|---|---|---|---|
| | Marginal effect* | $\bar{X}$ | Marginal effect* | $\bar{X}$ | Marginal effect* | $\bar{X}$ | Marginal effect* | $\bar{X}$ |
| Agriculture, forestry and fishing | | | 0.56 | -0.6472 | 0.16 | 3.5424 | | |
| Mining | | | 1.44 | -0.6525 | | | | |
| Manufacturing | -0.88 | 0.3531 | 0.67 | -0.6498 | 0.11 | 3.5170 | | |
| Construction | | | | | | | 0.07 | 77,746 |
| Trade | -1.03 | 0.3531 | 0.41 | -0.6505 | 0.07 | 3.5122 | 0.02 | 43,079 |
| Transport, storage and communication | | | 0.90 | -0.6520 | | | 0.22 | 567,066 |
| Financial services | -1.28 | 0.3530 | 0.84 | -0.6484 | | | 0.16 | 245,799 |
| Other services | | | | | 0.25 | 3.5750 | 0.28 | 52,527 |
| Petroleum | | | 1.32 | -0.6502 | | | | |

* 1% change in independent variables.
Source: Own calculations.

## Appendix A

Summary of Statistics

| **Variables (units)** | Average | Standard Deviation | Min. | Max. |
|---|---|---|---|---|
| Foreign share in firms' capital (%) | 18.1852 | 36.1446 | 0.0000 | 100.0000 |
| Firms' FDI income (USD) per year | 8,979,416 | 77,353,014 | 21,889 | 1,671,290,258 |
| Date of firms' listing on the stock market (year) | 1,992 | 8.9313 | 1,981 | 2,011 |
| Date of firms' establishment (year) | 1,980 | 13.2475 | 1,870 | 2,000 |
| Number of firm's employees | 130 | 429.8413 | 10 | 23,882 |
| Volatility of real exchange rate index (standard deviation) | 0.0341 | 0.0163 | 0.0085 | 0.0638 |
| Volatility of terms of trade (standard deviation) | 0.0367 | 0.0109 | 0.0209 | 0.0564 |
| Income tax (%) | 35.3037 | 2.1074 | 33.0000 | 38.5000 |
| FDI implicit profitability (%) | 9.2318 | 2.5729 | 5.8700 | 12.9400 |
| Rule of law (index) | -0.6494 | 0.2102 | -0.9342 | -0.3327 |
| Firms' capital intensity (USD) | 49,774 | 321,196 | 0.0000 | 15,819,393 |
| WTI petroleum price (dollars per barrel) | 53.9176 | 23.6273 | 25.9341 | 100.4060 |
| Sectoral labor remuneration (%) | 32.1589 | 9.4903 | 6.1917 | 76.5466 |
| Sectoral profitability (%) | 33.7461 | 20.3754 | 3.1004 | 92.5428 |
| Sectoral labor productivity (USD) | 11,759,150 | 10,356,216 | 3,006,979 | 91,755,598 |
| Sectoral capital intensity (%) | 128.8232 | 133.5219 | 9.6398 | 1494.6300 |
| Sectoral return on FDI (%) | 4.5430 | 13.7658 | -45.7164 | 208.4730 |
| Sectoral return on assets (%) | 4.7596 | 1.5682 | 0.0136 | 15.2908 |
| Sectoral return on equity (%) | 9.1974 | 3.4382 | -0.8054 | 25.1392 |

Source: Superintendencia Financiera, Superintendencia de Sociedades, Superintendencia de Servicios Públicos Domiciliarios, Banco de la República, Colombian Stock Market, World Bank, International Monetary Fund and DANE. Own calculations.

## Appendix B

**Variables: Sources and Definitions**

| Variable | Description | Source |
|---|---|---|
| Foreign share in firms' capital | Between 0 and 100 % | Supersociedades, Superfinanciera, and firms' web pages |
| Firms' FDI income | | Banco de la República |
| Date of firms' listing on the stock market | | Colombian Stock Market |
| Date of firm's establishment | | Supersociedades and firms' web pages |
| Number of firms' employees | | Supersociedades, Superfinanciera, and firms' web pages |
| Economic sector | | Supersociedades, Superfinanciera, and firms' web pages |
| Firms' location | | Supersociedades, Superfinanciera, and firms' web pages |
| Firms' size | Law 590 of 2000 | Supersociedades, Superfinanciera, and firms' web pages |
| Residence country of firms' headquarters | | Supersociedades, Superfinanciera, and firms' web pages |
| Firms' capital intensity | Property, plant and equipment (net) / total workers | Firms' balance sheets |
| Sectoral labor remuneration | Sectoral labor remuneration and value added ratio. | DANE |
| Sectoral profitability | Gross operating surplus / value added | DANE |
| Sectoral labor productivity | Real value added / employed population | DANE |
| Sectoral capital intensity | Gross operating surplus / remuneration to employees | DANE |
| Volatility of real exchange rate index | Standard deviation of real exchange rate index | Banco República and own calculations |
| Volatility of terms of trade | Standard deviation of terms of trade | Banco República and own calculations |
| Income tax rate | | DIAN |
| FDI implicit profitability | Profitability/ stock of FDI | International Monetary Fund |
| Interest rate differential | FDI Implied returns – PRIME rate | International Monetary Fund, Banco de la República and own calculations |
| Rule of law | Index that fluctuates between -2.5 (weak) and 2.5 (strong) | World Bank |
| WTI petroleum price | | Datastream |