An Empirical Examination of the Determinants of Foreign Direct Investment: A Firm-Level Analysis for the Colombian Economy

Ana María Iregui
María Teresa Ramírez
Aarón Garavito

Banco de la República , Colombia

International Panel Data Conference
Tokyo, July 10 2014

Outlook

I. Introduction
II. Objective
III. Evolution of FDI in Colombia
IV. Characterization of Firms having FDI
V. What factors determine that a firm is more likely to have FDI?: An Econometric Estimation
VI. Conclusions

Outlook

I. **Introduction**
II. Objective
III. Evolution of FDI in Colombia
IV. Characterization of Firms having FDI
V. What factors determine that a firm is more likely to have FDI?: An Econometric Estimation
VI. Conclusions

- Foreign direct investment (FDI) **is essential** to an economy as a source of external funding and, for its **effect on a** country's balance of payments, long-term economic growth and productivity.

- 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.

- Therefore, it is important to analyze the economic **characteristics that make firms** have FDI.

- The **aim of this paper** is to study the factors that determine that a firm is more likely to have FDI, for which we take advantage of a **unique and large dataset at the firm level**.
- The dataset, that we assembled, 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.**

- To our knowledge the study of this topic has not received enough attention in Colombia, especially at the firm level.
- 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.

Outlook

I. Introduction

II. Objective

III. Evolution of FDI in Colombia

IV. Characterization of Firms having FDI

V. What factors determine that a firm is more likely to have FDI?: An Econometric Estimation

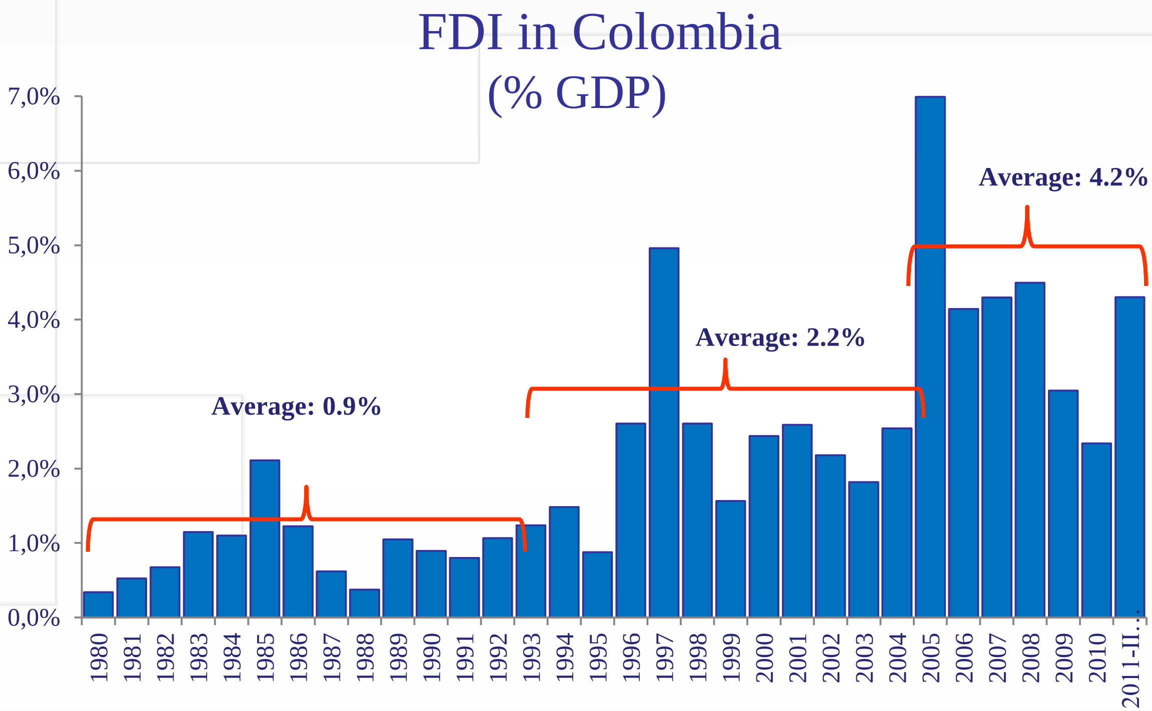
VI. Conclusions

- To analyze the characteristics of the firms that have FDI and compare them to those which did not have it.
  - It is considered that a firm has FDI if its foreign equity is greater than or equal to 10%.

- To perform two exercises:
  - The first one estimates econometric models for the determinants of the probability that a firm has FDI,
  - The second one estimates a model to help explain the foreign share of the firm’s capital.

Outlook

I. Introduction
II. Objective
III. Evolution of FDI in Colombia
IV. Characterization of Firms having FDI
V. What factors determine that a firm is more likely to have FDI?: An Econometric Estimation
VI. Conclusions



- **1980-1992**: Restrictions on capital inflows, exploitation of natural resources and few industrial activities.
- **1993-2003**: Structural reforms and better conditions for FDI, industry and services (privatization).
- **2004-2012**: Increasing inflows of FDI, Consolidation of FDI policies (regulatory framework), oil and mining.

- FDI flows in Colombia represent near 9% of FDI flows in Latin America (2012)

Outlook

I. Introduction
II. Objective
III. Evolution of FDI in Colombia
IV. Characterization of Firms having FDI
V. What factors determine that a firm is more likely to have FDI?: An Econometric Estimation
VI. Conclusions

Sector	Number of firms	% of firms	Firms without FDI		Firms with FDI	
			Number of firms	% of firms	Number of firms	% 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

Data base

Sector	Number of firms	% of firms	Firms without FDI		Firms with FDI	
			Number of firms	% of firms	Number of firms	% of firms
Agriculture, forestry and fishing	543	10.12				
Mining	39	0.73				
Manufacturing	1,516	28.26				
Electricity, gas and water	30	0.56				
Construction	478	8.91				
Trade	1,396	26.03				
Transport, storage and communication	153	2.85				
Financial services	1,024	19.09				
Other services	115	2.14				
Petroleum	70	1.30				
Total	5,364	100.00				

- Period: 2000-2010.
- Manufacturing (28%)
- Trade (26%)
- Financial services (19%).

We use a database consisting of 5,364 firms

Sector	Number of firms	% of firms	Firms without FDI		Firms with FDI	
			Number of firms	% of firms	Number of firms	% of firms
Agriculture, forestry and fishing					134	24.68
Mining					16	41.03
Manufacturing					517	34.10
Electricity, gas and water					14	46.67
Construction					77	16.11
Trade					366	26.22
Transport, storage and communication					61	39.87
Financial services					327	31.93
Other services					43	37.39
Petroleum					67	95.71
Total					1,622	30.24

- 41% of the firms in mining have FDI.
- 47% of firms in the electricity, gas and water sector have FDI.
- 96% of the firms in the petroleum sector have FDI.

- **30% of the firms in the sample have FDI.**

- 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.

- 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, especially in the **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 electricity, gas and water encouraged the arrival of foreign capital to this branch of economic activity.

- 77% of firms in the sample with FDI are classified as large, 14% as medium and 9% as small.
- 73% of the firms having FDI are registered in Bogota.
- 78% of the firms having FDI conducted some foreign trade activity.
- In Colombia, an important amount of FDI is in the form of **mergers and acquisitions** (M&A) 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.

- Over 60% of the firms having 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.

- 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 and 15% are headquartered at offshore financial centers.

- Firms having FDI are **more physical capital intensive** than other firms. This is because some of the main sectors that have FDI (petroleum, mining and manufacturing) are capital intensive.

Outlook

I. Introduction

II. Objective

III. Evolution of FDI in Colombia

IV. Characterization of Firms having FDI

V. What factors determine that a firm is more likely to have FDI?: An Econometric Estimation

VI. Conclusions

i. Determinants of the probability that a firm has FDI

- 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.

- These models are not necessarily substitutes, but generally are complementary and explain different aspects of FDI (Faeth, 2009).

- 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 has FDI, where the **dependent** variable takes the value of 1 if the company had 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*.

- 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 the firm 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
  - labor remuneration.
- In the set **of macroeconomic variables**, we include:
  - real exchange rate volatility and volatility in terms of trade
  - income tax rate
  - rule of law

- 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, which facilitates estimating and interpreting the **marginal effects**.

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					
	Prob > chi2 = 0.0000					

- What factors determine that a firm is more likely to have FDI?

Period: 2000-2010

- Marginal Effects obtained from a Population Averaged Model.

- Estimation Method: Panel probit

- Dependent variable: 1 if the firm has FDI, 0 otherwise.

- The **results indicate** the probability that a firm has FDI increases for:
  - Firms located in Bogotá,
  - Companies in the petroleum sector,
  - Large firms,
  - Firms listed on the National Stock Market,
  - Firms that conduct foreign trade activities,
  - Firms are more likely to have FDI if the have greater capital intensity, both at sectoral and firm level.

- **On the contrary**, the results show that firms are risk averse, because the higher the volatility in the terms of trade, the less likelihood of a firm having FDI.

- Summarizing, foreign investors are looking to invest in **major companies** as a way to gain quick access to representative market shares and to **<u>well-established</u>** business structures and marketing channels to obtain operating results in the short run.

ii. Determinants of foreign share in firms' capital

- We also performed an exercise considering the **foreign share of firms' capital** as a dependent variable.
- 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).
- We estimate panel data **with random effects,** using the same set of explanatory variables.

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		

- Estimation Results of the Foreign Share in the Firms' Capital Model: 2000-2010
- Random effects estimation

- 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.
- 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).
- Volatility in terms of trade and the income tax rate **negatively affect** foreign ownership share.

Sectoral Level Analysis:

- 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 are no significant** differences at sectoral level.

- For example, an improvement in the rule of law indicator, the fact that the firm is engaged in foreign trade activities, that is located in Bogota and has a higher capital intensity encourage foreign participation in the firms' capital in most sectors.

However, there are **some differences**:

- 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.

Outlook

I. Introduction
II. Objective
III. Evolution of FDI in Colombia
IV. Characterization of Firms having FDI
V. What factors determine that a firm is more likely to have FDI?: An Econometric Estimation
VI. Conclusions

- We **put together a panel data containing** information on company characteristics, macroeconomic variables and sectorial variables to investigate **what are the factors that determine that a firm is more likely to have FDI in Colombia,** during a period characterized by increasing capital inflows.

- Our results suggest that foreign investors prefer to **<u>acquire large and well established firms</u>** that allow them to participate in a relevant market share and well-established business structures and trade channels.

- The **growing dynamics** of FDI flows in Colombia has made that these flows gain greater importance in the country's external sector.

THANKS