

# The Determinants of Firms' Investments in the Manufacturing Sector: What Role for Macroeconomic Policies?

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## Abstract

Low investment rates are the key problem of development. Adverse macroeconomic conditions are often identified as the main causes of low investments in developing countries. This paper contributes to the debate of what macroeconomic conditions spur investments. It investigates how firms adjust their investments to macroeconomic conditions and if these macroeconomic conditions explain differences in firms' investments rates between countries. Using data from World Bank Enterprise Surveys, we estimate a multilevel Heckman selection model of firms' investment decisions. The findings of this paper suggest that macroeconomic conditions are important determinants of firms' investments but matter more as within country variations than as between countries variations. This means that firms' investment choices are not affected by structural macroeconomic conditions, but follow business cycles' fluctuations.

**Keywords:** structural change, macroeconomic policies, structural policies, business cycles

**JEL classification:** O11, O14, E6, E32

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## 1. Introduction

Low investment rates are the key problem of development. Adverse macroeconomic conditions are often identified as the main causes of low investments in developing countries. Different policy approaches historically tried to neutralize them. Following the debt crisis of the 1980s, several developing countries were pressured to adopt neoliberal policy agendas. Under the Washington Consensus, markets were freed from distortive government interventions and governments were only required to achieve and maintain macroeconomic stability and fiscal discipline. Together with inflation targeting and fiscal discipline, Washington Consensus prescribed trade and financial liberalizations, privatizations, deregulations, price and tax reforms. In the neoliberal view, these reforms would create favourable conditions for private investments.

In the literature, there is little agreement on the effects of this type of policies. Much of the criticism came from structuralist economists who in turn had been heavily criticized by the neoliberals during the period of State-led industrialization. The mixed evidence on the effects of Washington Consensus type of policies, together with the current adoption of austerity measures in Europe and countercyclical policies in emerging countries, kept the debate on the role of macroeconomic policies hot and burning. This paper contributes to this debate and investigates how firms adjust their investment decisions in response to macroeconomic factors. In particular, the paper tries to understand if macroeconomic conditions matter in firms' investment behaviours as structural factors.

Our approach is novel in several aspects. First, it uses firm-level data, rather than national aggregate investments. Micro data allow exploring the micro-macro interdependencies that shape aggregate investments and so contribute to a better understanding of the microfoundations of investment patterns. Secondly, this study covers the period 2002-2010. During this period, structural adjustment programs imposed by international organizations like the IMF and the World Bank had come to an end and developing countries were starting to apply novel macroeconomic approaches. Finally, by estimating a multilevel Heckman selection model, this paper takes into account country heterogeneities and explores the role of within and between country variations in firms' investment behaviours.

The remainder of the paper is organized as follows: the next section reviews the neoliberal and structuralist views on the role of macroeconomic policies in economic growth and investments. The third and fourth sections set the scene by describing the data and methodology used and showing some descriptive statistics. In section 5, the results of our econometric exercise are presented and discussed. In Section 6, we check the robustness of our results. Section 7 draws some conclusions.

## 2. Literature review

In the literature there is little agreement about the effects of neoliberal macroeconomic policies on investments and economic growth. After the wave of neoliberal reforms and structural adjustment programs of the late 70s, 80s, and 90s, empirical studies evaluating their effects mushroomed. Some of these studies analysed the joint effect of several policies, while others focused on one particular aspect of the neoliberal agenda.

A series of papers measured the extent of economic reforms in Latin America by developing indexes of structural reforms (Lora, 1997, 2001; Morley et al., 1999; Lora and Panizza, 2002). These indexes comprise trade and financial policy, privatizations, tax and labour reforms. Eicher and Schreiber (2010) developed a similar index to explain economic growth in 26 transition economies during the 1990s. According to their results, a 10% increase in their index is associated with 2.7% increase in economic growth. Other empirical studies investigated the effect of variables like fiscal budget surpluses, exchange rates, interest rates, inflation, and debt on private investments (Greene and Villanueva, 1991; Serven and Solimano, 1991; Fisher, 1993), or GDP growth (Bleaney, 1996; Easterly et al. 1997), or both (Easterly and Rebelo, 1993). Among non-econometric studies, the World Bank (1991, 1994) and Edwards (1996) described East Asian, African, and Latin American macroeconomic conditions and experiences with neoliberal reforms. All these studies concluded that macroeconomic stability and Washington Consensus type of policies spurred investments and economic growth.

Other studies focused only on one or few aspects of the neoliberal agenda, like inflation targeting (Bruno and Easterly, 1998; de Gregorio, 1993; Dornbusch and Fisher, 1993) and trade liberalization (Edwards, 1992, 1993; Pritchett, 1996; Wacziarg and Welch, 2007). Since the pioneering work by Gurley and Shaw (1955), Shaw (1973), and McKinnon (1973), a large literature on financial deepening emerged.<sup>2</sup> Some of these studies (e.g. Levine and Zervos, 1992; King and Levine, 1993a, 1993b; Rajan and Zingales, 1998; Levine et al. 2000; Beck et al., 2000) found a strong and positive relationship between financial deepening and economic growth. However, after witnessing the consequences of financial reforms, some authors began to question their effects, especially in Latin America (Diaz-Alejandro, 1985; De Gregorio and Gui-

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<sup>2</sup> According to this literature, the main constraint on private investments in developing countries is the quantity rather than the cost of financial resources. Limited financial resources would be the results of distortive policies that direct credit and push interest rates down. When real interest rates become negative (a situation called financial repression), a rise in real interest rates increases financial savings, and so investment funds available to firms. This theory served as a justification to the financial reforms adopted in developing countries. These reforms eliminated “distortive” policies and raised real interest rates. Early empirical studies could not prove a positive effect of real interest rates on private investments, but credit availability was found to be a big constraint on private investments in developing countries (e.g., Blejer and Khan, 1984; de Melo and Tybout, 1986).

dotti, 1995). A “vanishing effect” of financial deepening, meaning that after a certain level more financial depth is detrimental to growth, was found (Rousseau and Wachtel, 2011; Arcand et al., 2012; Cecchetti and Kharroubi, 2012).<sup>3</sup> Comprehensive indexes of financial reforms were recently developed (e.g. Laeven, 2003; Chinn and Ito, 2008; Abiad et al., 2009). These indexes incorporate elimination of credit controls, reserve requirements, interest rates controls, restrictions to the banking sector and international financial transactions, and reforms to develop security markets. Using these indexes, some empirical studies confirmed the positive effect of financial reforms on economic growth (e.g., Galindo et al., 2007; Christiansen et al., 2013).

The strongest critiques to neoliberal policies are attributable to structuralists. In general terms, neoliberal policies have been criticized for being too pro-cyclical and short-termed (ECLAC, 1998; Nayyar, 2008, 2011; Stiglitz et al., 2006). Despite acknowledging the desirability of macroeconomic stability, structuralists claim that this goal should not be pursued at the cost of economic recession (Taylor, 1993; Ocampo, 2002, 2003; Moreno-Bid et al., 2005). Moreover, inflation is considered harmful only when it is too high (hyperinflation). Low to moderate levels of inflation, instead, can increase economic growth to levels that would not be attainable otherwise and efforts to further decrease it might have higher costs than benefits (Taylor, 1993). Finally, in the structuralist view, inflation could be tolerated as a by-product of economic growth (e.g., Lustig and Ros, 1993).

The fundamental critiques of the structuralists to neoliberal policies concern the interpretation of and consequent approach to macroeconomic instability and the effects on structural and technological change and income distribution.<sup>4</sup> First of all, structuralists question the neoliberal understanding of macroeconomic instability. The argument is as follows. In developing countries, macroeconomic instability is the result of a variety of mechanisms that depend on production structures, terms of trade, capital-account shocks, and exchange rate movements. Abundance of natural resources makes developing countries specialize in primary commodities. This makes them vulnerable to (volatile) commodity prices and causes cyclical overvaluations of the exchange rate that penalize the manufacturing industry (Bresser-Pereira, 2008, 2012).<sup>5</sup> Exchange rates’ movements and commodity prices also affect inflation. Given this, inflation cannot be seen as a mere consequence of monetary expansion, but rather as a structural phenomenon (Noyola, 1956; Sunkel, 1958; Olivera, 1964; Pinto, 1968; Prebisch, 1981).

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<sup>3</sup> See Levine (2005) for a comprehensive review of this literature.

<sup>4</sup> In this section we will focus on the first two aspects. For a discussion of the latter, see Ocampo (2002, 2004).

<sup>5</sup> In the structuralist interpretation, investments are discouraged by cyclical overvaluation of the exchange rate. These overvaluations are caused by two structural factors: the Dutch disease and excessive capital inflows.

These mechanisms affect each other and have long-lasting and reinforcing effects on investments. In the old days of State-led industrialization, these forces were offset by policy tools like multiple exchange rates, foreign exchange and capital controls, import duties and quantitative restrictions, taxes on traditional exports and incentives to non-traditional exports. The abandonment of these tools and the adoption of neoliberal policies aggravated the tendency of the exchange rate to overvalue (Ocampo, 2011; Bresser-Pereira, 2008, 2012).

Latin American hostile macroeconomic conditions generated permanent mutations in firms' investment behaviours. These induced firms to prefer flexibility and low-risk high-returns investments (e.g., Fanelli and Frenkel, 1996; Katz, 1996; 2001; Cimoli and Katz, 2003). Even more, the elimination of these mechanisms and the unsuccessful attempts at macroeconomic stabilization perpetuated and reinforced the adaptive defensive behaviours described above and in so doing redirected the patterns of structural and technological change in Latin America (Cimoli and Katz, 2003). Firms in resource-based industries reacted better to the reforms, while firms in knowledge-intensive sectors were more hit. By removing protection and incentive mechanisms to the development of national knowledge-intensive industries, neoliberal policies halted processes of capability accumulation in Latin American R&D and engineering intensive firms (Katz, 2000, 2001; Cimoli and Katz, 2003; Cimoli and Correa, 2005).

In all industries, trade liberalization pushed imports up and macroeconomic stabilization contracted domestic demand. As a consequence, many Latin American firms were forced out of the market. Evidence of these dynamics is based on a long series of case studies (e.g., Katz, 1986; Mizala, 1992; Bercovich and Katz, 1997).

In light of all this, structuralists conclude that the lack of recognition of macroeconomic instability as a structural phenomenon explains why neoliberal policies failed to generate truly stable and favourable macroeconomic conditions.

### **3. Methodology and approach**

#### ***Methodology***

This paper explores the determinants of firms' investments in the manufacturing sector using the World Bank Enterprise Surveys. The World Bank ran comparable surveys from 2002 to 2013 in several developed and developing countries. Details on the countries and years covered by this study can be found in Table 12 (Appendix 1).

Our dependent variable is the logarithm of firms' investments over sales, where investment is defined as expenditure for the acquisition of machinery and equipment.<sup>6</sup> In the dataset, 52% of the firms report zero investments. Any regression that does not account for the presence of these zeros and for the fact that this selection is not random would produce biased results. In these cases, Heckman selection models should be estimated. Heckman selection models correct for the selection bias by estimating two separate equations: a selection and an outcome equation. The selection equation models the choice of whether to invest or not and is estimated by a probit model. The outcome equation models firms' investment levels. In Heckman selection models, the two equations are linked by the inverse Mill's ratio ( $\lambda$ ) that corrects for the selection bias. Given that these two equations are separately estimated, the Heckman selection model allows for investment choices and investment levels to be explained by different factors. Having different variables in the two equations also limits the collinearity caused by the insertion of  $\lambda$ .<sup>7</sup>

This study postulates that firms' investment behaviours are determined by firms and countries' characteristics. Because firms are nested within countries, data present a hierarchical structure. In these cases, single-level models are not suitable because the assumption that observations are independent is violated. As a consequence, multilevel models should be estimated. Multilevel models are also referred to as mixed effects models because they contain fixed and random effects. The random component is made of the random country effects that are added to the fixed effect model, so that:

$$y_{ij} = \beta_0 + \beta_1 X_{ij} + u_j + e_{ij}$$

where  $\beta_0$  and  $\beta_1$  are the fixed effect parameters to be estimated,  $u_j$  are the country effects, and  $e_{ij}$  is the error term. Because country effects are modelled as random effects, they are not directly estimated. Instead,  $\sigma_u^2$ , the variance of the country effects, is estimated and reported.

Multilevel models have been mostly used in behavioural economics, sociology, geography, and biology. However, because it is reasonable to assume that several economic data present hierarchical structures, scholars have recently started to use multilevel analysis to explain firms' innovation (Srholec, 2011), entrepreneurship (Sanditov and Verspagen, 2011), and firms' investments (Farla, 2013).

## ***Approach***

### *Macroeconomic variables*

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<sup>6</sup> In the literature, firms' investments were also introduced as logarithm of ratio of investment over sales (Farla, 2013) and ratio of investments over investments or value added (Bigsten et al., 1999, 2005).

<sup>7</sup> In order to check for collinearity, we regress  $\lambda$  against the explanatory variables and check the  $R^2$ . High  $R^2$  is a symptom of high collinearity.

This paper investigates the effect of macroeconomic policies on firms' investment decisions. Policy areas of interest can be summarized under the following headings: macroeconomic stability; financial reforms; trade reforms, which include trade liberalization and exchange rate management; and tax reforms.

In the empirical literature, efforts towards macroeconomic stabilization are captured by fiscal balance and external debt as percentages of GDP, and inflation (e.g. Serven and Solimano, 1991; Bleaney, 1996).<sup>8</sup> According to neoliberals, fiscal balances are expected to have a positive effect on investments, while a negative sign is expected on the coefficient of external debt and inflation.

The average ratio of broad money (M2) to GDP is a common measure of financial deepening and is expected to have a positive and significant effect on investments. Following neoclassical theory, a negative coefficient of real interest rates is expected.<sup>9</sup>

Trade liberalization entails the reduction of tariffs and other barriers to import and a competitive exchange rate that promotes exports. We use two indexes of domestic trade protection: average tariffs and an index of selectivity of tariffs (the share of tariff lines with international peaks).<sup>10</sup> Negative coefficients of these indicators would be in line with Washington Consensus prescriptions. For the exchange rate, we rely on the undervaluation index developed by Rodrik (2008). The expected sign of the undervaluation index is uncertain. In the tradable sector, undervalued exchange rates push exports; this stimulates investments and generates foreign exchange to acquire imported goods. This would justify a positive coefficient of the undervaluation index. In the non-tradable sector or in cases of high dependence on imported capital goods, the cost of new imported goods is higher than the benefit in terms of exports. This would justify a negative coefficient of the undervaluation index.

Finally, we account for the extent of tax collection by total tax revenues in GDP and expect a positive impact on investments.<sup>11</sup>

Structuralists advocate for countercyclical fiscal and monetary policies. Because the years under analysis comprise the international financial crisis, fiscal and monetary expansionary policies can be seen as counter-cyclical. This justifies a negative coefficient of fiscal balance and a positive coefficient of external debt. Because few countries in our sample have an inflation rate higher than 20 or 30%, a significant negative impact of inflation on investments is not expected.

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<sup>8</sup> Alternatively, government consumption in GDP has also been used in the literature (e.g., Easterly et al., 1997; Bengoa and Sanchez-Robles, 2003).

<sup>9</sup> Most developing countries cannot be considered financially repressed anymore. Moreover, already in early studies (e.g. Greene and Villanueva, 1991), negative relationship between investments and interest rates was found.

<sup>10</sup> In the literature trade openness indexes, like the ratio of manufactured exports in GDP or total exports, or the ratio of import plus exports over GDP have also been used.

<sup>11</sup> In the literature (e.g. Dincecco, 2011; Besley and Persson, 2008), tax revenues are also used as a proxy of State capacity. Following this interpretation, a positive sign on tax revenues is expected.

With respect to financial deepening, a negative sign of M2 to GDP would be explained in light of the negative effects that excessive capital inflow exerts on investments in manufacturing by worsening the tendency of the exchange rate to overvalue.

As for trade policies, positive and significant coefficients of average tariffs and tariff selectivity are justified because tariffs ensure protection of the domestic market and so guarantee returns on investments and because import restrictions can be used to neutralize the Dutch disease.

#### *Firm-level variables*

In our model, the choice of whether to invest or not also depends on some firms' characteristics. In particular, we assume that established large firms are more likely to invest than small and young firms. Firms' size and age also affect firms' investment levels: established larger firms invest more than small and young firms (e.g. Bigsten et al., 1999).

We also hypothesize that exporting firms are more likely to invest than firms that not export, but this does not affect investments' levels. This means that the variable *export* is a selection variable and will be only included in the selection equation.

#### *Control variables*

In all specifications we control for GDP per capita, GDP growth, terms of trade. These three variables are included as selection variables. We expect firms in countries with higher GDP and higher GDP growth to be more prone to invest. Terms of trade are added to control for the presence of Dutch disease. We account for sectoral heterogeneities in all models by including industry dummies. Industries are defined in the following way: 1) leather, garments, and textiles; 2) agroindustry, food, and beverages; 3) metals and machinery; 4) electronics; 5) auto, auto components, and other transport equipment; 6) chemicals and pharmaceuticals; 7) wood and furniture, non-metallic and plastic materials, paper and other manufacturing.

## **4. Results**

#### *Descriptive statistics*

Table 1 present basic descriptive statistics for our variables of interest. Details on the definition and sources of all our variables can be found in Table 13 in Appendix 2. Our average firm is small and young and exports a small share of its production. With respect to macroeconomic variables, small fiscal deficits prevail, average inflation is low, and average external debt is around 40% of GDP. Average tariffs are roughly 10%, with a maximum value of 21%. Given the time span of this study, these numbers are no

surprising. After the Washington Consensus, several countries have kept their macroeconomics in order. Moreover, also due to WTO's regulations, the room for trade protection and export-based subsidies is at best reduced. When we look at within and between countries variations in country-level variables, we notice that between countries variations are larger than within variations for all variables.

**Table 1.** Basic descriptive statistics

Variable	Observations	Mean	Standard Deviation		
			Overall	Between	Within
<b>Micro-variables</b>					
Investment to sales (ln)	27507	-4.21	2.56		
Investment to capital (ln)	23274	-1.69	1.93		
Age (ln)	76997	2.72	0.85		
Size (ln)	77154	3.62	1.52		
Export (% of sales)	77684	16.99	32.13		
<b>Indicators of macroeconomic policies</b>					
Deficit (% of GDP)	64914	-1.50	3.50	4.39	1.56
External debt (% of GDP)	70292	42.58	28.66	33.34	14.03
M2 (% of GDP)	76164	59.70	38.61	39.10	6.65
Inflation (ln) <sup>12</sup>	76885	1.74	0.77	0.73	0.42
Interest rate	67496	7.53	9.92	7.60	3.43
Undervaluation index	69565	0.15	0.43	0.39	0.17
Tax revenues (% of GDP)	66103	15.10	5.81	6.20	1.11
Average tariff	52285	10.24	4.16	3.90	1.05
Tariff selectivity	52285	1.56	3.48	3.17	0.87
<b>Country-level control variables</b>					
GDP per capita (ln)	77249	8.47	0.91	1.10	0.14
GDP per capita growth	77725	3.68	3.89	3.85	2.58
Terms of trade (ln)	77598	4.67	0.26	0.25	0.11

If we take only the subsample of firms for which all explanatory variables are available, we have a sample of 37333 firms. Sample means for the subsample of investors and non-investors and for the pooled sample are reported in Table 2. Sample means by and large support our hypotheses. Investors are older and larger and export more than non-investors. Investors face slightly smaller fiscal deficits and external debts, lower inflation, and lower and less selective import tariffs. Investors are in countries with higher GDP per capita and tax revenues, and face more developed financial systems (higher ratios of broad money as percentage of GDP). Surprisingly, investors also face lower GDP growth and higher interest rates than non-investors.

<sup>12</sup> Following Easterly et al. (1997), we include inflation as the logarithm of 1 plus inflation.

**Table 2.** Sample means: investors, non-investors, and pooled sample

Variable	Investors	Non-investors	Pooled
<b>Micro-variables</b>			
Age	2.78	2.70	2.74
Employees	4.13	3.41	3.78
Export	0.20	0.15	0.17
<b>Indicators of macroeconomic policies</b>			
Fiscal balance	-1.23	-1.34	-1.28
External debt	39.03	40.70	39.83
M2	58.72	57.47	58.12
Inflation	1.71	1.82	1.77
Interest rate	9.21	7.33	8.31
Undervaluation index	0.15	0.33	0.24
Tax revenue	16.11	15.09	15.67
Average tariffs	10.27	10.99	10.58
Selectivity index	0.75	1.18	0.93
<b>Country-level control variables</b>			
GDP per capita	8.49	8.34	8.42
GDP per capita growth	3.84	4.61	4.21
Terms of trade	4.69	4.65	4.67

*Econometric estimations*

Now we are ready to start our econometric exercise. In Table 3, we report the results of the probit selection and outcome models for two specifications of our base model. In the first specification (Columns 1 and 2), we include all explanatory variables, but average tariffs and the index of tariff selectivity. In the second specification (Columns 3 and 4), average tariffs and tariff selectivity are added. This is because of the high number of missing values for these two variables.

The output of the multilevel Heckman selection model is divided in two parts: a fixed and random part. The first part includes all the  $\beta$  of the explanatory variables. The second part refers to the country unobserved effects. For these effects, the standard deviations  $\sigma_v$  are estimated and reported.

In the table we also report *rho*, the intraclass correlation coefficient. *Rho* is the ratio of the level 2 variance over total residual variance ( $\rho = \frac{\sigma_v}{\sigma_v + \sigma_e}$ ). *Rho* accounts for how the variance divides up among levels.

So in cases of 2-levels models like ours, *rho* represents the percentage of variance at the country level.

**Table 3.** Base model

	Selection – Model 1			Outcome – Model 1			Selection – Model 2			Outcome – Model 2		
	coef	se	sig	coef	Se	sig	coef	Se	sig	coef	se	sig
Age	-0.089	0.010	***	-0.171	0.023	***	-0.115	0.013	***	-0.226	0.027	***
Size	0.237	0.006	***	-0.122	0.013	***	0.235	0.008	***	-0.108	0.016	***
Export	0.029	0.027					0.054	0.035				
Fiscal balance	-0.196	0.012	***	-0.413	0.013	***	-0.170	0.017	***	-0.345	0.016	***
External debt	0.006	0.001	***	0.012	0.002	***	0.026	0.002	***	0.078	0.004	***
Inflation	-0.314	0.027	***	-0.178	0.051	***	0.721	0.127	***	-0.145	0.178	
M2	-0.020	0.004	***	-0.003	0.005		0.008	0.006		-0.006	0.009	
Interest rate	0.011	0.007		0.053	0.009	***	0.064	0.011	***	0.158	0.016	***
Undervaluation	-4.079	0.172	***	-3.293	0.174	***	-5.092	0.226	***	-7.117	0.309	***
Tax revenue	0.235	0.021	***	0.244	0.018	***	0.102	0.035	**	0.486	0.033	***
Tariff							-0.121	0.015	***	-0.251	0.028	***
Selectivity							0.001	0.054		0.028	0.076	
GDP per capita	3.894	0.280	***				2.062	0.421	***			
GDP growth	-0.307	0.010	***				-0.057	0.013	***			
Terms of trade	-1.247	0.146	***				1.006	0.262	***			
$\Lambda$				0.182	0.037	***				0.464	0.085	***
I_ind1	-0.149	0.024	***	-0.180	0.053	***	-0.201	0.030	***	-0.152	0.061	*
I_ind2	-0.034	0.025		-0.023	0.054		-0.077	0.030	*	0.003	0.061	
I_ind3	-0.097	0.030	**	0.147	0.063	*	-0.101	0.039	**	0.146	0.073	*
I_ind4	0.063	0.039		-0.032	0.088		-0.013	0.054		-0.085	0.116	
I_ind5	0.105	0.046	*	0.088	0.104		0.131	0.071	+	0.083	0.145	
I_ind6	0.045	0.031		-0.323	0.066	***	0.026	0.038		-0.256	0.073	***
Constant	-27.987	2.516	***	-8.21	0.492	***	-25.288	3.611	***	-13.800	1.204	***
$\sigma_0$	4.595	1.000	***	2.123	0.231	***	2.822	0.783	***	5.155	0.591	***
firms		36992			18694			25881			14151	
countries		55			53			45			44	
Rho		0.955			0.453			0.888			0.829	
LR		-17881.947			-42532.48			-11626.751			-32307.592	

**Legend:** + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

These results suggest that macroeconomic factors are important determinants of firms' investments. However, they give only limited support to the neoliberal approach. Fiscal deficits and external debts are associated with higher investments, while the effect of inflation is difficult to assess. In the base model, inflation negatively affects investment choices and levels, while in the second specification, inflation becomes positive and significant in the probit model and negative and insignificant in the outcome equation. When we move to financial reforms, the coefficient of the ratio of broad money to GDP (M2) is significant only in the probit model of the base model. Its negative sign supports the view against financial deepening reforms. The coefficient of interest rates is positive and significant in almost all equations. This is an unexpected result that suggests that quantity rather than cost of financial resources matters more in

developing countries. With respect to trade policies, the negative sign of the undervaluation index can be justified in light of the high dependence of developing countries on imported capital goods and the low shares of export over total sales of the firms in our sample. The coefficient of average tariff is negative and highly significant in both equations, while the tariff selectivity index is positive but not significant.

With respect to firm-level variables, results suggest that are younger and larger firms that are more likely to invest. But smaller firms are those that invest more. Firms' exports, instead, do not affect the choice of whether to invest or not.

As a final remark, we notice the high values of  $\rho$ , the intraclass correlation coefficient, which show that including country effects is necessary due to the high degree of heterogeneity at the country level.

Given that macroeconomic factors are important determinant of firms' investments, we proceed by investigating how these macroeconomic factors influence investment behaviours. In particular, we are interested in understanding if macroeconomic conditions are structural; in other words, if macroeconomic conditions affect investments because they are structurally adverse or favourable. We distinguish two forms by which macroeconomic factors can affect investments: by acting as structural conditions or as business cycles. Methodologically, we account for the structural component by taking country means and for business cycles by looking at variations of macroeconomic conditions within countries. Hence, only in the first case macroeconomic conditions are taken as fixed country effects.

In the tables that follow, within transformations are denoted by the prefix  $w$  and country means by  $av$ . In Table 4, we report the results of our base model expressed in terms of within variations (columns 1 and 2) and country averages (columns 3 and 4). In our third model (columns 5 and 6), we include both within variations and country means. In this case, country means also represent the Mundlak (1978) covariates, which act as controls for possible endogenous variables. In Table 5, we estimate the same models of Table 4 and add tariffs and tariff selectivity.

**Table 4.** Within and between country variations: the base model

	Selection – Model 1			Outcome – Model 1			Selection – Model 2			Outcome – Model 2			Selection – Model 3			Outcome – Model 3		
	coef	se	sig	coef	se	sig	coef	se	sig	coef	se	sig	coef	se	sig	coef	se	sig
Age	-0.086	0.011	***	-0.155	0.025	***	-0.035	0.009	***	-0.099	0.028	***	-0.086	0.011	***	-0.142	0.025	***
Size	0.239	0.007	***	-0.182	0.017	***	0.207	0.006	***	-0.042	0.085		0.239	0.007	***	-0.221	0.016	***
Export	0.047	0.030					0.002	0.026					0.048	0.030				
w_balance	-0.196	0.012	***	-0.361	0.016	***							-0.195	0.012	***	-0.346	0.014	***
w_debt	0.006	0.001	***	0.014	0.002	***							0.006	0.001	***	0.013	0.002	***
w_infl	-0.327	0.027	***	-0.136	0.054	*							-0.327	0.027	***	-0.146	0.053	**
w_M2	-0.023	0.004	***	-0.015	0.006	*							-0.022	0.004	***	-0.008	0.006	
w_intrate	0.006	0.007		0.021	0.009	*							0.007	0.007		0.009	0.009	
w_underval	-3.898	0.173	***	-2.399	0.309	***							-3.890	0.173	***	-1.551	0.266	***
w_taxrev	0.244	0.021	***	0.241	0.021	***							0.241	0.021	***	0.208	0.021	***
w_lngdppc	4.193	0.283	***										4.221	0.282	***			
w_gdpgrowth	-0.310	0.010	***										-0.311	0.010	***			
w_tot	-1.343	0.146	***										-1.327	0.145	***			
av_balance							0.022	0.028		-0.141	0.042	***	0.153	0.087	+	-0.136	0.056	*
av_debt							0.000	0.003		-0.001	0.006		-0.007	0.011		-0.006	0.008	
av_M2							0.009	0.003	**	0.009	0.007		0.035	0.011	**	0.003	0.008	
av_infl							0.144	0.151		0.126	0.270		0.874	0.471	+	-0.136	0.347	
av_intrate							0.005	0.010		0.027	0.017		-0.024	0.030		0.028	0.022	
av_underval							-0.806	0.279	**	1.229	0.615	*	-2.923	0.957	**	0.879	0.676	
av_taxrev							-0.004	0.014		0.063	0.024	**	-0.048	0.042		0.063	0.031	*
av_lngdppc							0.005	0.098					0.017	0.301				
av_gdpgrowth							-0.021	0.028					-0.145	0.088	+			
av_tot							0.094	0.452					-0.805	1.415				
$\Lambda$				-0.280	0.079	***				0.970	0.698					-0.652	0.073	***
Constant	-0.617	0.304	*	-3.307	0.219	***	-1.441	2.286		-6.536	1.315	***	2.270	7.102		-3.994	1.112	***
$\sigma_0$	2.051	0.465	***	1.142	0.129		0.497	0.105	***	0.870	0.101		1.511	0.341	***	1.124	0.138	
firms		33053			16645			35923			18160			33053			16645	
countries		47			45			50			49			47			45	
Rho		0.808			0.186			0.198			0.111			0.695			0.182	
LR		-16117.689			-38235.323			-21505.753			-42256.102			-16102.987			-38210.013	

**Legend:** + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table 5.** Within and between countries variations with trade liberalization

	Selection – Model 1			Outcome – Model 1			Selection – Model 2			Outcome – Model 2			Selection – Model 3			Outcome – Model 3		
	coef	Se	sig	coef	se	sig	coef	se	sig	coef	se	sig	coef	se	sig	coef	se	sig
Age	-0.108	0.013	***	-0.185	0.029	***	-0.032	0.010	**	-0.099	0.027	***	-0.108	0.013	***	-0.175	0.028	***
Size	0.234	0.008	***	-0.195	0.026	***	0.206	0.006	***	0.014	0.073		0.234	0.008	***	-0.219	0.022	***
Export	0.079	0.036	*				0.019	0.028					0.081	0.036	*			
w_balance	-0.143	0.016	***	-0.280	0.019	***							-0.145	0.017	***	-0.286	0.015	***
w_debt	0.027	0.002	***	0.073	0.005	***							0.027	0.002	***	0.074	0.005	***
w_M2	0.001	0.007		-0.023	0.009	**							0.003	0.007		-0.012	0.009	
w_infl	0.442	0.133	***	-0.787	0.167	***							0.477	0.134	***	-0.579	0.161	***
w_intrate	0.051	0.011	***	0.113	0.016	***							0.057	0.011	***	0.105	0.016	***
w_lkunderval	-4.449	0.268	***	-5.142	0.634	***							-4.465	0.270	***	-4.670	0.483	***
w_taxrev	0.150	0.038	***	0.513	0.039	***							0.134	0.038	***	0.477	0.038	***
w_tariff	-0.123	0.015	***	-0.188	0.033	***							-0.122	0.015	***	-0.137	0.034	***
w_selectivity	-0.030	0.061		-0.022	0.078								-0.043	0.060		-0.032	0.078	
w_lngdppc	3.428	0.488	***										3.542	0.493	***			
w_gdpgrowth	-0.059	0.013	***										-0.063	0.013	***			
w_tot	0.699	0.271	**										0.782	0.272	**			
av_balance							0.033	0.026		-0.141	0.043	**	0.111	0.054	*	-0.100	0.107	
av_debt							0.003	0.003		-0.003	0.006		-0.004	0.008		-0.029	0.015	+
av_M2							0.009	0.003	**	0.012	0.007	+	0.008	0.007		0.007	0.016	
av_infl							0.203	0.159		0.192	0.307		0.131	0.360		0.111	0.780	
av_intrate							0.006	0.009		0.031	0.017	+	-0.020	0.019		0.007	0.043	
av_lkunderval							-0.449	0.281		0.873	0.576		-0.834	0.700		2.362	1.475	
av_taxrev							0.003	0.013		0.051	0.025	*	-0.005	0.038		0.019	0.075	
av_tariff							0.027	0.023		-0.017	0.043		0.024	0.050		-0.053	0.109	
av_selectivity							-0.086	0.036	*	0.028	0.076		-0.114	0.080		-0.378	0.174	*
av_lngdppc							0.101	0.101					0.050	0.245				
av_gdpgrowth							-0.008	0.026					-0.094	0.055	+			
av_tot							-0.141	0.424					-1.617	0.883	+			
$\Lambda$				-0.447	0.207	*				1.431	0.628	*				-0.734	0.165	***
Constant	-0.045	0.184		-3.944	0.420	***	-1.740	2.216		-6.957	1.430	***	7.450	4.701		-2.654	2.499	
$\sigma_v$	1.113	0.304		2.286	0.278	***	0.451	0.101	***	0.859	0.109		0.888	0.240		2.122	0.291	***
firms		23915			13387			30830			16832			23915			13387	
countries		41			40			46			45			41			40	
Rho		0.553			0.485			0.169			0.107			0.441			0.448	
LR		-10814.165			-30604.436			-18688.127			-39310.489			-10804.818			-30602.149	

**Legend:** + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Even though the descriptive statistics in Table 1 showed that variation in the data is mainly between countries rather than within countries, results clearly point out that within country variations are far more important than between countries variations in explaining investment behaviours. In model 1 and 3, coefficients of variables taken as within variations are always significant, while in model 2 and 3 very few coefficients of country means are significant. This contrasts with the fact that the higher variation in the data is between rather than within countries but is consistent with the accepted idea that investments are related to business cycles.

If we look at within country variations, previous results are largely confirmed. With respect to previous estimations, more stable results are found on inflation, ratio of broad money to GDP (M2), and terms of trade. The coefficient of inflation is always significant and negative. M2 to GDP is always negative and almost always significant, which further corroborates the interpretation of harmful effects of financial deepening. Finally, the negative sign of the terms of trade's coefficient seems to support structuralist theories on the consequences of the Dutch disease. According to structuralists, in resource-abundant developing countries higher terms of trade have two main undesirable effects: they hinder export diversification and appreciate the exchange rate. Given the negative sign of the coefficient of the undervaluation index, our results only partially confirm the structuralist story.

When we look at country means, few variables are significant. In the selection equation, only M2 and the undervaluation index are significant. In the outcome equation, fiscal balances, undervaluation, and tax revenues are significant. The undervaluation index becomes positive in the outcome equation. So, firms' investments are determined by between countries' differences in exchange rates and undervalued exchange rates are associated with higher firms' investments. This is an interesting result especially in light of the debate mentioned above.

Both sets of results are confirmed when we include within and between country variations simultaneously (model 3 of Table 4).

In Table 5, results are robust to the inclusion of these indicators. The coefficients of tariffs are negative and significant only when taken as within country variations. Tariff selectivity, instead, only explains between countries variations. Contrary to the previous estimation, here the coefficient gets a negative sign.

We now investigate if firms within the same region react similarly to macroeconomic conditions. The literature suggests they might. As mentioned in Section 2, Latin American structuralists argue that chronic macroeconomic instability permanently changed firms' investment behaviours and induced them to adopt defensive investment strategies. These micro behaviours would explain low aggregate investment rates in Latin America.

We check if this is the case by looking at country effects by region (Table 6). These country effects are obtained from the base outcome model in Table 3.

**Table 6.** Random country effects by region

	<b>Mean</b>	<b>Standard deviation</b>	<b>Min</b>	<b>Max</b>
Sub-Saharan Africa	-0.436	2.142	-6.376	3.006
Latin America	-0.334	1.230	-2.683	3.673
Europe and Central Asia	-0.029	2.325	-4.577	2.942
Asia	1.912	0.920	-0.269	4.046
Overall	0.516	1.812	-6.376	4.046

Data show that country effects differ among regions and also among countries within regions. Firms in Sub-Saharan Africa tend to invest the least, which confirms previous empirical findings (e.g., Bigsten et al., 2005).<sup>13</sup>

In order to further investigate if (and how) our explanatory variables affect investment behaviours in different regions we run separate regressions for Latin America, Africa, and Asia. These regressions allow checking how different is the effect of macroeconomic factors in Latin America *vis a vis* Asia and Sub-Saharan Africa. Table 7 reports results of the selection model for Latin America, Sub-Saharan Africa, and Asia respectively.

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<sup>13</sup> Also there is much more heterogeneity among Sub-Saharan countries than among Asian or Latin American firms.

**Table 7.** Selection equations, by region

	Latin America			Sub-Saharan Africa			Asia		
	coef	se	sig	coef	se	sig	coef	se	sig
Age	-0.097	0.016	***	-0.062	0.025	*	-0.092	0.020	***
Size	0.207	0.011	***	0.224	0.017	***	0.255	0.010	***
Export	0.148	0.053	**	0.147	0.093		0.032	0.039	
Fiscal balance	-0.320	0.024	***	-0.331	0.069	***	-0.381	0.173	*
External debt	0.057	0.005	***	0.002	0.004		0.002	0.025	
Inflation	-0.840	0.210	***	1.698	0.271	***	-0.522	0.076	***
M2	0.128	0.007	***	-0.015	0.021		0.000	0.023	
Interest rate	-0.082	0.015	***	0.010	0.017		0.034	0.057	
Undervaluation	2.796	0.362	***	-6.886	1.042	***	-4.522	1.920	*
Tax revenues	0.726	0.038	***	-0.103	0.058	+	-0.135	0.094	
GDP per capita	11.070	0.772	***	2.888	0.736	***	1.227	1.381	
GDP growth	-0.130	0.024	***	-0.138	0.035	***	-0.060	0.085	
Terms of trade	2.289	0.318	***	-3.101	1.031	**	-1.916	0.740	**
I_ind1	-0.195	0.037	***	-0.172	0.061	**	-0.004	0.054	
I_ind2	-0.031	0.038		-0.067	0.052		0.097	0.060	
I_ind3	-0.080	0.050		-0.060	0.066		0.085	0.064	
I_ind4	-0.307	0.106	**	-0.053	0.216		0.247	0.061	***
I_ind5	0.004	0.118					0.253	0.066	***
I_ind6	-0.028	0.045		0.115	0.084		0.200	0.069	**
Constant	-126.319	6.864	***	-8.459	7.427		1.869	8.865	
$\sigma_v$	6.214	0.609	***	1.937	1.028	*	1.353	0.729	
Firms	14401			5420			11863		
Countries	15			14			11		
Rho	0.975			0.79			0.647		
LR	-6659.789			-2913.234			-6107.686		

**Legend:** +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Few results vary by region. Those that vary the most are precisely those of interest to structuralists. First of all, Latin American firms react to inflation more like Asian firms than like sub-Saharan African firms. The coefficient of inflation is highly significant in all the three regressions. But, for Latin America and Asia, it is negative, while for Sub-Saharan Africa it is positive. Inflation is generally lower in Asia than in Latin America and sub-Saharan Africa. This means that while it is logical that Asian firms are sensitive to inflation, Latin American firms should be more used to it.

Secondly, the undervaluation index that was negative in all previous estimations is still negative and significant for Sub-Saharan Africa and Asia, but positive in Latin America. The positive sign of the undervaluation index indicates that firms invest more in the manufacturing industry if the exchange rate is un-

dervalued. This result is very interesting and confirms the view that for Latin America the tendency of the exchange rate to overvalue plays an important role in firms' decisions to invest.<sup>14</sup>

The third interesting variable is terms of trade. The coefficient of terms of trade is significant in all three regressions and is positive for Latin America and negative for sub-Saharan Africa and Asia. This result is partly unexpected. According to the literature, Latin America exports mainly commodities, so favourable terms of trade would divert investments away from the manufacturing sector. However, it has been argued that high terms of trade allowed Latin America to alleviate the impact of the international financial crisis of the second half of the 2000s (De Gregorio, 2013).

Finally, it is interesting to notice that in the electronics sector (industry 4) the probability of investing is negative for firms in Latin America and positive for firms in Asia. Even more, coefficients of the dummies of less traditional industries (transport, chemicals and pharmaceuticals) are positive and significant only in the Asian case. This is consistent with the literature on sectoral catching up.

Table 8 reports regression results of the outcome equations for Latin America, Sub-Saharan Africa and Asia.

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<sup>14</sup> Interestingly, the positive sign of the undervaluation index coincides with a significant coefficient of firms' export, indicating that undervaluation is crucial when firms export.

**Table 8.** Outcome equations, by region

	Latin America			Sub-Saharan Africa			Asia		
	coef	se	sig	coef	se	sig	coef	se	sig
Age	-0.159	0.040	***	-0.198	0.052	***	-0.220	0.036	***
Size	-0.189	0.024	***	-0.095	0.043	*	-0.060	0.028	*
Fiscal balance	-0.517	0.034	***	0.058	0.035	+	-0.482	0.116	***
External debt	0.016	0.010		0.017	0.003	***	0.034	0.008	***
Inflation	2.394	0.501	***	2.793	0.266	***	-0.492	0.083	***
M2	0.234	0.022	***	0.191	0.024	***	0.028	0.01	**
Interest rate	0.655	0.050	***	-0.024	0.012	+	0.082	0.022	***
Undervaluation	-9.369	0.530	***	-5.473	0.794	***	-3.863	0.629	***
Tax revenues	-0.143	0.104		-1.109	0.086	***	-0.171	0.078	*
$\Lambda$	0.532	0.084	***	0.051	0.342		0.259	0.201	
I_ind1	-0.345	0.088	***	-0.082	0.124		-0.214	0.092	*
I_ind2	-0.194	0.087	*	0.439	0.109	***	-0.249	0.104	*
I_ind3	0.038	0.102		0.350	0.138	*	0.071	0.113	
I_ind4	-0.645	0.272	*	-0.133	0.454		-0.023	0.106	
I_ind5	0.134	0.212					0.068	0.122	
I_ind6	-0.598	0.102	***	0.103	0.173		0.035	0.119	
Constant	-22.465	3.147	***	-0.209	3.122		-4.259	1.137	***
$\sigma_v$	10.702	2.256	***	10.942	2.309	***	1.487	0.404	
Firms	8120			3105			5950		
Countries	15			14			11		
Rho	0.943			0.959			0.393		
LR	-19447.792			-7001.375			-12157.08		

**Legend:** +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Results are stable across regions. Only the effect of inflation varies. The coefficient of inflation is always highly significant but is negative only for Asian firms. If we compare these results with those obtained in the selection equation, we can conclude that firms in sub-Saharan Africa are not discouraged by inflation, probably because inflation is a persistent condition. In Latin America, inflation discourages firms to invest, but firms who decide to invest, invest more in presence of inflation. Finally, in contrast with previous estimations where the sign of M2 was most of the times negative, here we find a significant and positive coefficient of M2. This finding casts doubts on the robustness of previous results.

## 5. Robustness check

In order to further check the robustness of the results obtained so far, we test our model using the log of investment to capital as an alternative dependent variable. Capital is defined as the net book value of machinery, vehicles, and equipment. In terms of definitions, this variable is preferable to the one used so far, but using investment to capital further reduces the number of observations due to missing data.

Table 9 below shows the results of the outcome equation of the base model in Table 3 (so these lambdas are computed with the probit results of Table 3).

**Table 9.** Base model with log of investment to capital as dependent variable

	Outcome –Model 1			Outcome – Model 2		
	Coef	se	sig	coef	se	sig
Age	-0.148	0.019	***	-0.164	0.022	***
Size	-0.197	0.011	***	-0.171	0.013	***
Fiscal balance	-0.004	0.010		-0.007	0.011	
External debt	0.000	0.001		-0.001	0.002	
Inflation	-0.122	0.036	***	0.314	0.078	***
M2	-0.011	0.002	***	-0.006	0.003	*
Interest rate	0.002	0.005		0.008	0.007	
Undervaluation index	-0.658	0.105	***	-1.069	0.151	***
Tax revenue	0.072	0.011	***	0.063	0.014	***
Tariff				-0.005	0.016	
Selectivity				0.063	0.030	*
$\Lambda$	0.008	0.024		0.057	0.052	
Constant	-0.705	0.255	**	-1.798	0.377	***
$\sigma_v$	0.511	0.070	***	0.574	0.089	***
Firms		15963			11787	
countries		51			42	
Rho		0.078			0.100	
LR		-31785.241			-23224.915	

**Legend:** + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

The coefficient of fiscal balances and external debts lose significance, which partly downsize the importance of fiscal discipline. Similarly to Table 3, it is difficult to assess the effect of inflation that is significant and negative in model 1 but significant and positive in model 2. Findings on M2, undervaluation, and tax revenues are also confirmed. The coefficient of average tariffs is negative and insignificant, while the coefficient of tariff selectivity is significant and positive. This last finding is not consistent with previous estimations.

Table 10 replicates the regression results of Table 5 with the log of investment to capital as dependent variable.

**Table 10.** Within and between variations with log of investment to capital as dependent variable

	Outcome – Model 1			Outcome – Model 2			Outcome – Model 3		
	coef	Se	sig	coef	se	sig	coef	se	sig
Age	-0.164	0.023	***	-0.165	0.021	***	-0.170	0.022	***
Size	-0.188	0.020	***	-0.137	0.055	*	-0.178	0.017	***
w_balance	-0.001	0.016					-0.004	0.013	
w_debt	0.008	0.004	*				0.010	0.004	**
w_infl	0.413	0.123	***				0.420	0.119	***
w_M2	-0.006	0.007					-0.008	0.007	
w_intrate	-0.004	0.011					-0.004	0.011	
w_lkunderval	-1.223	0.462	**				-1.479	0.359	***
w_taxrev	0.095	0.029	**				0.106	0.029	***
w_tariff	0.039	0.025					0.030	0.025	
w_selectivity	0.188	0.055	***				0.203	0.057	***
av_balance				-0.012	0.022		-0.022	0.030	
av_debt				-0.002	0.003		-0.004	0.005	
av_M2				-0.001	0.004		-0.011	0.005	*
av_infl				0.023	0.160		0.032	0.233	
av_intrate				0.006	0.009		0.000	0.013	
av_lkunderval				-0.271	0.313		-0.312	0.479	
av_taxrev				0.044	0.014	**	0.033	0.021	
av_tariff				-0.015	0.022		-0.045	0.031	
av_selectivity				-0.010	0.043		-0.075	0.055	
$\lambda$	-0.022	0.156		0.676	0.482		0.078	0.125	
Constant	-0.526	0.193	**	-1.406	0.938		0.020	0.717	
$\sigma_v$	0.621	0.082	***	0.417	0.060	***	0.568	0.091	***
firms		11073			14141			11073	
countries		38			46			38	
rho		0.117			0.051			0.099	
LR		-21751.334			-28388.03			-21767.056	

**Legend:** + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Results confirm the story emerged from Table 4; that is, within country variations matter more than between country variations. As in the previous table, the coefficient of tariff selectivity is positive and highly significant when we use log of investment to capital instead of the log of investment to sales. This result calls for more caution with implications for trade policies. All other results are largely confirmed.

As a final check, Table 11 replicates the regression results of Table 8 with the log of investment to capital as dependent variable. The most stable results are those obtained for Asia. As for Latin America, the only confirmed findings are those on inflation and exchange rates.

**Table 11.** Outcome equation, by region with log of investment to capital as dependent variable

	Latin America			Sub-Saharan Africa			Asia		
	Coef	Se	sig	coef	se	sig	coef	se	sig
Age	-0.112	0.028	***	-0.053	0.046		-0.290	0.037	***
Size	-0.245	0.016	***	-0.136	0.035	***	-0.091	0.029	**
Fiscal balance	0.090	0.020	***	-0.081	0.026	**	-0.568	0.126	***
External debt	0.001	0.005		-0.009	0.002	***	0.024	0.008	**
Inflation	0.957	0.232	***	0.908	0.218	***	-0.445	0.086	***
M2	-0.059	0.009	***	0.021	0.013		0.022	0.011	*
Interest rate	-0.006	0.017		0.029	0.011	**	0.052	0.023	*
Underval	-2.739	0.244	***	1.373	0.603	*	-3.359	0.663	***
Tax revenue	-0.079	0.040	*	0.061	0.039		-0.067	0.088	
$\lambda$	-0.106	0.039	**	0.633	0.248	*	0.516	0.210	*
I_ind1	0.044	0.063		-0.171	0.112		0.176	0.095	+
I_ind2	-0.010	0.062		0.091	0.099		0.249	0.107	*
I_ind3	-0.013	0.071		-0.213	0.123	+	0.310	0.115	**
I_ind4	-0.042	0.187		1.039	0.382	**	0.338	0.108	**
I_ind5	0.034	0.146					0.080	0.124	
I_ind6	0.062	0.072		-0.013	0.156		0.145	0.123	
Constant	2.347	0.828	**	-4.945	0.835	***	-3.419	1.291	**
$\sigma_v$	0.794	0.225		1.217	0.521		1.623	0.465	+
firms		6929			2431			5575	
countries		14			14			10	
rho		0.182			0.311			0.450	
LR		-13504.798			-4945.685			-11226.308	

**Legend:** +  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## 6. Conclusions

This paper addressed a hot issue in the economic literature and in economic policy making. Despite the long debate and the variety of macroeconomic approaches experimented so far, there is little agreement on what governments can do in terms of macroeconomic policies to stimulate private investments. On one side of the fence, neoliberals advocate for a limited role of the State that should aim at getting prices right and maintaining fiscal discipline. On the other side of the fence, heterodox economists, and especially structuralists, criticized the neoliberal policies adopted in the 1980s and 1990s. They argue that in order to counterbalance the adverse macroeconomic conditions that firms face in developing countries, governments should act proactively. This means implementing counter-cyclical fiscal and monetary policies and designing mechanisms to neutralize the Dutch disease.

This paper empirically tests these two approaches by estimating a multilevel Heckman selection model of firms' investments in developing countries from 2002 to 2010. The paper is novel in various aspects. One

of the most important is the use of firm level data. Extant empirical studies on this subject used national aggregate investments. The use of micro data allows investigating the micro-foundations of investment patterns.

The paper tries to understand how firms react to macroeconomic conditions and if these macroeconomic conditions are structural conditions affecting firms' investment decisions.

With respect to the first question, our econometric exercise indicates that macroeconomic conditions are important determinants of firms' investments. Fiscal deficits and external debts positively affect investments. Because the period of analysis includes the recent international crisis, these policies might be seen as countercyclical. These results, however, are not robust to different specifications. Instability of results of structural policies on investments is consistent with existing empirical evidence (e.g., Levine and Renelt, 1992; Levine and Zervos, 1993).

Little support to the neoliberal approach also comes from the results on financial deepening. Our paper finds a negative effect of financial deepening on firms' investments. This finding is in line with some recent empirical evidence on the limits of financial development and with the structuralist idea that financial liberalization hurts investments by increasing the already excessive capital inflows in developing countries, and so by appreciating their exchange rate.

According to structuralists, exchange rate management should be one of the key areas of macroeconomic policymaking in developing countries. In these contexts, cyclical overvaluations of the exchange rate restrict firms' access to foreign markets. Our data confirm that exchange rate management has a clear impact on private investments and show that undervalued exchange rates depress investments. As we explained in Section 3, the effect of the exchange rate on investments depends on the relative importance of exports versus imports. The negative coefficient of the exchange rate indicates that firms are more sensitive to the higher costs of imported goods than to the easier access to international markets.

With respect to the second question, we find that within country variations are more important than between country variations in explaining firms' investment behaviours. Hence, the findings of our paper suggest that macroeconomic conditions matter for firms' investments, but they are more important in business cycles than structurally. In the data between countries variations are larger than within country variations for all country level variables. In light of this, we might have expected between countries variations to be more important than within country variations.

Nevertheless, our finding should not surprise. It is well established that investments are volatile and follow business cycles. Recently, micro-founded evolutionary models of business cycles have been developed (Dosi et al., 2005, 2008, 2010; Meijers et al., 2014). In these models, firms generate business cycles fluctuations with their investment decisions. This paper contributes to this literature by providing supporting empirical evidence on the microfoundations of business cycles.

We check if firms in Latin America react differently to macroeconomic conditions, by estimating separate models for Latin American, sub-Saharan African and Asian firms. We find that firms in the three regions react similarly to almost all macroeconomic conditions. Dissimilar reactions are found in response to inflation and exchange rate movements. With respect to inflation, results show that inflation discourages firms' investments only in Latin America and Asia. However, in Latin America and Africa firms that chose to invest invest more in inflationary periods. With respect to exchange rate management, our paper shows that undervaluation has a positive impact on investment decisions only in Latin America.

The fact that country macroeconomic conditions are more important in business cycles than structurally contradicts part of the structuralist interpretation of low investment rates in Latin America. According to the structuralist interpretation, macroeconomic instability in the region is structural in the sense that it is intrinsically determined by permanent characteristics related to natural resource abundance. Resource abundance makes Latin American production structures subject to volatile terms of trade and exchange rates movements. This affects balance of payments, interest rates, and inflation. In response to chronic macroeconomic instability, firms in Latin America adapted defensive investment strategies. By showing that firms' investments follow business cycles, this paper confirms that macroeconomic volatility is a major determinant of investments. Moreover, results confirm structural theories on the impact of exchange rates' overvaluations on investments in manufacturing.

To sum up, this paper shows that macroeconomic factors are important determinants of firms' investments and it is their variable component, rather than their structural component, to matter the most. In this sense, the findings of this paper suggest that macroeconomic conditions do not act as structural factors; rather firms' investment choices follow business cycles.

This result has important policy implications. It suggests that rather than focusing on structural conditions, macroeconomic policies should "manage" business cycles in order to counteract their effects. Because firms' investments are not affected by structural macroeconomic conditions, fiscal discipline and inflation targeting should not be considered the primary goals of all macroeconomic policies. And because investments follow business cycles, fiscal discipline and inflation control should not be pursued in

times of slow growth or recession. This is precisely what was done in several developing countries during the 1980s and 1990s and what is currently imposed to Southern European countries. Instead of this type of pro-cyclical policies, a sound macroeconomic agenda should include countercyclical fiscal, monetary, and exchange rate policies. This agenda has been strongly advocated for by several strands of heterodox economists, among which structuralist economists.

## 7. References

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## Appendix 1.

**Table 12.** Number of firms per country and year

Country year	Number of firms	Percent	Country year	Number of firms	Percent
Albania_2002	61	0.16	Hungary_2005	359	0.96
Angola_2006	271	0.73	Hungary_2009	56	0.15
Angola_2010	47	0.13	India_2002	1,475	3.95
Argentina_2006	741	1.98	India_2006	2,010	5.38
Argentina_2010	499	1.34	Indonesia_2003	709	1.9
Armenia_2005	227	0.61	Indonesia_2009	291	0.78
Armenia_2009	58	0.16	Jordan_2006	353	0.95
Azerbaijan_2009	52	0.14	Kenya_2003	209	0.56
Bangladesh_2002	976	2.61	Kenya_2007	214	0.57
Bangladesh_2007	663	1.78	Lao PDR_2006	102	0.27
Belarus_2002	42	0.11	Lao PDR_2009	47	0.13
Belarus_2005	55	0.15	Lesotho_2003	55	0.15
Belarus_2008	58	0.16	Madagascar_2005	275	0.74
Bhutan_2009	37	0.1	Madagascar_2009	77	0.21
Bolivia_2006	404	1.08	Malaysia_2002	561	1.5
Bolivia_2010	69	0.18	Mauritius_2009	101	0.27
Bosnia and Herzegovina_2009	81	0.22	Mexico_2006	1,124	3.01
Botswana_2006	145	0.39	Mexico_2010	615	1.65
Botswana_2010	53	0.14	Moldova_2003	103	0.28
Brazil_2003	1,630	4.37	Moldova_2005	207	0.55
Brazil_2009	881	2.36	Moldova_2009	60	0.16
Bulgaria_2002	49	0.13	Mongolia_2009	87	0.23
Bulgaria_2004	325	0.87	Mozambique_2007	341	0.91
Bulgaria_2005	58	0.16	Nigeria_2007	463	1.24
Bulgaria_2007	577	1.55	Paraguay_2006	431	1.15
Bulgaria_2009	55	0.15	Paraguay_2010	83	0.22
Cape Verde_2006	37	0.1	Peru_2002	117	0.31
Cape Verde_2009	25	0.07	Peru_2006	361	0.97
Chile_2004	757	2.03	Peru_2010	515	1.38
Chile_2006	691	1.85	Philippines_2003	618	1.66
Chile_2010	446	1.19	Philippines_2009	286	0.77
China_2002	957	2.56	Romania_2002	82	0.22
China_2003	1,156	3.1	Romania_2005	386	1.03
Colombia_2006	648	1.74	Romania_2009	100	0.27
Colombia_2010	392	1.05	Serbia_2009	88	0.24
Costa Rica_2010	185	0.5	South Africa_2003	573	1.53
Dem. Rep. of Congo_2006	191	0.51	South Africa_2007	680	1.82
Dem. Rep. of Congo_2010	46	0.12	Sri Lanka_2004	417	1.12
Dominican Republic_2005	165	0.44	Sri Lanka_2011	86	0.23
Dominican Republic_2010	65	0.17	Tajikistan_2003	96	0.26
Ecuador_2003	427	1.14	Tanzania_2003	242	0.65
Ecuador_2006	390	1.04	Tanzania_2006	282	0.76
Egypt_2004	971	2.6	Thailand_2004	1,385	3.71
Ethiopia_2002	371	0.99	Uganda_2003	256	0.69
Georgia_2002	34	0.09	Uganda_2006	334	0.89
Georgia_2005	49	0.13	Ukraine_2002	136	0.36
Georgia_2008	51	0.14	Ukraine_2005	180	0.48
Guatemala_2003	434	1.16	Ukraine_2008	250	0.67
Guatemala_2006	448	1.2	Uruguay_2006	391	1.05
Guatemala_2010	171	0.46	Uruguay_2010	199	0.53
Honduras_2003	450	1.21	Venezuela_2006	282	0.76
Honduras_2006	369	0.99	Zambia_2002	169	0.45
Honduras_2010	21	0.06	Zambia_2007	304	0.81
Hungary_2002	49	0.13	Total	37,333	100

## Appendix 2

**Table 13.** Explanatory variables

Variable	Details	Source	Coverage
<b>Indicators of macroeconomic policies</b>			
Inflation	Consumer prices (annual %)	WDI	2002-12
Interest rate	Real interest rate (%)	WDI	2002-12
Undervaluation index	Real exchange rate adjusted for the Balassa-Samuelson effect (Rodrik, 2008)	Built with data from PWT	2002-11
Government budget surplus/GDP	Revenue (including grants) minus expense, minus net acquisition of nonfinancial assets	WDI	2002-12
Foreign debt/GDP	Total external debt stocks to gross national income.	WDI	2002-12
M2/GDP	Ratio of broad money over GDP	WDI	2002-12
Tax revenue/GDP	Compulsory transfers to the central government	WDI	2002-11
Average tariffs	Unweighted average of most favored nation rates for all products subject to tariffs calculated for all traded goods	WDI	2002-11
Share of tariff lines with international peaks	Share of lines in the tariff schedule that are set on a per unit basis or that combine ad valorem and per unit rates	WDI	2002-11
<b>Country-level control variables</b>			
GDP per capita	GDP per capita based on purchasing power parity (PPP), constant 2005 prices	WDI	2002-12
GDP per capita growth	Annual percentage growth rate of GDP per capita	WDI	2002-12
Terms of trade	Net barter terms of trade (the ratio of the export unit value index to the import unit value index)	UNCTAD and WDI	2002-12
<b>Firm-level control variables</b>			
Age	Logarithm of years since establishment	Enterprise Survey	2002-13
Size	Logarithm of number of permanent full-time workers	Enterprise Survey	2002-13
Export	Proportion of total sales that are exported directly and indirectly	Enterprise Survey	2002-13
Sector	Sector dummies	Enterprise Survey	2002-13