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HELL, HEAVEN OR HEDGED: DEBT, DEVALUATION AND FIRM INVESTMENT IN COLOMBIA

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ABSTRACT

During the nineties the economic performance of many emerging economies was directly linked to their access to foreign capital and its impact on the real exchange rate. Colombia was not an exception, as it experienced a sharp boom and bust cycle during the decade. Although a number of studies have attempted to explain the underperformance of the Colombian economy since the mid-1990s, little attention has been given to firm-level evidence. In this paper, we rely on information for a large sample of firms during 1995-2001 and examine the impact of exchange and interest rate volatility on the level of investment of firms with varying degrees of foreign indebtedness, output tradeability, and imported inputs. Our results challenge the friendly view on the effects of devaluations on the grounds that firms borrowing in foreign currency faced a currency mismatch which produced negative balance-sheet effects.

JEL Classification: E22, F31
Keywords: Colombia, investment, devaluation, balance sheet effects

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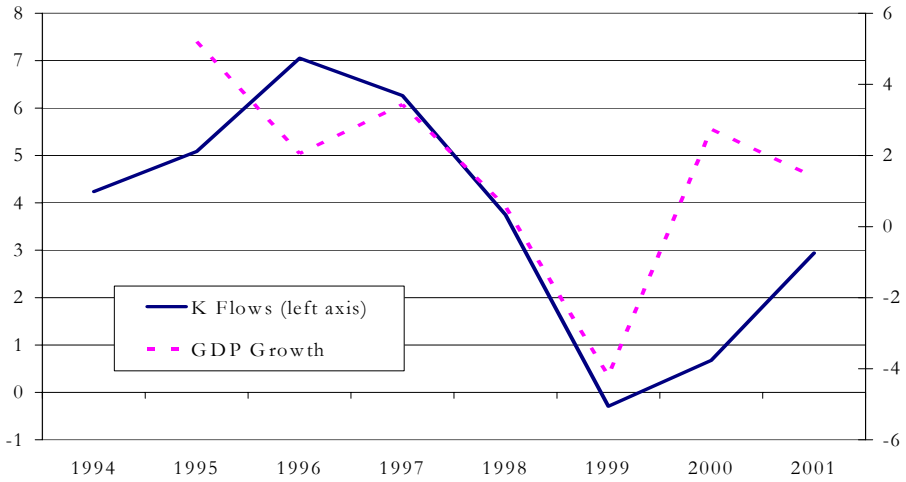
As it has been the case in many emerging economies, since 1990 the performance of the Colombian economy has been closely associated with the evolution of capital flows. Positive and increasing levels of capital inflows during the first half of the 1990s allowed for a respectable performance in terms of GDP growth. Likewise, a curtailment of foreign financing after 1997 has coincided with Colombia's worst growth performance on record (Figure 1). While ample foreign financing brought about an appreciation of the real exchange rate between 1990 and 1997, a significant real depreciation was observed since (Figure 2).

Figure 1. Capital Flows and GDP Growth

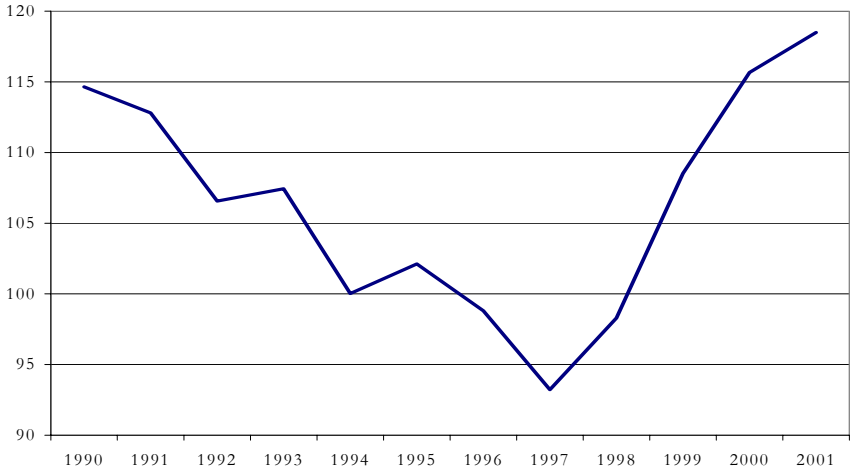
Capital flows as % of GDP and real GDP growth, 1994-2001



Source: DANE and Banco de la República.

Figure 2. Real Exchange Rate Index (1994=100)

+ is depreciation, 1990-2001

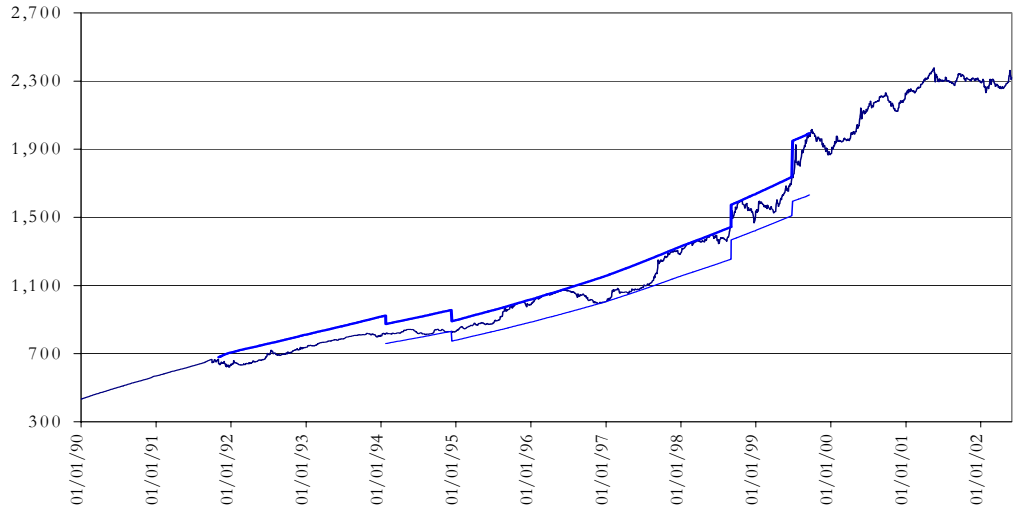


Source: Banco de la República

Starting in 1990, Colombia has had four distinct exchange rate regimes (Figure 3). Until late 1991 a standard crawling peg was in place, supported by an array of capital controls. Between 1992 and 1993 the central bank issued *certificados de cambio* (CE) in exchange for foreign currency, thereby consolidating into one operation the purchase of foreign exchange and the subsequent sterilization. Holders of CE's could keep them to maturity (originally three months, eventually one year) and convert them into pesos at the official exchange rate, or they could sell them upon issuance to the central bank at a 12.5% discount. An informal exchange rate band was thus introduced, since CE's could be sold in the secondary market. In 1994 the central bank abandoned its sterilization policy, and, thus, the issuance of CE's. Instead, a formal band was put in place. Since capital inflows remained strong, the band had to be shifted down twice during its first year of operation (in the pesos per dollar axis, see Fig. 3). After 1997 the critical situation in international capital markets and the vulnerability of the peso called for two upward shifts of the band, which was eventually abandoned in late 1999, when a floating regime was introduced.

Figure 3. Nominal Exchange Rate

Colombian pesos per US Dollar, 1990-2002 (daily data)



Source: Banco de la República

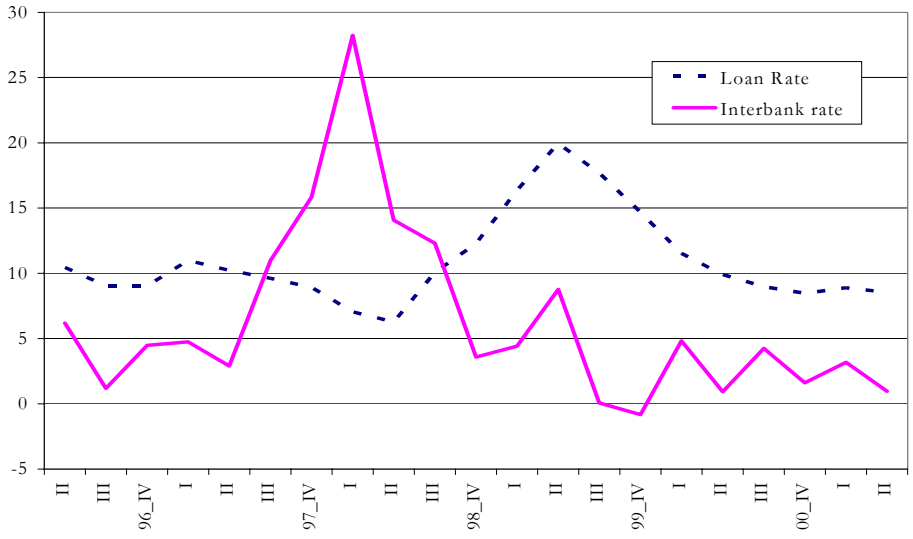
Since mid-1997, the sharp nominal depreciation notwithstanding, participants in the foreign exchange market anticipated that the band was not sustainable, and acted accordingly. As a result, the central bank hiked its intervention interest rates. This tightening temporarily made it to the loan rate of financial institutions (Figure 4). Once the exchange rate was allowed to float, the trend depreciation continued, albeit with much lower interest rates. At the time the band came under attack, many analysts and policy-makers argued that the lackluster performance of the economy beginning in the second half of 1997 was associated with an ill-conceived monetary and exchange rate policy that kept interest rates too high and the domestic currency too strong[1]. Under this interpretation, floating the currency should have reverted the trend of the key components of aggregate demand. In particular, lower interest rates should foster investment and consumption and a weaker currency should boost exports. The stylized facts indicate that during the period of floating

[1] Prominent interest groups (including the National Federation of Coffee Growers and other exporters) have generally favored a weak currency as a key instrument for export promotion and diversification. For details, see Jaramillo, Steiner and Salazar (2001).

the recovery of private consumption and private investment has been far from satisfactory, while non-traditional exports[2] have performed reasonably well (Figures 5 and 6).

Figure 4. Real Interest Rates

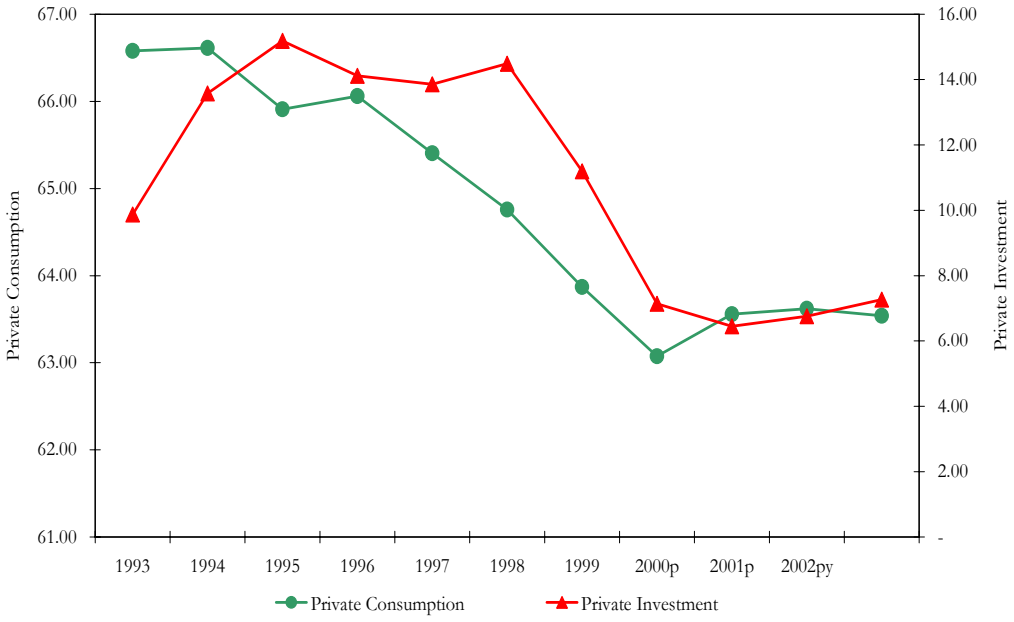
Loan and interbank effective annual rates, 1996-2001 (quarterly data)



Source: Superintendencia Bancaria

Figure 5. Private Investment and Private Consumption, 1993-2002

Consumption and Investment as % of GDP

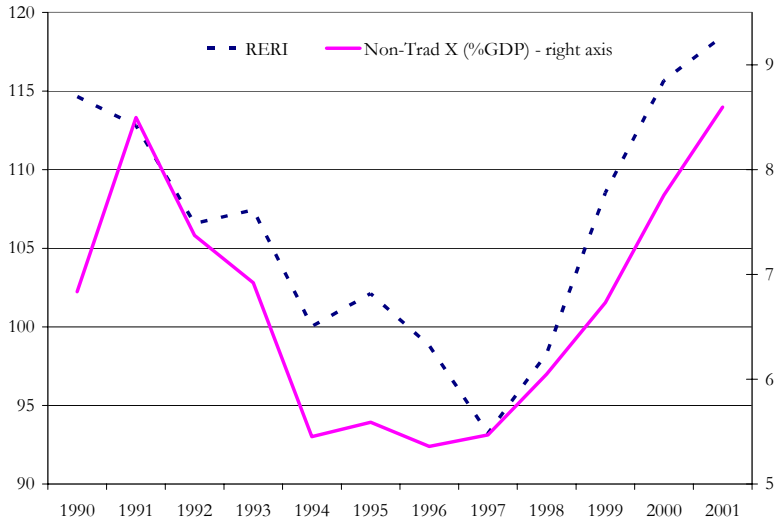


Source: DANE and DNP

[2] Those different from coffee, oil and coal.

Figure 6. Non-Traditional Exports Growth and RERI

Exports different from coffee, oil and coal
and real exchange rate index (RERI), 1990-2001



Source: DANE and Banco de la República

The traditional expansionary effect of a devaluation predicted by the Mundell-Fleming model has been recurrently subjected to criticism (i.e. Krugman and Taylor, 1978), and challenged on new grounds (Calvo, 1999, 2000, Calvo and Reinhart, 2000, Dornbusch, 2001). The basic argument in this new strand of literature is that firms and governments that borrow in foreign currency and produce an output that is not entirely tradable face a currency mismatch which, following a devaluation, can produce a balance sheet effect that offsets any enhancement in competitiveness.[3]

Of course, the jury is still out in this respect, and the final verdict has to come form the data and the particular conditions of firms in specific countries. In this paper we study the firm-level effects of monetary and exchange rate developments in Colombia during 1995-2001. Whether the recent relatively poor performance of the Colombian economy is associated with a protracted effect of having instrumented a tight monetary policy to defend the currency when it came under attack after 1997 and/or with the balance sheet effect associated with the depreciation following the floating of the currency is an empirical matter, better addressed at the level of the firm.

In this paper we examine the impact of exchange and interest rate volatility on the level of investment of firms with varying degrees of foreign indebtedness, output tradeability, and imported inputs. Our main results indicate that the usual expansionary effects of devaluations in investment are unlikely to hold for this sample of Colombian firms. There is clear evidence indicating that the real exchange rate devaluation had on average a detrimental effect on firm investment. In general, this negative effect is larger for firms with a higher share of dollar indebtedness. Our estimations

[3] Céspedes et al. (2000) develop a model in which one can introduce a balance sheet effect and still obtain the standard Mundell-Fleming expansionary results from a devaluation. Caballero and Krishnamurthy (2000) introduce domestic credit constraints and offer an explanation as to why firms can access foreign financing in spite of the balance sheet effects that ensue from a devaluation.

also suggest that the exchange rate *level* had a positive impact on firm investment. We also find weak evidence indicating that the latter effect is higher for exporting firms and lower for firms that import part of their inputs. Regarding the role of the interest rate and its interaction with debt maturity, we are unable to find robust and significant results on firm investment. We also examine the determinants of debt denomination and find that foreign debt is positively correlated with firms´ size and, albeit less strongly, with the extent of foreign participation. There is evidence that exporting firms and firms in more open sectors tend to have larger shares of dollar debt. Nonetheless, imports are a significant determinant of foreign indebtedness as well, given that dollar indebtedness is often trade-related. In fact, the effect of imports on debt denomination is several times larger than that of exports. Thus, although firms might attempt to "match" their revenue with liabilities, importing firms are actually engaged more often in dollar indebtedness.

2. A review of the literature

The friendly view of devaluations has recently been challenged on the grounds that borrowing in foreign currency and producing a non-tradable output generates negative balance sheet effects during devaluations. We review this line of research in section 2.1. The empirical work on the role of real exchange rate changes on firm-level investment is scarce. We review some noteworthy examples in section 2.2.

2.1 Exchange rate and balance sheets: the theoretical literature

Largely motivated by the failure of traditional models of balance of payments crisis[4] to explain the financial turmoil in emerging markets during the late 1990's (most notably, the Asian crisis of 1997), a number of authors have appealed to an argument that could be called, following Krugman (1999a), "open economy Bernanke-Gertler". According to this view, financial market imperfections imply that firm investment is often constrained, so that net worth affects investment levels (Bernanke and Gertler, 1989). When combined with substantial levels of foreign currency denominated liabilities, this implies the possibility of self-fulfilling crises: a loss of confidence by foreign investors and the capital flight that results leads to exchange rate depreciation and to a balance sheet effect that depresses investment. A loose monetary policy after the crisis is not a remedy, as it reinforces the currency depreciation and its balance sheet effect (Krugman, 1999b).

Aghion, *et al.* (2000, 2001) argue that the balance sheet effect of a devaluation might entail a decrease in economic activity which reduces money demand and weakens the currency even further. A currency crisis is a "bad" equilibrium, with low output and a weak exchange rate. They find that if credit supply does not react too strongly to changes in the interest rate, a tight monetary policy is the correct prescription to avoid a crisis. Nonetheless, if the rise in interest rates has a significant negative effect on future output that exerts downward pressure on the currency, it might be impossible to avoid a crisis.

In a series of papers Céspedes, Chang and Velasco support the Mundell-Fleming prediction and argue against dollarization. They point out that although a devaluation under "dollarization" of

[4] "First generation" models emphasized the role of inflationary financing of budget deficits: fixed exchange rates collapsed as the government appealed to seignorage to cover its deficit. A speculative attack followed as foreign reserves fell below a given level. "Second generation" models relied instead on the conflict between a fixed exchange rate and an expansionary monetary policy.

liabilities has a detrimental effect on net worth which constrains investment when firms face financial frictions, the offsetting effect of increased home output and returns to investment generally imply that the standard Mundell-Fleming expansionary effect of devaluations is still generated (Céspedes *et al*., 2000). Nonetheless, balance sheet effects magnify the effects of foreign disturbances and might lead to a situation of *financial fragility* –where devaluations increase the country risk premium. The overall impact of a devaluation might indeed be contractionary, but only if inherited dollar liabilities are large and international financial markets very imperfect (Céspedes *et al*., 2002).

Céspedes *et al.* (2000) discuss the policy implications of their results. They find that fluctuations in domestic output and investment are larger and more persistent under fixed exchange rates. Also, under a fixed exchange rate, the impact of a real depreciation, albeit smaller, must be achieved through deflation, increasing the real wage and reducing employment if nominal wages are sticky. The authors recognize a drawback of their analysis, since under a more complete specification of shocks, the expected greater variability of relative prices under floating could endogenously increase the country risk premium. For them, this does not necessarily favor fixed rates, as variability of relative prices also creates incentives to reduce foreign denominated debt.

This last remark brings us to an important issue. If, as the literature suggests, balance sheets matter, why do domestic agents choose to hold foreign denominated liabilities in the first place? Explanations of the so called "original sin"—the fact that developing countries cannot borrow in their own currencies or at long maturities—range from models that point out moral hazard problems of fixed exchange rates and government policy (Burnside, *et al.* 1999, Schneider and Tornell, 2001) to those which consider the role of financial underdevelopment (Caballero and Krishnamurthy, 2000).

2.2 Some empirical work

The interaction between dollar indebtedness and exchange rate changes is studied in detail for a sample of Latin American firms by Bleakley and Cowan (2002, BC in what follows). They report that the effect of holding dollar debt during a devaluation is positive because the negative net worth effect is more than compensated by the effects of a devaluation on earnings. Furthermore, they suggest that this results from firms' matching the currency composition on both sides of their balance sheets.

These conclusions are not supported by Aguiar (2002), who studies investment in post-crisis Mexican firms, finding an important (negative) "balance sheet effect" of devaluation on investment. Even though exporters outperform non-exporters in terms of profits and sales after a devaluation, their investment is constrained as a result of holding foreign currency denominated debt. Floating the currency also implies an increase in sales volatility, which further reduces investment. Finally, Aguiar finds only weak evidence in support of a model of hedging which predicts that the currency of debt should match the currency of revenue (i.e. that foreign currency debt payments should increase with the covariance of profits and the exchange rate).

An important issue for policy discussion is the role of the exchange rate regime on exchange risk hedging. Arteta (2002) uses a database on deposit and credit dollarization in developing and transition economies to examine whether flexible exchange rate regimes encourage banks to match dollar-denominated liabilities with assets. His results indicate that, if anything, floating regimes tend to exacerbate currency mismatches. These results tend to favor the so-called "minority view" which

emphasizes that the cost of insurance against exchange rate risk goes up with exchange rate volatility. According to Martinez and Werner (2002), the previous results are not supported by the Mexican case, where firms took exchange rate risk more seriously after the floating in 1994.

3 Analytical framework for the firm-level analysis

In addition to the usual expansionary effect of devaluations, BC consider the fact that for dollar-indebted firms devaluations might lead to a decrease in "net worth" due to a currency "mismatch" between liabilities and income. This deterioration in balance sheets makes firms appear as riskier investments. As a result, they face higher interest rates, which bring about a decline in investment. BC's interesting framework fails to recognize other elements that might play a role in determining firms' investment during devaluations. In Appendix 1 we replicate the BC model and extend it in two directions, discussed by the authors but not incorporated in their model. First, firms might use imported inputs, challenging the fact that the "competitiveness" effect of a devaluation is necessarily positive. Second, firms pay an interest rate that depends not only on its own net worth, but also on macroeconomic elements —i.e. quitting the "dogged" defense of the currency allows the domestic interest rate to decrease, fostering investment of firms indebted in pesos.

Under both the basic and extended BC frameworks, the effect on investment of a devaluation can be either increasing or decreasing in the degree of dollar indebtedness. In the case of the extended framework, the source of the ambiguity becomes more difficult to disentangle. For instance, in BC there is an unambiguously positive "competitiveness" effect of devaluations coupled with an ambiguous "net worth effect" (which depends on the extent of the increase in earnings as compared to the rise in the cost of external funds). However, the "competitiveness" effect might be negative if imported inputs are important. In the extended framework, in addition to BC's competitiveness and net-worth channels, there is a "macroeconomic channel" affecting firms' investment after devaluations. This channel might have a differential effect on firms with varying degrees of foreign and domestic debt levels, and moreover with varying degrees of debt maturity.

4 Some facts

BC's claim of no evidence of a large, negative net-worth effect on investment following devaluations in emerging markets is based on a sample of 2644 publicly traded firms in 5 countries, including Colombia. Their sample is not only heavily biased in favor of Brazil and Mexico (1479 and 577 firms, respectively), countries whose private sectors are not known to have highly dollarized liabilities. It is also biased in that publicly traded firms, the source of their sample, are generally the largest and most financially sophisticated ones. We use a more representative database, which covers an average of 8,246 firms from 1995 through 2001. These firms belong to 66 sectors (4-digit ISIC classification), and are under the supervision of the Superintendencia de Sociedades. Only commercial firms with assets of at least 20,000 legal minimum monthly wages[5] now have to report to the Superintendencia, but the sample also includes smaller firms. Due to procedural changes --the Superintendencia now differentiates between inspected (*inspeccionadas*) and supervised (*vigiladas*)

[5] The current minimum monthly wage is US$110. Hence, only firms with assets above US$2 million are subject to mandatory reporting.

firms-- there was a non-negligible decrease in the number of firms in 2001. Until 2000 all firms had to report their financial statements. Starting in 2001 only *vigiladas* have to do so.

Firms entering after 1995 or leaving before 2001 because they ceased to operate will allow us to work with an unbalanced panel. Table 1 presents the sectoral distribution of the original data set.

Table 1. Firms per Sector (original data set)

	1995	1996	1997	1998	1999	2000	2001
Agriculture, livestock	769	736	740	719	743	863	463
Mining	233	246	246	250	256	248	191
Manufacturing	2,291	2,237	2,291	2,256	2,416	2,432	1,582
Electricity, gas and water	18	11	17	21	22	21	15
Construction	1,268	1,261	1,313	1,175	1,112	1,073	599
Commerce	2,272	2,185	2,337	2,310	2,344	2,466	1,557
Transport and communication	376	402	461	472	542	616	369
Other services	2,064	2,085	2,191	2,185	2,312	2,993	1,554
Total	**9,291**	**9,163**	**9,596**	**9,388**	**9,747**	**10,712**	**6,330**

Source: Authors' calculations based on Superintendencia de Sociedades.

We modified the data set in several ways. The following were excluded:

1) Firms that do not appear in the sample for at least four consecutive years. This results in dropping 6700 firms, which account for roughly 44% of the sample
2) 65 firms that have no change at all in their level of assets or liabilities in consecutive years.
3) 6 firms reporting unrealistically low levels of assets. In particular, firms whose assets do not exceed $100,000 Colombian pesos (US$35 at current exchange rates), which is nearly a third of the legal minimum monthly wage.
4) 868 firms displaying inconsistent accounting information, including:
    - firms having liabilities that exceed the value of their assets (812 firms)
    - negative operational income (4 firms)
    - short-term assets larger than total assets (7 firms)
    - firms reporting negative values for their total liabilities, any of its components, or on interests on their financial liabilities (24 firms)
    - firms in which components of liabilities exceed the total (foreign, domestic, trade and financial, 21 firms)
5) For estimation purposes we also drop:
    - Outliers (firms for which any of our measures of investment lie in the upper or lower 3% of the sample)[6].
    - Firms for which we do not have (or are unable to impute) denomination of output and inputs in terms of currencies. 100 firms are dropped because of these criteria.
    - 964 firms belonging to the commerce sector.

Table **2** includes the number of firms per year and sector that survived our filtering criteria (1 to 4).

[6] The sensitivity of results presented in Section 5 to the exclusion of outliers is being revised.

Table 2. Firms per Sector (revised data set)

	1995	1996	1997	1998	1999	2000	2001
Agriculture	512	554	599	623	607	567	343
Mining	121	137	156	165	152	137	109
Manufacturing	1638	1735	1860	1915	1837	1749	1203
Electricity, gas and water	6	8	14	15	14	13	10
Construction	649	728	846	881	806	704	406
Commerce	1428	1534	1732	1842	1715	1621	1056
Transport and comunications	253	286	342	355	347	332	219
Services	1335	1466	1668	1771	1647	1538	873
TOTAL	5942	6448	7217	7567	7125	6661	4219

Source: Authors' calculations based on Superintendencia de Sociedades

In what follows, we highlight several characteristics of the firms in our sample. Variables are defined in Appendix 2.

On average, total liabilities are close to 48% of total assets at the beginning of the period, and nearly 42% by the end (Table 3). The decrease in total leverage occurs in the beginning of the period, from 1995 to 1998. The median value of leverage is close to the average. Apparently, firms have moved to more "conservative" indebtedness, although a few still have liabilities that are as large as their own assets, as indicated by the last column of the Table.

The breakdown of liabilities by currency denomination and maturity is presented in Table 4 for the year 2000[7]. Firms hold a large proportion of short-term debt (close to 75% on average and about 90% for the median firm; short term is less than one year). This is consistent with the available evidence on firms' financial opportunities in Colombia, where internal resources are often the source of funding for investment, whereas debt is a source of working capital.

Table 3. Firm Leverage, descriptive statistics

Total Debt to Total Assets (%)

Year	Mean	Median	Std. Dev.	Min	Max
1995	47.79	50.61	26.08	0.00	100
1996	45.35	46.92	25.72	0.00	100
1997	44.54	45.72	26.27	0.00	100
1998	43.02	43.39	26.43	0.00	100
1999	42.28	41.77	26.36	0.00	100
2000	41.89	41.38	26.24	0.00	100
2001	42.13	42.27	26.33	0.00	100

Source: Authors' calculations based on Superintendencia de Sociedades

[7] Yearly information is available upon request. Ratios vary little through time. Despite the real depreciation of the currency, the share of dollar debt increases very slightly during the period, from 4.9% of total liabilities in 1995 to 5.8% in 2001.

Table 4. Debt Maturity and Denomination, descriptive statistics for 2000 (%)

Variable	Mean	Median	Std. Dev.	Min	Max
Balance sheet information (Total liabilities)					
Short Term Debt/Total Debt	76.66	93.40	30.42	0.00	100.00
Annex information (Financial and trade liabilities)					
Dollar Debt/Total Debt	5.47	0.00	14.79	0.00	99.98
Short Term Dollar Debt/Dollar Debt	92.19	100.00	24.82	0.00	100.00
Short Term Domestic Debt/Domestic Debt	78.88	100.00	32.36	0.00	100.00

Source: Authors' calculations based on Superintendencia de Sociedades

The share of "dollar" debt[8] is low on average (close to 5% of total debt) and most firms hold no foreign currency denominated liabilities (the median firm has no dollar debt). Nonetheless, a few hold a disproportionate share (the firm holding the largest share of foreign debt holds nearly 100% of its debt in dollars). The median firm holds its entire domestic and dollar debt in the form of short-term debt for all years. Also, the proportion of short-term debt is higher on average for dollar debt. Below we show the breakdown of liabilities between trade and financial debt.

"Dollar indebtedness" appears to be relatively unimportant for this large sample of firms. Yet, how important is foreign indebtedness among those firms that do hold foreign currency liabilities? About 26% of the firms in our sample hold a positive amount of dollar debt (Table 5). Firms indebted abroad hold on average 19% of their liabilities in dollars. The share of firms indebted abroad and, more surprisingly, their average indebtedness does not change much, despite the recent devaluation. The only exception is 2001, the year in which our sample changes to include mostly firms that are *vigiladas*. In this year, the share of firms indebted abroad rises to nearly 33% of the entire sample. These (larger) firms hold dollar denominated debt more often. In 2001 average indebtedness in dollars falls from 20.4% to 17.5% of total debt. Thus, although larger firms that are *vigiladas* are more frequently indebted in dollars, they now apparently hold a smaller share of their debt in dollars. The share of dollar debt for the median firm is always about a half of the share for the average firm; that is, most firms are either on the conservative side, or lack access to that financial market, with a few holding a disproportionate share of their debt in dollars.

Table 5. Dollar Debt as % of Total Debt

	Observations				
Year	Number of firms	As percent of sample	Mean	Median	Std. Dev.
1995	1679	26.06	18.93	9.50	22.34
1996	1820	26.53	18.47	9.50	21.80
1997	1991	26.03	19.07	10.44	22.13
1998	2021	25.59	18.77	9.71	21.89
1999	1977	26.05	18.77	10.13	21.89
2000	1931	26.85	20.35	11.14	22.60
2001	1492	32.97	17.45	8.92	20.77

Source: Authors' calculations based on Superintendencia de Sociedades

[8] Strictly speaking, "dollar" debt might actually be a combination of debt denominated in a basket of foreign currencies. It is impossible to disentangle the exact currency composition of foreign denominated liabilities in the data set.

Trade-linked debt accounts for nearly 20% of total liabilities on average, with most firms being on the low side (Table 6). We only show statistics for 2000 as there is no significant variation through time. Financial debt, in turn, is nearly 25% of total liabilities. Other liabilities (including bonds, liabilities with shareholders, among others) account for the remaining 55% of liabilities. Despite the fact that foreign trade debt represents on average a small share of total trade debt, and that the median firm holds no trade debt in dollars (not shown) most foreign currency denominated debt is trade debt (85% on average, and 100% of dollar debt for the median firm). Domestic debt is more evenly divided between trade and financial debt. Still, a number of firms hold a large amount of their trade debt in dollars (at least one holds its entire trade debt in dollars). This is also true for financial debt (not shown).

Turning to the revenue side, most firms do not export their output, although a few export their entire output (Table 7). The share of income generated abroad, while still low, has increased substantially through time, from 4.5% of total revenue to 7.1%. As the median firm illustrates, this effect was not widespread, and occurred especially in the aftermath of the exchange rate devaluation.

A large proportion of firms in our sample lack information on imported inputs. Furthermore, reported figures on imported inputs are often unreliable. We rely on sectoral data on imported inputs for estimation purposes, using the most disaggregated information available on inputs purchased (see Table 8). When detailed sectoral data on import orientation is examined, it is impossible to identify a general trend. Indeed, for most sectors imported input shares do not change much through time, though there is a significant heterogeneity in terms of import orientation and its evolution by sector.

Table 6. Breakdown of Liabilities between Financial and Trade Debt, 2000

All ratios in percentage

Variable	Mean	Median	Std. Dev.	Min	Max
Trade Debt/Total Debt	19.70	9.07	24.16	0.00	100.00
Foreign Trade Debt/Total Foreign Debt	85.55	100.00	33.11	0.00	100.00
Domestic Trade Debt/Total Domestic Debt	39.83	27.97	37.44	0.00	100.00
Financial Debt/Total Debt	24.82	15.21	26.95	0.00	100.00
Other Liabilities/Total Debt	55.48	52.91	33.06	0.00	100.00

Source: Authors' calculations based on Superintendencia de Sociedades

Table 7. Composition of Output in Terms of Currencies

Ratio of exports to total revenue, in percent

Year	Mean	Median	Std. Dev.	Min	Max
1995	4.43	0.00	17.05	0.00	100.00
1996	4.52	0.00	17.25	0.00	100.00
1997	4.65	0.00	17.53	0.00	100.00
1998	4.79	0.00	17.35	0.00	100.00
1999	5.36	0.00	18.39	0.00	100.00
2000	5.83	0.00	18.88	0.00	100.00
2001	7.07	0.00	19.74	0.00	100.00

Source: Authors' calculations based on Superintendencia de Sociedades

Table 8. Import Orientation of Firms, sectoral data

Imported input share as percentage of total expenditure on materials

Sectors	1994	1995	1996	1997	1998	1999	2000
Agriculture	**10.81**	**10.59**	**11.39**	**9.99**	**10.69**	**9.85**	**10.79**
Non-toasted and non-decaffeinated coffee	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Other agricultural products	24.96	24.98	25.97	23.46	25.45	22.99	24.45
Animals and animal products	0.98	0.69	0.81	0.40	0.34	0.21	0.27
Forestry, fishing and mining							
Forestry	10.21	10.51	8.45	9.25	10.06	11.23	12.16
Fish and other products from fishing	0.01	0.01	0.03	0.00	0.00	0.00	0.00
Coal, lignite, and peat	0.41	0.39	0.61	0.63	0.71	0.82	1.22
Crude oil, natural gas and other minerals	0.00	0.01	0.48	0.02	0.02	1.90	3.05
Metal minerals	6.72	4.43	8.85	54.90	15.66	15.59	16.81
Other non-metallic minerals	7.74	6.59	6.91	7.19	7.21	5.56	5.74
Gas and electricity	0.00	0.06	0.09	0.04	0.12	0.07	0.14
Water, sewage system, waste disposal and sanitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing industry	**34.05**	**34.62**	**34.67**	**35.49**	**35.33**	**31.30**	**31.61**
Production, transformation and conservation of beef and fish	12.92	16.01	17.99	18.29	18.84	22.12	22.97
Fruit, vegetable and bean production; oils	19.99	22.11	24.17	23.37	27.24	27.02	30.63
Dairy products	7.63	10.62	11.90	16.74	17.71	11.53	13.77
Meals and starches	8.55	6.92	6.59	7.21	6.29	5.35	6.88
Sugar mills and refineries	3.49	4.54	0.43	0.77	0.72	2.70	2.30
Coffee threshing	0.04	0.22	0.12	0.49	0.37	0.21	1.46
Bakery products	36.61	48.09	48.58	49.83	45.94	40.53	37.46
Other food products	24.43	27.55	28.59	30.31	33.02	30.01	32.92
Beverages	19.72	21.79	22.63	24.57	24.06	20.24	19.42
Tobacco products	97.39	98.18	98.45	98.23	98.47	97.24	97.35
Textile products spinning, weaving and finishing	11.55	12.72	12.21	12.81	15.22	17.96	28.60
Other textile products *	53.98	56.54	56.80	56.58	56.06	54.99	
Hand and machine knits and crochet articles; garments and clothing manufacturing	85.43	84.54	84.16	84.95	84.77	81.30	80.94
Leather tanning and preparation; Shoe manufacturing	27.72	30.37	29.95	31.35	38.10	32.75	34.68
Wood sawing, wood sheets; Carpentry pieces and parts for constructions; Other wood, cork and basketry products	5.56	5.13	5.70	5.70	4.73	5.29	6.69
Paper, cardboard and their products	17.12	16.99	16.25	17.18	17.11	15.44	13.70
Printing and publishing activities	16.76	17.97	17.55	17.79	19.12	15.50	15.13
Oil refinery and by-products	17.55	17.83	15.48	16.30	14.53	11.65	8.69
Basic chemical substances, synthetic and artificial fibres	32.02	32.86	34.24	35.24	35.91	34.66	35.85
Rubber and plastic products	11.46	13.76	15.32	16.51	16.64	16.34	17.46
Glass and glass products	7.96	9.03	9.27	10.25	10.07	8.90	8.78
Furniture manufacture	65.31	69.38	69.84	71.35	70.77	65.92	64.93
Waste recycling	36.88	36.00	45.52	42.55	45.49	42.99	39.81
Basic iron and steel industries; metal foundry; Basic precious metal and non ferrous industries; Manufacture of metal products	24.60	26.09	25.84	25.59	25.55	21.34	25.87
General and special use machinery	64.98	66.23	64.73	64.15	61.95	61.02	60.56
Other machinery and electrical appliances	69.19	71.56	70.69	70.99	72.01	69.41	69.08
Automotive vehicles and their engines; Bodies for automotive vehicles	64.95	60.91	56.66	58.36	55.01	53.21	49.73
Buildings and strucutures							
Buildings, structures and related activities	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other civil engineering projects	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commerce							
Commerce**							
Services							
Reparation of automotive vehicles, personal and domestic appliances.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hotels and restaurants.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Land transportation.	1.31	1.10	1.18	1.74	5.67	1.03	1.20
Water transportation	83.50	82.25	80.31	83.03	80.60	79.15	80.60
Air transportation	34.46	35.51	36.43	35.98	35.93	33.25	38.74
Transport services.	19.98	20.72	21.19	18.78	17.22	18.33	16.32
Postal and telecomunication services	10.21	8.15	7.08	5.94	7.24	5.05	4.96
Financial intermediation and related services	6.02	5.83	5.38	5.37	5.74	4.72	5.02
Real state services and home rentals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other services to enterprises excluding real state	7.08	8.47	12.58	10.37	11.24	12.81	11.03
Domestic services							
Education	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Social Services	0.00	0.00	0.00	0.00	0.00	0.00	0.00

* In 2000 this category is merged with Textile products spinning, weaving and finishing

**By construction, commerce purchases no intermediate inputs.

Source: DANE

Regarding the dependent variable, the rate of investment in fixed capital is defined as net purchases of property, plant and equipment as percent of total assets. Its evolution is presented in Table 9.[9] The mean indicates that fixed capital investment decreased sharply from 1996 to 1997 and slightly until its lowest level in 1999; thereafter, a mild recovery is observed. Overall, the rate of fixed capital investment falls from about 3.02% of assets in 1996 to 1.16% in 2000. Most firms are in the low side, with investment falling for the median firm from a rate of 0.95% to 0.16% of total assets during the same period.

Table 9. Fixed Capital Investment

Ratio of yearly investment to total assets, in percentage
after eliminating extreme values

Year	Mean	Median	Std. Dev.	Min	Max
1996	3.02	0.95	5.78	-7.95	114.39
1997	1.68	0.31	5.40	-69.32	93.46
1998	1.50	0.28	4.72	-45.27	85.17
1999	1.10	0.15	3.28	-44.39	40.55
2000	1.16	0.16	3.30	-51.38	19.56
2001	1.24	0.28	2.84	-25.69	16.72

Source: Authors' calculations based on Superintendencia de Sociedades

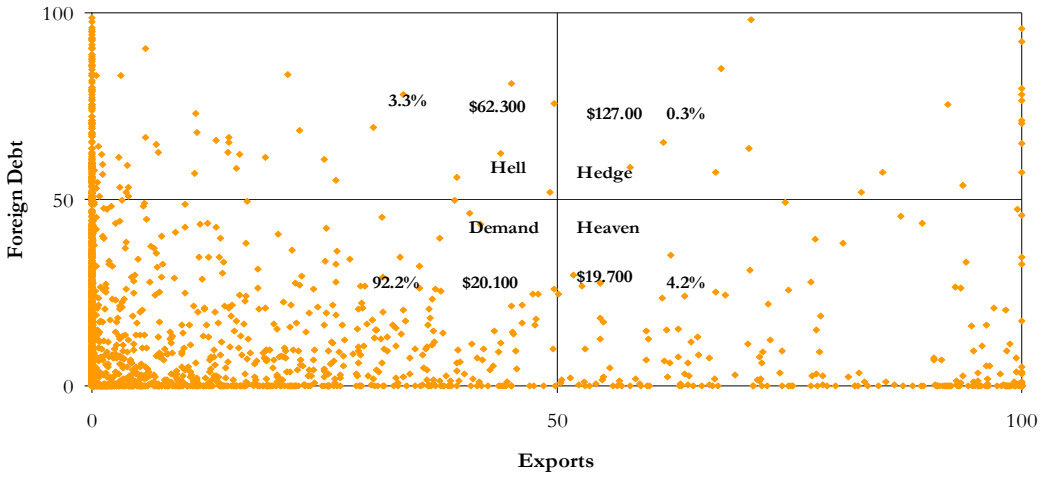
We now turn to a more detailed description of the main correlates of firms' characteristics, as well as their evolution through time. We identify each firm as belonging to one of four zones: *hell, heaven, hedge,* and *demand only*. Firms are in hell when their output is denominated in domestic currency, yet have a large share of foreign denominated liabilities. These are the firms that potentially face the strongest balance sheet effect during real exchange rate devaluations. In the opposite extreme, firms in heaven sell a large proportion of their output in dollars, yet have a low share of dollar debt. Firms that are highly indebted in dollars but nonetheless have a tradable output are hedged. Finally, firms with low levels of exports and dollar indebtedness only face the "demand channel" of a devaluation. The distribution of firms and the average value of assets for firms in each zone is presented for 2000 only, as it varies little through time[10].

As shown in Figure 7 an overwhelming majority of the firms in our sample belong to the "demand only" zone (92.2%). Firms in Heaven follow in importance (4.2%), whereas just a few firms are Hedged (0.3%). Finally, firms in Hell account for 3.3% of total firms. In terms of size, Firms in Heaven are the smallest; the numerous firms in the Demand Only zone are also small, whereas those Hedged and in Hell are relatively large. It seems that only large firms have foreign debt, and that larger does not necessarily mean more export oriented.

[9] In unreported estimations we also considered investment in inventories—the real change in inventories as percent of total assets—as an alternative dependent variable. Results were counterintuitive or non significant, revealing the fact that inventory accumulation is both an intended and an unintended process.

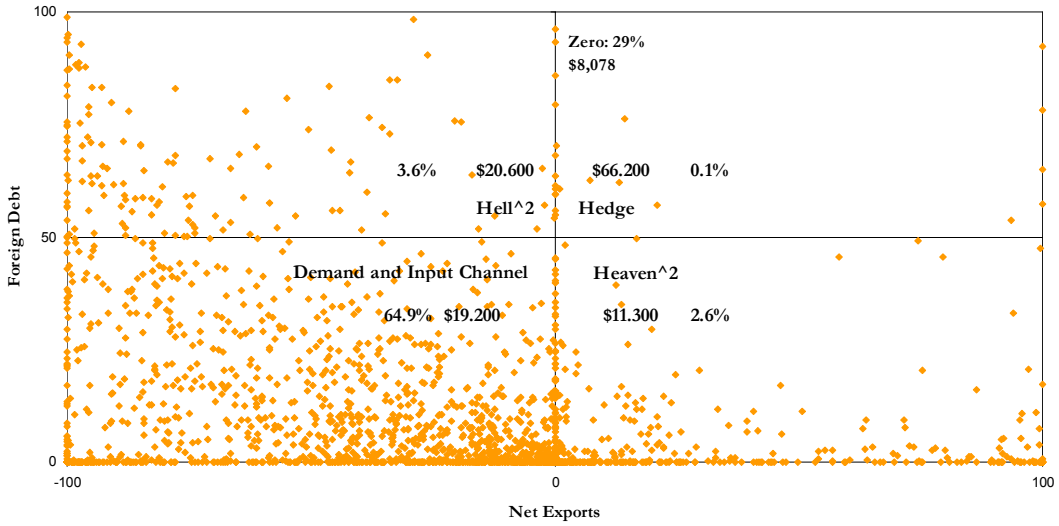
[10] Obviously, firms in Heaven are actually in Hell as a result of a real exchange rate appreciation.

Figure 7. Share of Foreign Debt vs. Share of Foreign Operational Income, 2000



Source: Authors' calculations based on Superintendencia de Sociedades
Note: Ratio of Foreign Debt to Total Debt and of Operational Income Generated Abroad to Total Operational Income, in percentage
Average value of assets for firms in each zone in 1995 Colombian pesos (in thousands)

Figure 8. Share of Foreign Debt vs. Net Exports, 2000



Source: Authors' calculations based on Superintendencia de Sociedades
Note: Ratio of Foreign Debt to Total Debt and of Operational Income Generated Abroad Net of Imports to Total Operational Income, in percent
Average value of assets for firms in each zone in 1995 Colombian pesos (in thousands)

From Figure 7 one is tempted to infer that it is unlikely to find a contractionary effect of devaluations on investment in this sample of firms. Firms in Hell, though large, are an almost negligible proportion of total firms. Nonetheless, the former classification has left out an important channel identified in our empirical framework through which a devaluation affects firm performance: imported inputs. To take this cost channel into account, in Figure 8 we consider *net* exports in the horizontal axis. Net exports are defined as the difference between operational income

generated abroad and imports of goods and raw materials, and are expressed as a percentage of total operational income. Figure 8 tells an interesting story: even though it is true that most firms face only the demand channel, several others have negative net exports. Thus, these firms are most likely harmed by the "competitiveness" effect. If, in addition, they have a large share of foreign debt (as some do), they are harmed on both accounts; that is, their situation is worse than Hell: Hell-squared.

When examined by sector, exports, imports, foreign debt and short term debt behave as follows (Figure 9 to 12): exports are important for firms in agriculture, manufacturing, and mining, although most firms do not export at all, regardless of which sector they are in. On the other hand, several sectors seem to be affected by the cost of inputs channel. This includes sectors that are important exporters as well as others which are not. Foreign debt is also important for a number of sectors, even though firms are typically not indebted in dollars. In particular, the electricity, gas and water sector (made up of a few and large firms) is highly indebted in dollars. This sector is also a net importer. Transportation and Commerce are in a similar situation. The importance of short-term debt for all firms is underscored by Figure 12.

Figure 9. Share of Exports, by sector
Operational income generated abroad as percent of total operational income, all years
median is zero for all sectors

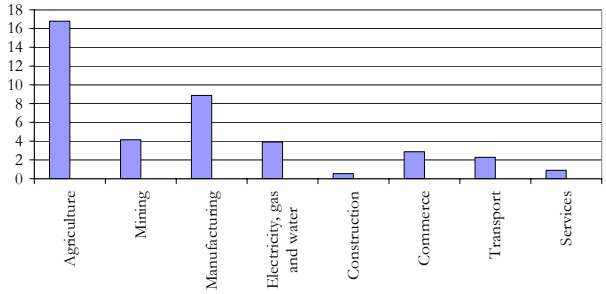


Figure 10. Share of Imports, by sector
Purchases of goods and raw materials from abroad as percent of total purchase of goods and raw material, all years

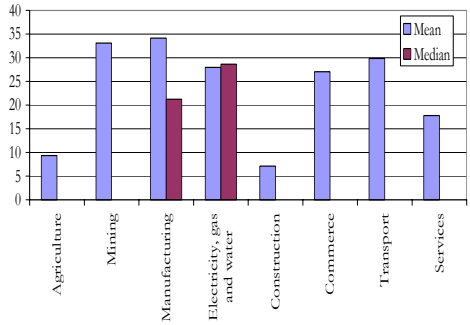


Figure 11. Share of Foreign debt, by sector
Total foreign debt as percent of total debt, all year
median is zero for all sectors

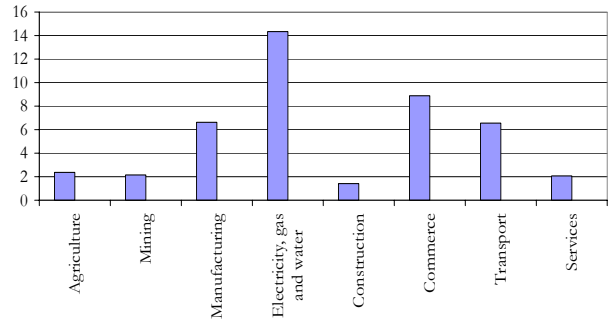
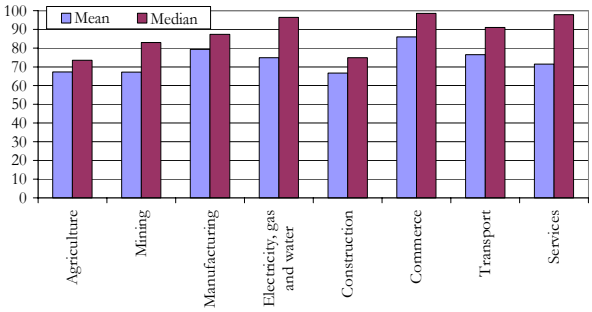


Figure 12. Share of Short Term Debt, by sector
Debt due in less than one year as percent of total debt, all years



Source: Authors' calculations based on Superintendencia de Sociedades

5 Estimation and results

5.1 Devaluation, interest rate volatility and investment

There are a number of studies on firm-level investment in Colombia that might shed light on the expected role of an exchange rate depreciation. Several authors have found that credit constraints are important for Colombian firms (Kugler, 1998c, Arbeláez and Echavarría , 2002). Several studies suggest mitigating factors with respect to the potential competitive effect of devaluations. Tybout and Roberts (1997) find that fixed costs to export are important for Colombian manufacturers. This might induce export hysterisis (Dixit, 1989; Krugman, 1989), as only firms already exporting are likely to react, unless the devaluation is drastic. Das *et al.* (2001) find that most of the entry and exit into foreign markets takes place among marginal exporters, who contribute little to aggregate export revenues. Brooks (2001) shows that Colombian manufacturers tended to under export to the United States from 1981 to 1991 because their products were of inferior quality. Hence, even if Colombian products are cheaper, unless a threshold quality level is reached, devaluation will not result in higher exports. Fernandes (2001) finds that lower tariffs in Colombia yielded higher productivity for manufacturing exporters in the 1980's. More recently, Medina et. al. (2003) find that protectionist policy in the form of tariffs has slowed down productivity growth during the nineties. These results could be driven by the fact that expensive imported inputs hindered productivity during protection. Likewise, devaluations could be detrimental to the performance of plants in technology-intensive sectors, which are most likely to be exporters, and have relatively high utilization of imported capital and intermediate inputs. Furthermore, Fernandes' estimations indicate that real exchange rate devaluation is associated with a decrease in plant productivity in traded industries relative to productivity gains in non-traded industries. As far as we are aware, ours is the first attempt, other than Bleakley and Cowan, to explicitly incorporate the role of foreign debt when analyzing the effects of exchange rate changes on firm performance.

Our interest is to estimate[11] alternative specifications of the following investment equation, motivated by the theoretical framework presented in section 3 and Appendix 1:

$$I_{it} = \beta_1 + \mu_i + \beta_2\left(D^*_{i,t-1} \times \Delta e_{BSt}\right) + \beta_3\left(EX_{i,t-1} \times e_t\right) + \beta_4\left(IMP_{i,t-1} \times e_t\right) + \beta_5 e_t + \beta_6 D^*_{i,t-1} + \beta_7 i_t + \beta_8\left(STD_{t,t-1} \times i_t\right) + \vec{\beta}_{10}\mathbf{X}_{i,t} + \varepsilon_{i,t} \quad (1)$$

where, I_{it} is the *rate* of fixed capital investment at time *t* for firm *i*, with investment in property, plant and equipment normalized by total assets. The main effect that we want to capture is the interaction between the inflation-adjusted devaluation of the bilateral exchange rate (with the U.S., e_{BSt}), and dollar debt at the beginning of *t*: $D^*_{i,t-1} \times \Delta e_{BSt}$.

Two alternative definitions of $D^*_{i,t-1}$ are considered: the ratio of lagged dollar debt to total debt and to total assets for firm *i*. Since foreign debt is presumably denominated in dollars, to capture the "balance sheet effect" we define exchange rate, e_{BSt} as the nominal bilateral exchange

[11] Estimations in this subsection were undertaken using DPD for OX developed by Manuel Arellano, Stephen Bond and Jurgen A. Doornik.

rate with the U.S. adjusted by domestic inflation. By interacting the (log) percentage change in this real exchange rate index with the share of foreign debt, we aim to capture the differential effect that real exchange rate volatility has on investment for firms with varying degrees of foreign debt exposure [12].

In addition, we include the direct effect of e_t, the effective real exchange rate--an index constructed as a weighted average of bilateral exchange rates with Colombia's 20 main trading partners. The investment response to higher exchange rate levels might vary for firms with different degrees of output and input tradeability. Thus, we include additional terms interacting the exchange rate with lagged exports ($EX_{i,t-1}$) and with lagged imports ($IMP_{i,t-1}$)

As noted above, we might see firms investing more after a devaluation not because individually they benefit from a "competitiveness effect" but because collectively this allowed for a looser monetary policy. Likewise, we could see them investing less not because of a balance sheet effect of dollar indebtedness but because they face higher interest rates under a dogged defense of the currency. Thus, we directly include the role of the lending real interest rate, i_t. Lagged short term debt, $STD_{i,t-1}$, and its interaction with this average domestic lending interest rate, is included to uncover the differential role of changes in interest rates depending on the maturity of debt.

All specifications consider firm fixed effects. In (1) we define $\beta_{1i} = \bar{\beta} + \mu_{i_t}$ as the intercept for the *i*th firm with $\bar{\beta}$ as the mean intercept and μ_i the difference from this mean for the *i*th firm. An additional set of regressors detailed below are summarized by $\mathbf{X}_{it}$.

We begin by mimicking BC's version of equation (1). That is, we initially include only the following effects: dollar debt, total leverage, and exchange rate devaluation and its interaction with dollar debt. Furthermore, instead of considering the level of the exchange rate, we consider its (log) percentage change. Alternative specifications of such regressions are reported in Table 10. In columns 1 and 2, dollar debt is normalized by total debt, whereas the two final columns include dollar debt to total assets. *The first point that should be highlighted is that the direct and independent effect of the real exchange rate depreciation is consistently negative.* Likewise, the interaction of the bilateral exchange rate devaluation with dollar debt is consistently negative and significant[13]. This result stands in stark contrast with the one reported by BC for their sample of Latin American corporations. Our results suggest that holding dollar debt during devaluations is detrimental for investment. Moreover, devaluation has a negative effect on investment irrespective of the denomination of their debt. In columns 2 and 4 we directly control for the share of exports and imported inputs and their interaction with real exchange rate devaluation. Although lagged imports have an unexpected negative effect on fixed capital investment, none of the additional variables are significant and, more importantly, results for real exchange rate devaluation and its interaction with debt remain

[12] We performed estimations for end of period and average percentage change of e_{BSt}. To ease reading, we shall present results with the former measure, noting which results change when average depreciation is considered instead. Estimations using average depreciation rates are available upon request.

[13] When interacting the (bilateral) real exchange rate depreciation with the level of dollar debt, the results are sensitive to whether end-of-period or average devaluation is used. Indeed, when using averages the interaction is positive but not significant.

unchanged[14]. Regarding other controls, investment depends positively, and in a significant manner, on sectoral output growth, whereas firm's leverage does not have a significant effect[15].

In short, the results from Table 10, which replicate in our own sample of firms the estimation undertaken by BC for a sample of Latin American corporations, indicate that there is a clear evidence of a negative effect of devaluations and that foreign indebtedness makes matters worse. Although these estimations are a useful starting point, there are a number of limitations in the approach. In what follows, we include the level of the exchange rate in our regressions. This approach allows us to move closer to most empirical approximations of the determinants of exports and imports. We also allow for the real exchange rate effect to vary according to the tradeability of each firm's input and output. In addition, we control directly for the level of the interest rate and the maturity structure of indebtedness.

On more technical grounds, a major drawback of the estimations reported thus far is that, although the within estimator eliminates the inconsistency arising from the fact that firm-specific effects might be correlated with the set of independent variables, it does not account for the fact that most right hand side variables might be endogenous. For instance, the share of imported inputs might be endogenous to the level of investment. Also, one might be interested in allowing the investment regressions to have a dynamic structure..

A Generalized Method of Moments (GMM) estimator based on the use of lagged observations of the dependent and explanatory variables allows us to deal with both of these problems (Arellano and Bover, 1995). To address the problem of possible omitted variable bias induced by firm specific effects, the regression equation is differenced. Also, to address the problem of joint endogeneity, suitably lagged values of the original (i.e. measured in levels) independent variables, including the lagged value of the dependent variable, are used as instruments for the right hand side variables (i.e. the differenced values of the original regressors) of the transformed equation. The validity of the moment conditions implicit in this "GMM difference estimator" are tested statistically. First, we present results for a Sargan test of over identifying restrictions that checks the overall validity of these moment conditions. Failure to reject this test indicates validity of the moment conditions. Under the maintained assumption that the error term of the original dynamic levels equation is serially uncorrelated, the transformed error term for the difference equation is expected to have serial correlation of first order, but no serial correlation of second order. Thus we report AR(1) and AR(2) tests on the lack of serial correlation for the transformed error term[16]. These tests statistics are asymptotically normal under the null of no serial correlation.

[14] There might be a chance for measurement error in the export and import variables if firms do not export/import directly but rather through an intermediary. As explained above, imported inputs data is imputed from sectoral data but we do rely on balance sheet data on exports for our baseline estimations. When sectoral data for exports is included results are unchanged.

[15] Notice that whereas dollar debt is interacted with the bilateral real exchange rate (BRER) devaluation, when devaluation enters independently it is measured by the effective (multilateral) real exchange rate (RER) devaluation. When the BRER depreciation is included instead, the resulting direct effect is still negative and much larger, yet in this case the interaction term ceases to enter significantly. Thus, the depreciation of the BRER has a detrimental effect on investment, irrespective of the denomination of debt.

[16] One may allow for the error term of the original levels equation to follow an autoregressive process of finite order, as long as there are enough time series to estimate the parameters. For example, if the original error term is MA(1), the differenced error term is MA(2) and only lags of the dependent variables dated *t-2* are available as instruments for the differenced equation. See Bond [2002] for an intuitive review on this and other issues concerning GMM estimators for dynamic panel data models. Unless otherwise stated, we stick to the assumption of no serial correlation in the residuals and use instruments dates *t-2* and earlier.

Table 10. Fixed Capital Investment Regressions (BC)

Exchange Rate in (log) percentage changes

Dependent variable: Fixed Capital Investment				
	(1)	(2)	(3)	(4)
DIRECT EFFECTS	dollar debt to total debt		dollar debt to total assets	
Δ Log (real exchange rate)	-0.0585038***	-0.0459509***	-0.0590216***	-0.0463386***
	(0.006426)	(0.008814)	(0.006381)	(0.008793)
INTERACTIONS				
Δ Log (end of period bilateral US "real exchange rate") x Dollar Debt	-0.0506702**	-0.050536**	-0.0877725**	-0.086709**
	(0.0209)	(0.02102)	(0.03905)	(0.03931)
Lagged Exports x Devaluation		0.00032903		0.000327988
		(0.0003509)		(0.0003513)
Lagged Imports x Devaluation		-0.000351108		-0.000357374
		(0.000265)		(0.000265)
CONTROLS				
Lagged "Dollar" Debt to Total Debt	-0.00330865	-0.00384471	-0.00887189	-0.00893557
	(0.004958)	(0.004946)	(0.01057)	(0.01061)
Lagged Exports		0.00151932		0.00145488
		(0.004334)		(0.004338)
Lagged Imports		-0.0123029***		-0.0122769***
		(0.002521)		(0.00252)
Leverage	0.00554653	0.00500553	0.00564034	0.00508707
	(0.00385)	(0.003844)	(0.003896)	(0.003889)
Sectorial Output Growth	0.0115748**	0.0171592***	0.0115091**	0.0171221***
	(0.00523)	(0.005524)	(0.005228)	(0.005524)
R^2	0.01547785	0.01806729	0.01547785	0.01806729
Observations	15900	15900	15900	15900
Wald Test (joint)	181.8 [0.000] **	205.8 [0.000] **	182.3 [0.000] **	207.0 [0.000] **

Notes
Estimates using within estimator, robust standard errors in parenthesis
p- values fo regression statistics appear in [ ]
***, significant at the 90% level, **at the 95%, *** at the 99%**

A drawback of the first differenced GMM estimator is that the instruments available for the transformed regression equation are weak when the individual series have near unit root properties. Indeed, if the series are highly persistent, their differences are nearly innovations and there are no good instruments for near white noise series. Thus, the GMM difference estimator can be subject to finite sample biases. This potential bias can be reduced using the "GMM system estimator" proposed by Arellano and Bover (1995). This estimator combines the regression expressed in first differences with the original equation expressed in levels. As before, suitably lagged values of the dependent variables in levels are used as instruments for the differenced equation, whereas the equation in levels is instrumented with lagged differences of the explanatory variables. Both the Sargan and serial correlation tests are examined in this case. A Difference Sargan Test is also useful

in this context, since the set of moment conditions specified under the simple difference estimator is a subset of the one considered in the system estimator[17]. The difference between the Sargan statistic obtained under the system estimator and the one obtained under the difference estimator is asymptotically distributed χ^2 with degrees of freedom given by the difference between the number of degrees of freedom of the system estimator and that of the difference estimator. Failure to reject the null hypothesis of the validity of additional restrictions gives support to the system estimator[18].

Results for the modified specifications and for two types of estimation techniques (static fixed effects and GMM Difference) are presented in Table 11. In general, the additional moment restrictions implied by the GMM System estimator, valid under a mean stationary assumption for the set of variables to be instrumented, were rejected according to the Sargan and Difference Sargan Tests in most of our specifications, despite the fact that the AR(1) and AR(2) statistics show satisfactory results. Thus, we present the system GMM System results in Appendix 3 and base our discussion in the fixed effects and GMM difference results. Appendix 3 also includes a number of additional regression results to verify the robustness of our baseline regressions to alternative specifications and data definitions.

Table 11 confirms that the effect of the bilateral real exchange rate devaluation is negative, significant, and economically meaningful under all estimation techniques. The lack of significance of the interactive term of real exchange rate devaluation with dollar indebtedness reveals further that there is on average a detrimental effect on investment *irrespective* of the denomination of firms' debt. Nonetheless, our estimations also imply that there is a positive impact of the level of the exchange rate on investment. According to our fixed effects regression in Table 11, this effect is higher for exporting firms and lower for importing firms. The GMM regressions, on the other hand, suggest that the average effect is the same for all firms irrespective of the denomination of their inputs and output[19]. A noteworthy result from our basic estimations is the fact that the real interest rate, arguably an important determinant of firm investment, is only significantly negative in one of our specifications.[20] We further interacted the level of the interest rate with the share of short-term domestic debt, since presumably those firms that are highly indebted domestically in the short term face a "maturity mismatch" that constraints investment. This term has the expected sign both in the fixed effects and GMM difference estimators, yet it is never significant[21].

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[17] The Difference Sargan Test is also useful in determining the lags available for instrumenting right hand side variables. Indeed, when right hand side variables are *endogenous*—correlated with present and past variables of the regression disturbance—lags dated *t-2* and onwards are available as valid instruments. If these variables are *predetermined*—correlated with past variables of the regression disturbance— then lags dated *t-1* also become available and if the variable is *strictly exogenous* then current values (dated *t*) are also available as valid instruments. In all specifications below, firm-specific characteristics are lagged one period, so we usually assumed that these variables are predetermined. Nonetheless, when more than one specification was valid according to Sargan tests, we relied on the Difference Sargan Test to choose the preferred specification.

[18] We present both one-step and two-step results (with finite sample correction) for the difference estimator and system estimators.

[19] As in our BC type of regressions, we checked the sensitivity of these results to the inclusion of sectoral data on exports. Results were qualitatively unchanged (i.e. the interaction of exports and the exchange rate level remained insignificant under the GMM regressions). For all tables reported below, we checked the sensitivity of the results to the inclusion of sectoral or firm-level data. Results did not change, unless otherwise stated.

[20] This finding is consistent with previous studies on the determinants of investment at the macro level. For instance, Ocampo *et. al.* (1988) survey the evidence on the determinants of investment in Colombia and conclude that, with a few exceptions, there is no significant impact of the real interest rate on investment. These results are confirmed by Fainboim (1990) who finds that the price of capital and tax policy are important determinants of investment, whereas the real interest rate is relevant only for a few sectors.

[21] Since most domestic debt is actually short-term, we checked for the sensitivity of the results presented in Table 11 and in tables presented below using an alternative measure of short term indebtedness: short-term debt to total debt, irrespective of whether it is domestic or foreign. Results hardly change, probably because most debt is actually domestic. Also, in Appendix tables 3 and 4 we repeat the estimations presented in Table 11, but drop the interest rate and its interactions. Results in these tables are quite similar to

Regarding the controls, investment now depends positively and significantly on lagged imports in the case of the fixed effects estimation. This is a reasonable result to the extent that the fixed effects regression does not control for the endogeneity of imports. Nonetheless, imports are not significant under any of the GMM estimations, and the only additional significant controls are leverage (with a positive sign[22]) and sectoral output growth (with a positive sign) in the GMM System regression that appears in the Appendix. Note also that in the last three columns of Table 11, we check the sensitivity of our results to the definition of dollar debt and find that when normalizing dollar debt by total assets rather than by total debt, results hardly change. One significant change refers to dollar debt to total assets having a significant negative effect under the GMM estimations.[23]

It should also be noted that although we run regressions instrumenting for all the firm-specific explanatory variables, we report only a small subset of the estimations undertaken –-i.e. those in which we only instrument for the intuitively "most endogenous" variables, the level of imports and the level of foreign debt. Also, although we run regressions using all available lags as instruments, we only report those in which three lags were used–-thereby minimizing the possibility of an "over fitting bias." A final point regarding econometrics is that, in this context, estimating the dynamic specifications with the fixed effects and OLS estimators is potentially useful, since the former is usually biased downwards and the latter upwards. For all reported estimations, we run OLS and fixed effects regressions to check that our GMM estimators, presumably consistent, lied between the two[24].

Our results tend to give an important role to the tradeability terms only in the fixed effects regressions. Indeed, after controlling for endogeneity and adding the lagged dependent variable, the interaction of exports and imports with the exchange rate is usually not significant. As noted above, there might be a chance for measurement error in the export and import variables if firms do not export/import directly but rather through an intermediary[25]. Although there is no simple way to capture this problem in the data, we performed some additional regressions that are reported in the Appendix. Appendix Table 5 reports some estimations including a sectoral variable that indicates the openness of the sector and its interaction with the level of the RER itself and excluding the export and imports interactions. The sectoral variable refers to the sum of exports and imports of goods produced by each sector, normalized by the sector's total production[26]. Besides from the fact that these regressions do not challenge our basic results, we believe that they are problematic in that the degree of sectorial openness actually captures a number of factors in addition to the tradeability of each firm's inputs and output.

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those presented in Table 11. The only relevant change refers to sectoral output growth, which is no longer relevant under the System GMM estimations, yet it now enters significantly and with the expected positive sign in the fixed effects regressions. Results for the specification tests indicate once again that although the AR(1) and AR(2) are still well behaved under all GMM estimations, the Sargan and Difference Sargan Tests for the System estimator are either rejected or only marginally accepted.

[22] This result does not change if we control for possible endogeneity of leverage by including its lags in the instrument matrix.

[23] A number of regression statistics are considered to examine the validity of our GMM estimations. The AR(1) and AR(2) tests for whiteness of the residuals behave as expected in the GMM Difference estimators of Table 11: there is significant negative first order serial correlation of residuals, yet no higher order serial correlation. Furthermore, the Sargan Test for moment conditions cannot be rejected at conventional confidence levels.

[24] Estimations are available upon request.

[25] Furthermore, unreported estimations actually show that results do not change when we include sectoral data for exports instead of firm-level data.

[26] Our sample size is reduced significantly as we do not have available openness data for all sectors included in the sample.

Table 11. Baseline FKI Regressions

Dependent Variable: Fixed Capital Investment						
	Dollar debt to total debt			Dollar debt to total assets		
		GMM Difference			GMM Difference	
Independent variables	Fixed Effects	1 step	2 step	Fixed Effects	1 step	2 step
Lagged dependent variable		0.0611887***	0.056014***		0.0586385***	0.0587991***
		(0.01406)	(0.01301)		(0.0136)	(0.01313)
DIRECT EFFECTS						
Real exchange rate index	0.0337294***	0.0933915**	0.0921701**	0.0340173***	0.0938351**	0.0907992***
	(0.009294)	(0.03874)	(0.03629)	(0.008889)	(0.03896)	(0.03485)
Δ Log (bilateral US "real exchange rate")	-4.22927***	-2.44456***	-2.37887***	-4.1822***	-2.52487***	-2.65588***
	(0.3561)	(0.7237)	(0.5959)	(0.3498)	(0.6766)	(0.5746)
Real interest lending rate	-0.0385378	0.273775	0.0668362	-0.06632151*	0.205005	0.0122803
	(0.02812)	(0.2415)	(0.2129)	(0.03493)	(0.2444)	(0.2005)
INTERACTIONS						
Δ Log (bilateral US "real exchange rate" - end of period) x Dollar Debt	0.0241924	-0.0128862	-0.02493	0.0287471	-0.00863996	-0.0193234
	(0.02141)	(0.04349)	(0.04465)	(0.03881)	(0.07255)	(0.07136)
Lagged Exports x Real Exchange Rate	0.000331795*	-0.00312018	-0.00353556	0.000338869*	-0.00341775	-0.0032956
	(0.0001985)	(0.004938)	(0.004015)	(0.0001988)	(0.004652)	(0.003628)
Lagged Imports x Real Exchange Rate	-0.00145776***	-0.000280436	-0.000146455	-0.00146546***	-0.00029636	-0.000267496
	(0.0002833)	(0.0008162)	(0.0007043)	(0.000273)	(0.0007556)	(0.0006741)
Real interest lending rate x Short-Term Domestic Debt to Total Domestic Debt	-0.0000006	-0.0030301	-0.0005981	0.000339533	-0.00195008	0.000336715
	(0.0002393)	(0.003381)	(0.002903)	(0.0003073)	(0.003354)	(0.002721)
CONTROLS						
Lagged "Dollar" Debt	0.00467684	-0.0272808	-0.0287691	0.00481491	-0.0846111**	-0.0595451*
	(0.004956)	(0.02358)	(0.02108)	(0.0104)	(0.04013)	(0.03588)
Lagged Exports	-0.0315395	0.424565	0.404806	-0.0322965	0.434291	0.359505
	(0.02253)	(0.5838)	(0.4895)	(0.02257)	(0.5439)	(0.4331)
Lagged Imports	0.139026***	0.0151616	-0.00178242	0.139605***	0.0145462	0.0123889
	(0.0288)	(0.09122)	(0.0772)	(0.02788)	(0.08431)	(0.07281)
Lagged Short-Term Domestic Debt to Total DomesticDebt	0.00218319	0.323369	0.0578927	-0.0343661	0.209471	-0.0293807
	(0.02665)	(0.3837)	(0.3388)	(0.03444)	(0.3798)	(0.3122)
Leverage	0.00167348	0.0798862	0.0400951	0.00233038	0.0918117	0.0209711
	(0.003803)	(0.05815)	(0.0458)	(0.003777)	(0.05744)	(0.04738)
Sectorial Output Growth	0.00921477	0.0184241	0.00906756	0.00962931	0.022879	0.016586
	(0.007971)	(0.02156)	(0.01864)	(0.007966)	(0.02135)	(0.01821)
Observations	15900	15900	15900	15900	15900	15900
Wald Test (joint)	290.2 [0.000]**	114.6 [0.000] **	110.7 [0.000] **	315.0 [0.000] **	115.1 [0.000] **	110.0 [0.000] **
Sargan Test		29.09 [0.217]	24.22 [0.449]		30.20 [0.259]	25.85 [0.471]
AR(1) test (N[0,1])		-9.750 [0.000] **	-9.988 [0.000] **		-10.06 [0.000] **	-10.02 [0.000] **
AR(2) test (N[0,1])		0.1664 [0.868]	0.7864 [0.432]		0.2526 [0.801]	0.8068 [0.420]

Notes
Robust standard errors in parenthesis
For GMM estimators, all variables enter in differences
Instruments used include suitably lagged values of the dependent variable as well as lagged levels of foreign indebtedenss and imports. Length of lags used restricted.
p- values fo regression statistics appear in [ ]
*, significant at the 90% level, **at the 95%, *** at the 99%

Notice finally that some of the most consistent results refer to macroeconomic variables such as the exchange rate and the exchange rate devaluation. It must be pointed out that putting too much emphasis on these coefficients is problematic because these variables, which are common to all firms and only vary across time, are likely to be correlated with a set of omitted macro variables that could be captured in a year-specific component of the error term. Thus, the coefficient attached to macroeconomic variables may be inconsistent. In Appendix Table 7, we present some specifications in which we drop the non-interacted macro variables and include year specific effects[27]. Although we present results for only one of the available measures of dollar debt, short-term debt, and exports, results do not change when alternative definitions are included. Notice that most interactions of macro variables with firm characteristics are not significant for the GMM estimators, except in the System estimator where the interactive term of exports and the exchange rate has a counterintuitive sign. This lack of significance holds even when the interactive terms are included individually (in unreported regressions). Nonetheless, the fixed effects regression does show satisfactory results in terms of the tradeability interactive terms. Regarding specification tests, notice that the time effects are always jointly significant, and the GMM System estimator has poorly specified Sargan and Difference Sargan Tests.

5.2 On the currency composition of debt

In BC it is argued that the key determinant of the overall sign that real exchange rate devaluation has on firm investment is the correlation between the currency composition of debt and the exchange rate sensitivity of profits at the firm level. Moreover, they argue that their finding that firms holding dollar debt actually invest more than firms holding peso debt in the period following a devaluation is due to the fact that firms match the currency composition of debt with the elasticity of their income to the real exchange rate. Under this interpretation, dollarization of liabilities should be higher in firms that could be expected to benefit from a devaluation. Lending support to this hypothesis, BC report the results of a set of simple regressions where the ratio of dollar debt to total liabilities is a (positive) function of several proxies for the sensitivity of profits to the real exchange rate. In what follows we replicate some of their exercises and extend them in several directions to check whether this result holds in our data.

In Table 12 we consider a set of alternative specifications for the determinants of debt denomination. In particular, we are interested in knowing whether larger firms have more access to external credit. Also, the tradeability of firms' output and inputs is presumably an important component of firms' foreign indebtedness to the extent that firms are interested in "matching" their income streams with their liabilities. Obviously, perhaps the most important determinant of the extent of dollar indebtedness is the interest rate differential that each firm faces when considering different financing options. Since we are working with low frequency data, it is difficult to find a reliable measure of such differential. Finally, a number of authors have found that firms with international operations are more likely to hold foreign debt. Although in our data set the information on whether a firm is a parent or subsidiary is unreliable, we include the overall share of foreign investment in each firm as an additional control.

[27] We also experimented by interacting firm-specific variables (like dollar debt, share of exports, and share of imports) with year dummies to examine whether the coefficients were different during the period in which the currency depreciates. These interactions never turned to be significant under any of the specifications.

The results presented in Table 12 clearly show that foreign debt is positively correlated with firms´ size (as captured by the logarithm of the value of its assets). In the first column of Table 12 a simple random effects panel data estimation reveals further that firms belonging to a tradable sector (agriculture, manufacturing or mining) have a significantly higher share of dollar debt to total debt, as captured by the coefficient of the openness dummy. In this equation, the degree of foreign participation in ownership is also a significant determinant of indebtedness in dollars. This simple regression is nonetheless problematic since conventional estimators are biased and inconsistent in the context of limited dependent variables[28]. Thus, we estimate a Tobit model in the second column of Table 12. Also, besides form the extent of dollar indebtedness, we are interested in the determinants of whether or not to acquire debt in dollars. Thus, a Probit model for the likelihood of holding dollar debt is presented in column 3. Results are qualitatively unchanged: size and openness are important determinants of foreign indebtedness. The extent of foreign participation remains an important determinant, albeit at lower significance levels.

Table 12. Determinants of Debt Denomination

	Dependent Variable: Foreign Debt to Total Debt					
	Random effects GLS	Tobit	Probit	Fixed Effects	Tobit	Probit
Independent variables						
Openness Dummy	3.067543*** (0.3387)	29.38689*** (1.0607)	3.13981*** (0.1251)			
Exports				0.00187** (0.061198715)	0.0888041*** (0.01331827)	0.0140431*** (0.0016394)
Imports				0.51343*** (0.115)	0.8007111*** (0.1947)	0.23369*** (0.0283)
Log (Assets)	1.0857*** (0.086477)	3.433*** (0.2510)	0.601237*** (0.0296)	1.2543*** (0.112)	4.1765*** (0.3286)	0.7081*** (0.0302)
Foreign participation	0.00953*** (0,0002182)	0.0277** (0.0007)	0.001877** (0.000896)	0.10242** (0.0033)	0.0211** (0.0074)	0.0018* (0.00989)
Constant	-29.2273*** (3.87214)	-95.8459*** 4,981371	-13.94912*** (0.482641)	-15.7267369*** (1.741)	-81.88*** (5.4535)	-1.755*** (0.488)
No of observations	15900	15900	15900	15900	15900	15900
Likelihood Ratio Test (Chi^2)		1075.78 [0.000]	1714.13 [0.000]		380.854 [0.000]	578.69 [0.000]
Wald-test	283.82 [0.000]	1254.42 [0.000]	1203.27 [0.000]	193.73 [0.000]	231.24 [0.000]	
R-square	0.09			0.0619		
Pseudo R-square		0.07	0.42		0.09	0.075

Notes:
Asymptotic standard errors in parenthesis
p-values for regression statistics appear in [ ]
***, significant at the 90% level, **at the 95%, *** at the 99%**

These results suggest that there is some evidence of matching of liabilities and income streams, to the extent that firms in more open sectors[29] tend to have foreign debt more often as well as larger shares of dollar debt. Nonetheless, dollar indebtedness for firms in our sample is quite often trade-

[28] In particular, since the dependent variable is truncated, the appropriate distribution of the error term must take this issue into account. Maximum likelihood procedures, whereby a log-likelihood function having a component for those observations that are "uncensored" and those that are "censored" is maximized, can be applied in this context to obtain consistent estimators.

[29] Besides from these regressions, we also performed regressions where the degree of sectoral openness, defined as the ratio of sectoral exports plus imports to total sectoral production, is considered instead of the openness dummy. Results also indicate that openness, size and the extent of foreign participation are significant determinants of the existence and extent of dollar indebtedness.

related. Thus, in the three final columns of Table 12 we drop the openness dummy and consider instead firms´ exports and imports as additional dependent variables. Initially, we run a simple regression where we control for firm specific effects and obtain very imprecise estimates. As before, this regression can be criticized on the grounds that the dependent variable lies between zero and one. Our Tobit and Probit[30] regressions show a very interesting result: *both* exports and imports are a significant and positive determinant of the existence and extent of foreign indebtedness. Moreover, the coefficient associated with imports is several times larger than the one of exports. Thus, although firms might attempt to "match" their revenue with liabilities, importing firms are actually engaged more often in dollar indebtedness and have a higher share of dollar debt. This highlights the importance of the cost channel that we mentioned in our descriptive section. The importance of imports for dollar indebtedness is quite strong. Actually, in (unreported) regressions where exports and imports are excluded and net exports are included instead, net exports enter significantly and with a *negative* coefficient[31].

6 Conclusions

The recent behaviour of the Colombian economy has been characterized by increased macroeconomic volatility. After a period of significant currency appreciation associated with important capital inflows, the exchange rate experienced a strong real depreciation in response to capital flight. While among policy makers the favorable view of exchange rate devaluation for firm investment has prevailed, there is a recent and increasing concern in the literature for the possible detrimental effects of devaluations in the presence of foreign indebtedness. Foreign denominated currency, it is argued, leads to a negative balance sheet effect that constraint firms' investment.

This paper is an attempt to contribute to this debate on empirical grounds. We examine the determinants of investment for a large sample of Colombian firms in the period 1995-2001. Our results suggest that the effect of a real exchange rate *devaluation* on investment is negative, significant, and economically meaningful. We also find clear evidence indicating that foreign indebtedness, if anything, makes matters worse. Nonetheless, our estimations also imply that there is a positive impact of the *level* of the exchange rate on investment. Furthermore, there is weak evidence indicating that this effect is higher for exporting firms and lower for importing firms. A noteworthy result from our basic estimations is the fact that the real interest rate --and its interaction with corporate debt maturity--, arguably an important determinant of firm investment, is rarely statistically significant.

We also examine the determinants of debt denomination and find that foreign debt is positively correlated with firms´ size and, albeit less strongly, to the extent of foreign ownership. There is evidence that exporting firms and firms in more open sectors tend to have larger shares of dollar debt. Nonetheless, imports are a significant determinant of foreign indebtedness as well, given that dollar indebtedness is often trade-related. The effect of imports on debt denomination is several times larger than that of exports. Thus, although firms might attempt to "match" their revenue with liabilities, importing firms actually engage more often in dollar indebtedness.

[30] Logistic regressions were also performed and results were very similar.
[31] For all estimations we report (and fail to accept) Likelihood Ratio and Wald tests for the joint lack of significance of the included regressors.

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Appendix 1. The BC set-up: summary and extensions

A summary of the BC set-up

In a two-period world, a continuum of firms holding a fraction β of their total liabilities (normalized to 1) in dollars seek to maximize their profits in period t+1 as given by:

$$\pi_{t+1}(e_{t+1}, K_{t+1}; \beta) = g(e_{t+1}; \beta)F(K_{t+1}) - r(W_t)K_{t+1}. \quad (2)$$

The first term at the right hand side of (2) are earnings before interest payments. For each firm, the capital stock at period t, K_t, is predetermined, as is their fraction of dollar debt. Function g captures the response of profits to changes in the real exchange rate. Firms borrow capital at an interest rate that is decreasing in net worth (W):

$$W_t = \pi_t - (\beta e_t + (1-\beta)). \quad (3)$$

Devaluations reduce net worth because they increase the domestic currency value of foreign liabilities. Firms choose K_{t+1} so as to maximize (2) subject to (3) and to an exchange rate level in period t+1 that exhibits persistence, $e_{t+1} = \mu(e_t)$. The F.O.C. implicitly defines an optimal demand for capital, whose derivation with respect to the exchange rate leads to BC's competitiveness and net-worth channels on investment.[32]

$$\frac{dK_{t+1}}{de_t} = \theta_t g'(e_{t+1}; \beta)\mu'(e_t) + \sigma_t \left[g'(e_t; \beta)F(K_{t+1}) - \beta \right]. \quad (4)$$

The first term in (4) is the "competitiveness effect". BC consider the case in which $g'(e_{t+1;}\beta) \geq 0$. As long as the exchange rate exhibits persistence is such that $\mu'(e_t) \geq 0$, this implies a positive competitiveness effect of devaluations on investment. A more general case —for instance, if imported inputs are important in production— should consider that $g'(e_{t+1;}\beta)$ might be negative. The second term in (4), capturing the net worth channel, is ambiguous. If $g'(e_{t+1;}\beta)$ is negative, a devaluation reduces earnings and net worth, leading to a decline in investment. On the other hand, for a sufficiently strong matching of liabilities and income streams ($g'(e_{t+1;}\beta) >> 0$), earnings increase with a devaluation, leading to higher investment and compensating the rise in foreign denominated liabilities (as captured by –β).

Following BC, we consider a "neutral" exchange rate for which the peso value of debt is identical for all firms, so that $g'(\bar{e}_{;}\beta) = \bar{g}$ for all periods and all β and $\frac{d\theta_t}{d\beta} = \frac{d\sigma_t}{d\beta} = 0$. The

[32] Where $\theta_t = \left[-\frac{F'(K_{t+1})}{g(e_{t+1};\beta)F''(K_{t+1})} \right] \geq 0$ and $\sigma_t = \left[g'(e_t;\beta)F(K_{t+1}) - \beta \right] \geq 0$.

differential effect on investment of a devaluation across firms with varying levels of "dollar" indebtedness is:

$$\frac{d}{d\beta}\left[\frac{dK_{t+1}}{de_t}\right] = \frac{dg'(e_{t+1};\beta)}{d\beta}\left[\theta_t \mu'(e_t)\right] + \sigma_t\left[\frac{dg'(e_t;\beta)}{d\beta}F(K_{t+1}) - 1\right] \quad (5)$$

The effect of imported inputs

From (5) it is clear that the effect on investment of a devaluation can be either increasing or decreasing in β. BC consider the case of "weak" matching of liabilities, where $\frac{dg'(e_{t+1};\beta)}{d\beta} \geq 0$.[33] This assumption hinges on the fact that $g'(e_{t+1};\beta)$ has been assumed positive. What if imported inputs are so important that $g'(e_{t+1};\beta) < 0$? Then it might be that $\frac{dg'(e_{t+1};\beta)}{d\beta} \leq 0$; firms with more dollar debt face a sharper *decrease* in profits as the exchange rate depreciates. In this case, a devaluation unambiguously decreases investment, and investment falls more in firms with higher dollar debt.

The effect of lower domestic interest rates

Quitting the "dogged" defense of the exchange rate allows interest rates to decrease. Thus, in addition to the idiosyncratic decrease in net worth, a macroeconomic channel affects the rate at which firms rent capital. Firms maximize profits in period t+1, now given by:

$$\pi_{t+1}(e_{t+1}, K_{t+1};\beta) = g(e_{t+1};\beta)F(K_{t+1}) - \left[r(W_t) + r^*(e_{t+1} - e_t;\beta)\right]K_{t+1} \quad (6)$$

In (6), the second term for the interest rate shows that higher devaluation expectations imply higher domestic interest rates. When the policymaker quits the "dogged" defense of the exchange rate, and a devaluation does occur, expectations for a devaluation disappear or decrease, and interest rates fall: $r'^*(e_{t+1} - e_t;\beta) \geq 0$. Firms with a higher fraction of peso debt will be favored more by a decrease in domestic interest rates[34]. F.O.C for firm's optimization implicitly defines an optimal demand for capital which, in addition to BC's competitiveness and net-worth channels, depends on a "macroeconomic channel":

$$\frac{dK_{t+1}}{de_t} = \theta_t g'(e_{t+1};\beta)\mu'(e_t) + \sigma_t\left[g'(e_t;\beta)F(K_{t+1}) - \beta\right] + \delta_t(\mu'(e_t) - 1). \quad (7)$$

[33] Presumably, risk averse firms will choose a composition of debt that will match the exchange rate sensibilities of their balance sheet and income stream. It could also be the case that creditors charge more to firm's without a proper currency matching. In equilibrium there would be a correlation between currency composition of liabilities and the "tradeability" of output.

[34] Where $\delta = -\left[\frac{1}{g(e_{t+1};\beta)F''(K_{t+1})}\right]r^{*\prime}(\mu(e_t) - e_t) \geq 0$.

The macro effect (third term on the RHS of (7)) has a simple interpretation. As long as $0 < \mu'(e_t) < 1$ —i.e. allowing the exchange rate to weaken today will not lead to a more than proportional weakening tomorrow— a devaluation has a positive impact on investment. The total effect on investment is still ambiguous; ultimately an empirical matter. The differential effect on investment of a devaluation across firms can be found by implicit differentiation of (7). This total effect is the sum of the competitiveness and net worth channels as well as an additional term capturing the "macroeconomic channel":

$$\frac{d}{d\beta}\left[\frac{dK_{t+1}}{de_t}\right] = \frac{dg'(e_{t+1};\beta)}{d\beta}\left[\theta_t \mu'(e_t)\right] + \sigma_t\left[\frac{dg'(e_t;\beta)}{d\beta}F(K_{t+1}) - 1\right] + \frac{1}{g(e_{t+1};\beta)F''(K_{t+1})}\frac{dr^{*}'(\mu(e_t)-e_t)}{d\beta}(\mu'(e_t)-1) \tag{8}$$

The way the macroeconomic effect on investment varies for firms with different proportions of dollar debt —the third term at the RHS of (8)— may be interpreted as follows. First, notice that under the assumption of moderate persistence of the exchange rate –-i.e. $(\mu'(e_t)-1) < 0$ — concavity of the production function implies that $\frac{1}{g(e_{t+1};\beta)F''(K_{t+1})}(\mu'(e_t)-1) > 0$. Thus, the sign of the expression is determined by $\frac{dr'(\mu(e_t)-e_t)}{d\beta}$. Recall that $r^{*}'(\mu(e_t)-e_t) > 0$ and note that for highly "dollar indebted" firms interest rates might increase less if devaluation expectations are high, since such firms presumably depend less on domestic credit conditions. Thus, $\frac{dr'(\mu(e_t)-e_t)}{d\beta}$ is negative and so is the "macroeconomic" channel. In other words, *for firms with a high proportion of dollar debt a devaluation, by decreasing domestic interest rates, will result in a lower increase in investment.* The combined effect of changes in earnings, in liabilities, and in domestic interest rates on the demand for capital is theoretically ambiguous.

Appendix 2. Data definition

In this appendix, we list the main variables used in the analysis. As explained in Section 4, some firm-level data was combined with aggregate macroeconomic or sectoral data in constructing relevant variables. In particular, import input shares were imputed to each firm by mapping each firm's sector with the most disaggregated sector available in National Accounts Data. Sectoral imported input shares were computed in turn as the ratio of imported intermediate purchases by each sector to total intermediate purchases, both domestic and imported. Such data is available from the economy-wide input-output matrix, with 60 sectors being the thinner disaggregation available. Also, in constructing the rate of inventory investment, the real change in inventories was computed by deflating the original firm level data by the most disaggregated data available on sectoral producer price indices (PPI). In those cases were there was no satisfactory disaggregation of the PPI to match the firm's sector, the total national PPI was used. Further details on variables' construction are available form the authors upon request.

Debt Variables

1. Total Debt=Total liabilities. Balance sheet.
2. Short-term Debt=Total liabilities due in less than one year. Balance sheet.
3. Foreign or "Dollar" Debt= Liabilities with foreign banks, corporations and foreign suppliers (long and short-term). Balance sheet annex, no. 9.
4. Short-term Foreign Debt=Short-term liabilities with foreign banks, corporations and foreign suppliers. Balance sheet annex, no. 9.
5. Foreign Financial Debt= Liabilities with foreign banks and corporations (long and short-term). Balance sheet annex, no. 9.
6. Foreign Trade Debt= Liabilities with foreign suppliers. Balance sheet annex, no. 9.
7. Domestic Debt= Liabilities with domestic banks, corporations and national suppliers (long and short-term). Balance sheet annex, no. 9.
8. Short-term Domestic Debt=Current liabilities with domestic banks, corporations and suppliers. Balance sheet annex, no. 9.
9. Domestic Financial Debt= Liabilities with domestic banks and corporations (long and short-term). Balance sheet annex, no. 9.
10. Domestic Trade Debt= Liabilities with national suppliers. Balance sheet annex, no. 9.
11. Leverage=Total liabilities as a share of total assets in the balance sheet.

Investment Variables

1. Investment in fixed capital= Net purchase of properties, plant and equipment. Income statement. For estimation, this variable is expressed as % of total assets.

Other Relevant Variables

1. Total assets. Balance sheet.
2. Exports= Operational income generated abroad. Balance sheet annex, no. 15.
3. Imports= Purchases of goods not produced by the firm and of raw materials abroad. Balance sheet annex, no. 15.
4. Net Exports= Total exports minus total imports. Balance sheet.
5. Interest expense: accrued interest on financial liabilities. Balance sheet annex, no.6.

Macroeconomic Variables

1. Real exchange rate index and bilateral exchange rate. Source: Banco de la República.
2. Real interest rate. Source: Superintendencia Bancaria.
3. Sectoral output and sectoral output growth. Source: DANE.

Appendix 3. Additional econometric results

Appendix Table 1

System GMM Regressions for specification in Table 11, Dollar Debt to total Debt

Dependent Variable: Fixed Capital Investment		
	GMM System	
	1 step	2 step
Independent variables		
Lagged dependent variable	0.0510444***	0.0585711***
	(0.01263)	(0.0115)
DIRECT EFFECTS		
Real exchange rate index	0.0385696	0.0355561
	(0.03182)	(0.03116)
Δ Log (bilateral US "real exchange rate")	-2.69802***	-2.40486***
	(0.5455)	(0.517)
Real interest lending rate	-0.048505	-0.0480274
	(0.482)	(0.4706)
INTERACTIONS		
Δ Log (bilateral US "real exchange rate" - end of period) x Dollar Debt	0.0122787	-0.00193601
	(0.03802)	(0.03672)
Lagged Exports x Real Exchange Rate	0.00027959	-0.00360594
	(0.003878)	(0.003057)
Lagged Imports x Real Exchange Rate	-0.000513359	0.0000514612
	(0.0008275)	(0.0008384)
Real interest lending rate x Short-Term Domestic Debt to Total Domestic Debt	0.0016442	0.0013676
	(0.006161)	(0.006073)
CONTROLS		
Lagged "Dollar" Debt to Total Debt	0.013572	0.0085325
	(0.01192)	(0.01091)
Lagged Exports	-0.126124	0.34411
	(0.4407)	(0.347)
Lagged Imports	0.0405237	-0.00622578
	(0.08473)	(0.08456)
Lagged Short-Term Domestic Debt to Total DomesticDebt	-0.154978	-0.111519
	(0.6849)	(0.6737)
Leverage	0.124027***	0.0753492***
	(0.02276)	(0.01849)
Sectorial Output Growth	0.0387018**	0.0313648**
	(0.01655)	(0.01525)
Wald Test (joint)	231.9 [0.000] **	200.8 [0.000] **
Sargan Test	90.94 [0.000] **	70.59 [0.003] **
Sargan Difference Test	61.85 [0.000] **	41.5 [0.002] **
AR(1) test (N[0,1])	-10.59 [0.000] **	-10.19 [0.000] **
AR(2) test (N[0,1])	0.5139 [0.607]	0.7771 [0.437]

Appendix Table 2

System GMM Regressions for specification in Table 11, Dollar Debt to Total Assets

Dependent Variable: Fixed Capital Investment		
	GMM System	
	1 step	2 step
Independent variables		
Lagged dependent variable	0.0566764***	0.0468656***
	(0.01559)	(0.01443)
DIRECT EFFECTS		
Real exchange rate index	0.0451541	-0.0313687
	(0.04731)	(0.04498)
Δ Log (bilateral US "real exchange rate")	-2.80577***	-2.41334***
	(0.6715)	(0.6354)
Real interest lending rate	0.185431	0.0379565
	(0.254)	(0.2271)
INTERACTIONS		
Δ Log (bilateral US "real exchange rate" - end of period) x Dollar Debt	-0.000995127	-0.00932673
	(0.07717)	(0.07603)
Lagged Exports x Real Exchange Rate	0.000169076	0.00656351
	(0.005743)	(0.004939)
Lagged Imports x Real Exchange Rate	-0.000828499	-0.000483925
	(0.0007389)	(0.0007483)
Real interest lending rate x Short-Term Domestic Debt to Total Domestic Debt	-0.000787003	0.00123948
	(0.003523)	(0.00316)
CONTROLS		
Lagged "Dollar" Debt to Total Assets	-0.0995233**	-0.0716093*
	(0.03973)	(0.03918)
Lagged Exports	-0.0267884	-0.799305
	(0.6639)	(0.5814)
Lagged Imports	0.0759854	0.0510808
	(0.08153)	(0.08129)
Lagged Short-Term Domestic Debt to Total DomesticDebt	0.10093	-0.0940319
	(0.4012)	(0.3613)
Leverage	0.154706***	0.0862704*
	(0.04839)	(0.05067)
Sectorial Output Growth	0.047204**	0.0526959***
	(0.01878)	(0.0173)
Observations	15900	15900
Wald Test (joint)	198.3 [0.000] **	168.9 [0.000] **
Sargan Test	47.02 [0.033] *	46.48 [0.037] *
Sargan Difference Test	16.12 [0.007]	20.63 [0.001]
AR(1) test (N[0,1])	-10.25 [0.000] **	-9.545 [0.000] **
AR(2) test (N[0,1])	0.3910 [0.696]	-0.5802 [0.562]

Notes
Robust standard errors in parenthesis
For GMM estimators, all variables enter in differences
Instruments used include suitably lagged values of the dependent variable as well as lagged levels of foreign indebtec and imports. Length of lags used restricted.
p- values fo regression statistics appear in [ ]
***, significant at the 90% level, **at the 95%, *** at the 99%**

Appendix Table 3

Baseline regressions without interest rate terms, Dollar Debt to Total Debt

Dependent Variable: Fixed Capital Investment					
		GMM Difference		GMM System	
	Fixed Effects	1 step	2 step	1 step	2 step
Independent variables					
Lagged dependent variable		0.060684***	0.0568708***	0.0672911***	0.0555354***
		(0.01331)	(0.01207)	(0.01486)	(0.014)
DIRECT EFFECTS					
Real exchange rate index	0.0289011***	0.104763***	0.0983558***	0.0862359**	0.0306044
	(0.008311)	(0.03226)	(0.02921)	(0.04244)	(0.03766)
Δ Log (bilateral US "real exchange rate")	-4.34678***	-2.68045***	-2.39647***	-3.3374***	-2.08997***
	(0.3637)	(0.7115)	(0.5809)	(0.7207)	(0.6207)
INTERACTIONS					
Δ Log (bilateral US "real exchange rate" - end of period) x Dollar Debt	0.0231572	-0.0142603	-0.0334814	0.00399258	0.0153945
	(0.02135)	(0.04332)	(0.04288)	(0.04396)	(0.04443)
Lagged Exports x Real Exchange Rate	0.000342906*	-0.00514991	-0.00481164	-0.00479346	-0.00141498
	(0.000199)	(0.003747)	(0.003027)	(0.004885)	(0.004345)
Lagged Imports x Real Exchange Rate	-0.00127479***	-0.00016746	0.0000806218	-0.00100591	-0.000471747
	(0.0002518)	(0.0006733)	(0.0006233)	(0.0007464)	(0.0007054)
CONTROLS					
Lagged "Dollar" Debt to Total Debt	0.00485494	-0.033567	-0.0336113*	-0.0121611	0.0035916
	(0.004952)	(0.02223)	(0.01991)	(0.02332)	(0.02317)
Lagged Exports	-0.0328154	0.64407	0.537057	0.622482	0.245857
	(0.02259)	(0.4451)	(0.36)	(0.5631)	(0.5087)
Lagged Imports	0.122729***	-0.00476282	-0.0119237	0.0892918	0.0454266
	(0.02628)	(0.07305)	(0.06632)	(0.08005)	(0.07494)
Leverage	0.0019507	0.0524409	0.0236195	0.145184***	0.141121***
	(0.003806)	(0.04897)	(0.03809)	(0.02833)	(0.0305)
Sectorial Output Growth	0.0171227***	0.00335923	0.003609	0.00125848	0.00686153
	(0.005061)	(0.007191)	(0.006737)	(0.008518)	(0.007539)
Observations	15900	15900	15900	15900	15900
Wald Test (joint)	288.2 [0.000] **	114.0 [0.000] **	112.3 [0.000] **	283.7 [0.000] **	291.7 [0.000] **
Sargan Test		32.61 [0.294]	27.41 [0.550]	54.44 [0.015] *	66.10 [0.001] **
Sargan Difference Test				21.83 [0.001]	38.69 [0.000]
AR(1) test (N[0,1])		-9.639 [0.000] **	-10.11 [0.000] **	-10.06 [0.000] **	-10.07 [0.000] **
AR(2) test (N[0,1])		0.01249 [0.990]	0.6778 [0.498]	-0.3017 [0.763]	-0.05488 [0.956]

Notes
Robust standard errors in parenthesis
For GMM estimators, all variables enter in differences
Instruments used include suitably lagged values of the dependent variable as well as lagged levels of foreign indebtedenss and imports. Length of lags used restricted.
p- values fo regression statistics appear in [ ]
***, significant at the 90% level, **at the 95%, *** at the 99%**

Appendix Table 4

Baseline regressions without interest rate terms, Dollar Debt to Total Assets

Dependent Variable: Fixed Capital Investment					
		GMM Difference		GMM System	
	Fixed Effects	1 step	2 step	1 step	2 step
Independent variables					
Lagged dependent variable		0.0589467***	0.0583056***	0.0576732***	0.0448386***
		(0.01311)	(0.01222)	(0.01464)	(0.01355)
DIRECT EFFECTS					
Real exchange rate index	0.0287329***	0.104392***	0.101862***	0.0832588*	0.00481421
	(0.008303)	(0.03169)	(0.02946)	(0.04479)	(0.04253)
Δ Log (bilateral US "real exchange rate")	-4.3026***	-2.74052***	-2.67441***	-2.93907***	-2.24036***
	(0.3562)	(0.6746)	(0.5651)	(0.6749)	(0.6238)
INTERACTIONS					
Δ Log (bilateral US "real exchange rate" - end of period) x Dollar Debt	0.027396	-0.00984306	-0.0144148	-0.00331825	0.03643
	(0.03872)	(0.07099)	(0.06806)	(0.07513)	(0.07135)
Lagged Exports x Real Exchange Rate	0.000345377*	-0.00515605	-0.00503223*	-0.00581448	-0.000242589
	(0.000199)	(0.003597)	(0.002996)	(0.005033)	(0.004451)
Lagged Imports x Real Exchange Rate	-0.00126955***	-0.000163876	-0.000109809	-0.000640273	0.0000086228
	(0.0002517)	(0.0006756)	(0.0006296)	(0.0007358)	(0.0007332)
CONTROLS					
Lagged "Dollar" Debt to Total Assets	0.00419931	-0.0819874**	-0.0602868*	-0.106134***	-0.0870325**
	(0.01036)	(0.04079)	(0.03552)	(0.04088)	(0.0408)
Lagged Exports	-0.0330111	0.625397	0.558359	0.656571	-0.00328401
	(0.0226)	(0.4188)	(0.3545)	(0.5854)	(-0.5299)
Lagged Imports	0.122137***	-0.00603747	-0.00895804	0.0433722	-0.0140957
	(0.02628)	(0.07308)	(0.06666)	(0.07985)	(0.07862)
Leverage	0.00197065	0.0599638	0.00910562	0.150105***	0.107983***
	(0.003855)	(0.04969)	(0.03874)	(0.0388)	(0.03519)
Sectorial Output Growth	0.0171828***	0.00301954	0.00364243	0.00329561	0.00626816
	(0.00506)	(0.007231)	(0.006803)	(0.007239)	(0.007118)
Observations	15900	15900	15900	15900	15900
Wald Test (joint)	289.7 [0.000] **	114.9 [0.000] **	111.5 [0.000] **	179.3 [0.000] **	145.4 [0.000] **
Sargan Test		32.83 [0.284]	27.81 [0.528]	54.89 [0.013] *	54.91 [0.013] *
Sargan Difference Test				22.06 [0.001]	27.1 [0.000]
AR(1) test (N[0,1])		-9.852 [0.000] **	-10.14 [0.000] **	-10.41 [0.000] **	-10.17 [0.000] **
AR(2) test (N[0,1])		0.1044 [0.917]	0.7362 [0.462]	-0.1024 [0.918]	0.2702 [0.787]

Notes
Robust standard errors in parenthesis
For GMM estimators, all variables enter in differences
Instruments used include suitably lagged values of the dependent variable as well as lagged levels of foreign indebtedenss and imports. Length of lags used restricted.
p- values fo regression statistics appear in [ ]
***, significant at the 90% level, **at the 95%, *** at the 99%**

Appendix Table 5

Regressions with sectoral openness, Dollar Debt to Total Debt

Dependent Variable: Fixed Capital Investment					
		GMM Difference		GMM System	
	Fixed Effects	1 step	2 step	1 step	2 step
Independent variables					
Lagged dependent variable		0.0294205	0.0388331*	0.0433078	0.0797469***
		(0.02412)	(0.02332)	(0.02755)	(0.02251)
DIRECT EFFECTS					
Real exchange rate index	-0.00337767	0.397632	0.313356	0.00644114	0.285041
	(0.005365)	(0.2947)	(0.3126)	(0.21)	(0.1991)
Δ log (bilateral US "real exchange rate" - end of period)	-4.21107***	-3.45025**	-3.93554***	-2.88693*	-3.28616**
	(0.4494)	(1.65)	(1.48)	(1.656)	(1.629)
Real interest lending rate	-0.677727	0.487651	0.384196	2.44553*	2.66785**
	(3.85)	(1.287)	(1.09)	(1.41)	(1.353)
INTERACTIONS					
Δ log(bilateral US "real exchange rate" - end of period) x Dollar Debt	-0.00673149	-0.0435505	-0.044052	0.0205806	-0.0648021
	(0.02462)	(0.07138)	(0.06524)	(0.09244)	(0.08677)
Opennes x Real Exchange Rate	0.000155697**	-0.00272487	-0.00191143	0.000238218	-0.00185396
	-0.00006373	(0.002501)	(0.002631)	(0.001542)	(0.001453)
Real interest lending rate x Short-Term Domestic Debt to Total Domestic Debt	-0.0134551	-0.00753995	-0.00578021	-0.0300923	-0.037315**
	(0.04255)	(0.01676)	(0.01343)	(0.01888)	(0.01866)
CONTROLS					
Lagged "Dollar" Debt to Total Debt	0.00113469	0.0374499	0.0284164	-0.0495786**	-0.025998
	(0.006069)	(0.04729)	(0.04357)	(0.01937)	(0.0179)
Lagged oppennes	-0.0232401***	0.339558	0.229319	-0.0333141	0.197652
	-0.008167	(0.3264)	(0.3433)	-0.1705	(0.1596)
Short-Term Domestic Debt to Total Domestic Debt	0.0188638	0.890709	0.68515	3.4132	4.20517**
	(0.04785)	(1.87)	(1.496)	(2.095)	(2.061)
Leverage	-0.00679583	0.205827*	0.142409	0.23118***	0.152254***
	(0.004827)	(0.1192)	(0.09359)	(0.05314)	(0.03731)
Sectorial GDP growth	-0.00194633	-0.0110969	-0.00500673	0.0555089	-0.0123684
	(0.00957)	(0.08085)	(0.08631)	(0.0687)	(0.0689)
Observations	9766	9766	9766	9766	9766
Wald Test (joint)	200.2 [0.000] **	47.18 [0.000] **	47.42 [0.000] **	164.2 [0.000] **	163.8 [0.000] **
Sargan Test		9.816 [0.709]	8.852 [0.784]	18.39 [0.682]	20.89 [0.527]
Sargan Difference Test				8.574 [0.477]	12.038 [0.211]
AR(1) test (N[0,1])		-4.721 [0.000] **	-4.664 [0.000] **	-5.640 [0.000] **	-3.558 [0.000] **
AR(2) test (N[0,1])		-0.9393 [0.348]	-0.2190 [0.827]	-1.344 [0.179]	-1.365 [0.172]

Notes

Robust standard errors in parenthesis

For GMM estimators, all variables enter in differences

Instruments used include suitably lagged values of the dependent variable as well as lagged levels of foreign indebtedenss and imports. Length of lags used restricted.

p- values fo regression statistics appear in [ ]

***, significant at the 90% level, **at the 95%, *** at the 99%**

Appendix Table 6

Regressions with sectoral openness and no interest rate terms

Dependent Variable: Fixed Capital Investment					
		GMM Difference		GMM System	
	Fixed Effects	1 step	2 step	1 step	2 step
Independent variables					
Lagged dependent variable		0.0330675	0.035885	0.0536369**	0.0753637***
		(0.02545)	(0.02506)	(0.02486)	(0.02736)
DIRECT EFFECTS					
Real exchange rate index	-0.00252178	0.388855***	0.33643***	0.211146***	0.241812***
	(0.005138)	(0.1422)	(0.1295)	(0.06983)	(0.06447)
Δ log (bilateral US "real exchange rate" - end of period)	-4.28733***	-3.10108**	-3.42711**	-4.6546***	-4.28333***
	(0.4592)	(1.539)	(1.371)	(1.353)	(1.186)
INTERACTIONS					
Δ log(bilateral US "real exchange rate" - end of period) x Dollar Debt	-0.00563251	-0.0378105	-0.0227778	0.0185568	-0.00693677
	(0.02453)	(0.07293)	(0.07189)	(0.07579)	(0.06858)
Opennes x Real Exchange Rate	0.00015964**	-0.00257659*	-0.00213878*	-0.00115491**	-0.00142516***
	(0.00006372)	(0.001409)	(0.001268)	(0.0004687)	(0.0004418)
CONTROLS					
Leverage	-0.00760883	0.227978*	0.189498*	0.195444***	0.1371***
	(0.005059)	(0.1248)	(0.1131)	(0.03954)	(0.04378)
Lagged "Dollar" Debt to Total Debt	0.00069548	0.0272179	0.0271557	-0.0437217***	-0.0101801
	(0.006046)	(0.03757)	(0.03566)	(0.01548)	(0.01438)
Lagged oppennes	-0.00237296***	0.325037	0.269293	0.122127**	0.152224***
	(0.008165)	(0.1989)	(0.1795)	(0.05291)	(0.05061)
Sectorial GDP growth	0.00303428	0.0147457	0.00846464	0.0142444	0.0226302*
	(0.006043)	(0.01548)	(0.0136)	(0.0145)	(0.01277)
Observations	9766	9766	9766	9766	9766
Wald Test (joint)	182.7 [0.000] **	46.34 [0.000] **	43.50 [0.000] **	183.6 [0.000] **	182.8 [0.000] **
Sargan Test		10.03 [0.613]	8.205 [0.769]	36.73 [0.061] *	40.14 [0.028] *
Sargan Difference Test				26.7[0.002]	31.935 [0.000]
AR(1) test (N[0,1])		-7.217 [0.000] **	-7.338 [0.000] **	-7.755 [0.000] **	-6.831 [0.000] **
AR(2) test (N[0,1])		-1.138 [0.255]	-0.8457 [0.398]	1.307 [0.191]	1.975 [0.048] *

Notes

Robust standard errors in parenthesis

For GMM estimators, all variables enter in differences

Instruments used include suitably lagged values of the dependent variable as well as lagged levels of foreign indebtedenss and imports. Length of lags used restricted.

p- values fo regression statistics appear in [ ]

***, significant at the 90% level, **at the 95%, *** at the 99%**

Appendix Table 7

Time effects regressions

Dependent Variable: Fixed Capital Investment					
		GMM Difference		GMM System	
	Fixed Effects	1 step	2 step	1 step	2 step
Independent variables					
Lagged dependent variable		0.0582909***	0.0547558***	0.0711383***	0.0791081***
		(0.01316)	(0.01193)	(0.01473)	(0.01544)
INTERACTIONS					
Δ Log (bilateral US "real exchange rate" - end of period) x Dollar Debt	0.0199352	-0.0180206	-0.0330116	-0.0210648	-0.0257659
	(0.02142)	(0.03998)	(0.03862)	(0.04505)	(0.04515)
Lagged Exports x Real Exchange Rate	0.00040213**	-0.00435219	-0.00338736	-0.00341193	-0.00496478*
	(0.0001977)	(0.003582)	(0.002572)	(0.003941)	(0.00295)
Lagged Imports x Real Exchange Rate	-0.000463742*	0.000185679	0.000186622	-0.000389001	0.0000298742
	(0.0002713)	(0.0007086)	(0.0005801)	(0.0007321)	(0.0006291)
Real interest lending rate x Short-Term Domestic Debt to Total Domestic Debt	0.0137815	0.000748276	-0.000231398	0.00226879	0.00242485
	(0.03052)	(0.005404)	(0.004989)	(0.006251)	(0.005356)
CONTROLS					
Lagged "Dollar" Debt to Total Assets	0.00592949	-0.0263088	-0.0271308	-0.0300185**	-0.0189103
	(0.004973)	(0.02735)	(0.02593)	(0.01328)	(0.01199)
Lagged Exports	-0.0378848*	0.544223	0.379081	0.542672	0.696577**
	(0.02247)	(0.4074)	(0.2935)	(0.4672)	(0.3414)
Lagged Imports	0.0431246	-0.0354086	-0.031298	0.0190108	-0.020806
	(0.02784)	(0.07706)	(0.06139)	(0.07757)	(0.06501)
Lagged Short-Term Domestic Debt to Total Domestic Debt	-0.0126618	-0.0713125	0.0272706	-0.323294	-0.292693
	(0.03421)	(0.5965)	(0.5429)	(0.6913)	(0.5944)
Leverage	-0.000246901	0.0700531	0.0461119	0.0782022**	0.0525959***
	(0.003721)	(0.04999)	(0.04006)	(0.03067)	(0.01922)
Observations	15900	15900	15900	15900	15900
Wald Test (joint)	17.83 [0.037] *	48.10 [0.000] **	44.60 [0.000] **	153.0 [0.000] **	151.9 [0.000] **
Wald Test (time)	189.0 [0.000] **	59.59 [0.000] **	74.54 [0.000] **	65.41 [0.000] **	108.4 [0.000] **
Sargan Test		35.08 [0.240]	28.90 [0.523]	94.57 [0.000] **	64.78 [0.022] *
Sargan Difference Test				59.49 [0.000] **	31.935 [0.004] **
AR(1) test (N[0,1])		-9.891 [0.000] **	-10.10 [0.000] **	-9.816 [0.000] **	-10.48 [0.000] **
AR(2) test (N[0,1])		0.1749 [0.861]	0.6740 [0.500]	-0.8858 [0.376]	-0.3716 [0.710]

Notes
Robust standard errors in parenthesis
For GMM estimators, all variables enter in differences
Instruments used include suitably lagged values of the dependent variable as well as lagged levels of foreign indebtedenss and imports. Length of lags used restricted.
p- values fo regression statistics appear in [ ]
***, significant at the 90% level, **at the 95%, *** at the 99%**