

BORRADORES DE ECONOMÍA



Short vs Medium-Run: Exchange
Rate Movements, Investment
and the Currency Composition of
Balance Sheets

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No. 1354
May 2026



Corto vs mediano plazo: movimientos del tipo de cambio, inversión y la composición por monedas de las hojas de balance

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Resumen

Desentrañamos empíricamente los efectos de corto y mediano plazo de los movimientos del tipo de cambio sobre la inversión de las empresas no financieras en Colombia entre 2005 y 2019. Encontramos que una depreciación estructural del peso afecta negativamente la inversión a través de un efecto en el balance para las empresas con deuda en moneda extranjera (ME). Las exportaciones ofrecen una cobertura natural contra las fluctuaciones del tipo de cambio, pero solo en el corto plazo. Los contratos forward en ME protegen a las empresas frente a depreciaciones sorpresivas de la moneda; sin embargo, implican un costo de oportunidad en términos de inversión real. También encontramos que, en períodos de depreciación del peso frente al dólar americano, las grandes empresas realizan coberturas financieras. Asimismo, las empresas orientadas a las exportaciones y las que tienen un componente extranjero accionario importante, utilizan coberturas naturales y con las casas matrices para protegerse de los movimientos cambiarios. Racionalizamos nuestros hallazgos con la literatura de macroeconomía internacional y microfinanzas.

Clasificación JEL: F31, F41, G11, G32

Palabras clave: Deuda en ME, tasa de cambio, cobertura, descalce cambiario, inversión

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Short vs Medium-Run: Exchange Rate Movements, Investment and the Currency Composition of Balance Sheets

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Abstract

We empirically disentangle the short vs medium-run effects of exchange rate movements, on the investment of non-financial firms in Colombia from 2005 to 2019. We find that a structural depreciation of the peso weights on investment through a balance-sheet effect for firms with Foreign Currency (FC) debt. Exports provide a natural hedge against exchange rate fluctuations but only in the short-run. FC forwards protect firms against surprise currency depreciations; nevertheless, they present a cost of opportunity in terms of real investment. We also find that in periods of a depreciated exchange rate, big firms financially hedge while export-oriented and foreign firms use natural hedging and their relationship with headquarters to protect themselves against exchange rate movements. We rationalize our findings with the international macro and micro-finance literature.

JEL Classification: F31, F41, G11, G32

Keywords: foreign currency debt, exchange rate, hedging, currency mismatch, investment.

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1 Introduction

The inflation targeting framework with a floating exchange rate and free capital mobility has proven essential in reducing inflation levels while helping to stabilize the growth of developed and developing countries (Svensson (2011)). However, exchange rate variations may weigh on domestic activity when they cannot be hedged. An example is the transmission of exchange rate shocks to the domestic economy through firms' balance sheets conditional on financial frictions (Krugman (1999), Aghion et al. (2001), Céspedes et al. (2004), Aghion et al. (2004)).

Especially, in economies where exports are invoiced in a dominant currency (Casas et al. (2017)), limiting the role of exports in external adjustment as a consequence of the absence of the competitiveness effect of depreciations (Casas et al. (2020)). The lack of an increase in the external demand for firms' production, accompanied by practical reasons that limit their ability to use exports as a natural hedge (Alfaro et al. (2023)), leave firms vulnerable against exchange rate risk.

With the growth of a liquid and robust Foreign Currency (FC) derivatives market, the corporate private sector can help isolate the economy from extreme exchange rate fluctuations. If firms are able to set the value of the future exchange rate at which they repay their FC financial debt, they would protect their net worth and therefore their investment plans. Similarly, if firms set the value of future exchange rate at which they repay their imported inputs, they would insulate their marginal costs from pressures of exchange rate depreciations, allowing them to maintain steady their optimal mark-ups without extreme price setting movements. As a result, the adjustments of the Central Bank's intervention rate as a response to external shocks would smooth across time, and the magnitude of its increases would diminish.

In Medellín and Restrepo (2024), we show, in the context of an Emerging Market Economy such as Colombia, the regulations, policy interventions and market distortions that limit the development and sophistication of the FC forward market. In this paper, we continue with this agenda but now we evaluate the protective power of FC forwards on firms' investment in fixed capital, against exchange rate surprises.

Our contribution to the literature is twofold. First, we evaluate the short and medium-run effects of

hedged and unhedged FC debt on firm-level investment. Second, we document heterogeneous drivers and consequences of FC debt and FC hedging against exchange rate surprises, amid periods of different equilibrium exchange rates.

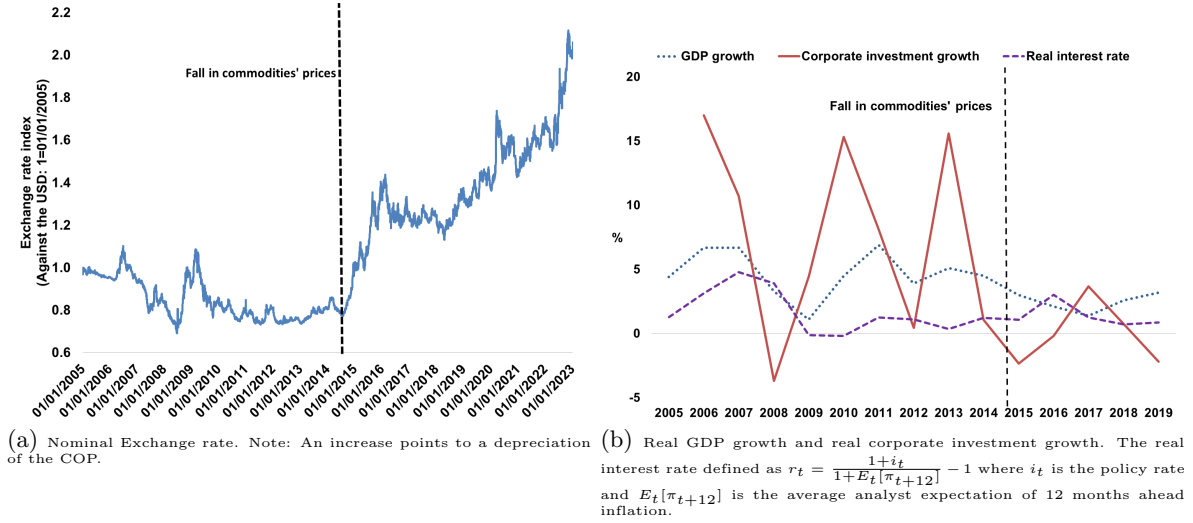
For this, we construct a data-set of Colombian non-financial firms' balance sheet and income statements from 2005 to 2019. This time span is of extreme interest as it can be divided by two distinctive periods. Figure 1, shows that between 2005 and 2013 there were large capital inflows and a long-run exchange rate appreciation (panel (a)) accompanied by robust economic growth (panel (b)). Then, after the collapse in oil prices in 2014, the exchange rate depreciated sharply –the average price of the dollar in Colombian peso for the 2014-2019 period was 39 percent higher in comparison to 2005-2013– and growth rates halved¹. Within these two periods there were two important depreciations of the bilateral exchange rate COP/USD. The Global Financial Crisis (GFC) between 2008 and 2009, where the COP depreciated by 40 percent in only 8 months; and, the collapse of commodity prices between 2014 and 2016, where the exchange rate depreciated by 60 percent in a year and a half. We will use these exchange rate variations to compare firm reactions to exchange rate shocks in periods with two different exchange rates of equilibrium².

Figure 1, panel (b), also shows the corporate investment growth and the real interest rate. Similarly to the exchange rate behaviour, corporate investment growth exhibits two marked periods: before and after the shock in commodity prices. Between 2005-2013 the average investment growth was 8.5 percent, from 2014 to 2019 it was 0.1 percent. Although we do not want to neglect the neoclassical real interest rate channel as a driver for investment (Ramsey (1928), Koopmans (1965), Cass (1966)), we want to point out that this fall in investment does not seem to respond to a structural variation of the real interest rate (with an average of 1.7 percent during the first period and 1.4 percent during the second period).

¹The average between 2005-2013 was 2032 COP/USD against 2831 COP/USD for 2014-2019.

²In this paper, the term "equilibrium exchange rate" refers to the observed average nominal exchange rates over the medium term, with no explicit reference to a model of equilibrium.

Figure 1: Nominal Exchange Rate COP/USD and Real Economic Growth (2005-2019)



Source: Authors' estimations based on Departamento Administrativo Nacional de Estadística and Banco de la República.

Therefore, besides a weaker aggregate demand^{3 4 5} there are two plausible explanations for the fall of investment: i) the accumulation of uncovered FC debt (on average uncovered FC debt was 3.5 percent of GDP higher in the second period) in tandem with a more depreciated exchange rate; and ii) the fall in oil prices⁶ (the average annual growth in the price of Brent oil per barrel was +15 percent in the first period vs -4 percent in the second period). In this paper, we want to quantify the non-financial firm level importance of the first channel procuring to control for the second channel.

Myers (1977) shows that debt overhang leads to under-investment by firms, as new capital cannot be raised when profits primarily benefit existing debt holders instead of new investors. More generally, debt overhang can crowd out private investment in general equilibrium via higher borrowing costs (Krugman (1988), Kürsat et al. (2024)). The result will be a firm de-leveraging process during which

³Increased uncertainty might be another plausible candidate for a decrease of investment. We construct a proxy using the dispersion in the prediction of analysts for the exchange rate. It was not statistically significant in any of our exercises, suggestive evidence of no structural shift in uncertainty.

⁴From the political point of view, during this time period the peace process with the guerrilla armed group FARC was negotiated (2012-2016) and signed (2016). Although there is micro-economic evidence that this peace process increased business credit in FARC municipalities (de Roux and Martínez (2021)), this increase in long-term investments were concentrated in the periphery in small agricultural businesses, with little macroeconomic implications (Hofstetter (2016)). Nevertheless, in our robustness checks, we control for sector-year fixed effects which should capture this differential shock to agricultural sector firms.

⁵From the policy perspective, during this time-span there had been 8 tax reforms in Colombia. 5 before 2014 and 3 after. During both periods there were both reforms that increased the cost of capital and others that decreased it. We expect year fixed effects to capture the variation in investment arising from tax adjustments.

⁶The fall in oil prices was detrimental for Colombia. The oil and mining sector accounts for 10 percent of fiscal revenues, it produces more than half of the economy's exports, and it attracts almost a third of Colombia's FDI.

firms cut down investment. Kalemli-Özcan et al. (2022) test for this and find that the leverage channel can explain 40 percent of the cumulative decline in aggregate investment of European firms over four years after the Sovereign-debt crisis. We want to further explore the impact of leverage when part of the debt is denominated in FC and there is unequal access to currency hedging.

We carry-out two different set of regressions with two different econometric techniques. The first set enquires for the change in the FC indebtedness and hedging decisions of firms between the two periods of study, according to their characteristics (e.g size, export orientation and foreign ownership), conditional on the exchange rate. With the help of a tobit estimator, we find that bigger, more-export oriented and foreign firms, are associated with larger shares of FC debt and longer positions in the forward market during the first period of study. During the second period, larger firms decreased their FC debt and increased their long positions, while more export oriented and foreign firms increased their FC debt and decreased their long positions. Big firms rely more in financial hedging; export-oriented and foreign firms seem to profit from a natural hedge and FDI from their headquarters. These movements in the variables of interest are a consequence of choices by firms and not a result of mere revaluations of the exchange rate.

In the second set of regressions, we follow the theoretical model of Cowan and Hoyt (2002) and Cowan and Hoyt (2008). In this framework, movements of the exchange rate can affect investment through three different channels: i) The competitiveness effect of an exchange rate depreciation; ii) The nominal revaluation effect of exports; and iii) The balance sheet effects of FC debt. To empirically capture these effects, we apply dynamic panel techniques, complemented with the construction of a measure of exchange rate surprises: the percentage difference between the realized exchange rate and the average/median analysts' expectation.

We find that a currency depreciation depress investment through a balance sheet effect. However, investment is more sensitive with respect to structural shrinks in net-worth, than to transitory reductions of net-worth: Exchange rate temporary variations do not reduce investment as much as a medium-run shift in the exchange rate of equilibrium.

We also document that export-oriented firms do not profit from the competitiveness effects of exchange

rate depreciations as a consequence of invoicing in a dominant currency⁷, but they do benefit from a positive effect of the revaluation of exports in domestic currency. This nominal revaluation effect more than compensates for the lack of the competitiveness effect of exports.

Concerning financial hedging, we find that when the exchange rate of equilibrium is more depreciated, there is a negative effect of hedging on investment. Given that the forward contracts become more expensive, financial frictions become binding and firms face a trade-off between real investment and hedging against exchange rate uncertainty (Rampini and Viswanathan (2010)). Nonetheless, firms that hedge see an increase of investment when faced with exchange rate short-run surprises. If the currency depreciation is big enough, the cost of opportunity of hedging in terms of forgone real investment disappears. FC forwards are an effective protection against exchange rate transitory movements.

The Cowan and Hoyt's framework also allows to disentwine the double shock faced by firms of the oil and mining sector as a consequence of the negative correlation between the exchange rate and commodity prices. Similarly to the firms of other sectors, when the exchange rate depreciates, firms from the oil and mining sector would suffer from the balance sheet effects of a currency depreciation through their debt in FC; but, unlike firms in other sectors, they would experience a negative shock to their earnings as the price of their production falls. To isolate our results from the double shock faced by these firms, we capture sector specific shocks with the sector-time fixed effects. On top of this, as a robustness check, we drop firms from these sector. Results hold.

Another matter of concern that may arise, is the sensitivity of our results with respect to changes in the market valuation of firms in our sample and its effects on their investment (Brainard and Tobin (1968), Tobin (1969)). If we take firms in the oil and mining sector as an example, as the price of their product falls, the market valuation of firms in these sectors falls, which could have a negative impact on their investment decisions (Tobin's Q). Consequently, we introduce a dummy for listed firms. The coefficient is statistically significant and negative in all specifications. Listed firms see a differential decline in their investment in comparison to non-listed firms. However, all the aforementioned effects hold: they are not driven by Tobin's Q.

Related Literature. – This paper relates to the financial accelerator literature initiated by the sem-

⁷Gopinath et al. (2020) document how Colombian firms invoice more than 98 percent of their exports in USD.

inal paper of Bernanke and Gertler (1989), where the premium of external credit is decreasing in net-worth and therefore net-worth has an effect on investment. In our particular case, we follow the literature that introduces the financial accelerator economic mechanism in to the context of an open economy. According to this view, substantial levels of FC denominated liabilities imply the possibility of self-fulfilling crises: a loss of confidence by foreign investors and the capital flight that results in a currency depreciation and a balance sheet effect that depresses investment (Krugman (1999), Aghion et al. (2004), Aghion et al. (2001), Céspedes et al. (2004)).

We also connect with the international trade (Gopinath and Itskhoki (2021)), macroeconomics (Gopinath and Stein (2020), Casas et al. (2017)) and finance (Alfaro et al. (2023)) literature showing that, in a world of dominant currencies, firms tend to invoice in vehicle currencies and this can have real effects. We are interested in the economic mechanisms that preclude firms from exploiting the competitiveness effects of currency depreciations through their exports. In the context of an economy that invoices in a dominant currency, a depreciation with respect to this currency does not move the relative prices, and therefore, the increase in the external demand predicted by the Producer Currency Paradigm does not occur.

To counteract the lack of the competitiveness of exports, firms have at their disposal a variety of financial products in the FC derivatives market to protect themselves against balance sheet mismatches. Our findings echoes the theoretical literature of hedging, where financial protection can add value to the firm (Froot et al. (1993)), more so, when faced with exchange rate shocks in periods of a depreciated exchange rate of equilibrium. Nonetheless, we also find evidence of how financial frictions act as a binding constraint on firms access to the supply of financial products. Given their net-worth constraint, firms cannot access the size enhancement and hedging products simultaneously (Rampini and Viswanathan (2010)). As a consequence, for constrained firms, there is a trade-off between real investment and FC hedging. In the case of non-financial firms in Colombia, this constraint becomes binding in periods of a depreciated exchange rate of equilibrium, where forward contracts become more expensive.

From an empirical perspective, this paper is related to Caballero (2021). The author constructs a novel database of stocks of FC bonds issued by 7000 firms from 15 emerging economies⁸ between 2000-2015.

⁸India, Indonesia, Korea, Malaysia, Philippines, Israel, Poland, South Africa, Turkey, Brazil, Chile, Colombia, Mexico

The author finds that a depreciation of 10 percent is associated with a ratio of capital expenditures to assets between 0.3 and 0.6 percentage point less for firms with outstanding stocks of FC bonds in the year following the depreciation. The difference with this paper is twofold. First, we concentrate not only in firms with FC bonds but also in firms with FC bank loans. Second, we use the case study of non-financial firms in Colombia instead of a panel of firms of different countries. Other case studies that found a robust, negative and significant balance sheet effect are Galiani et al. (2003) for Argentina; Cowan et al. (2005) for Chile; Endr sz and Harasztosi (2014) for Hungary; Aguiar (2005) for Mexico; and Kim (2016) and Kim et al. (2015) for South Korea. There are also examples of case studies where there is an absence of the balance sheet effect, for Colombia Echeverry et al. (2003), and for Brazil Bonomo et al. (2003).

The rest of the paper is organized as follows. Section 2 presents the data-set, provides the descriptive statistics and stylized facts. Section 3 reviews the theoretical framework of Cowan and Hoyt (2008) and Cowan and Hoyt (2002) that inspire the reduced form specification for the empirical exercise. Section 4 has the econometric specifications, identification strategy and results. Section 5 concludes and derives policy implications.

2 Data

In the first part of this section we present the data-set, its sources, along with its main descriptive statistics. In particular the aggregate evolution and components of financial FC debt, FC forwards, net-exports, and an overall measure/proxy for balance sheet exposure. In the second part, we provide firm-level characteristics and descriptive statistics for the two periods of interest. In the third part, we document the stylized facts related to the distribution of firm-level investment in fixed assets and balance sheet exposure amid the two periods of study, and their correlation. In the final section, we depict and explain the different measures of exchange rate surprises constructed using the Banco de la Rep blica de Colombia's (BdR⁹) survey to analysts.

and Peru.

⁹The Central Bank of the Republic of Colombia.

2.1 Data-set

The data-set contains information on the end of year balance sheet and income statement of non-financial firms in Colombia, provided by the Colombian Societies Superintendency (SS) and the Financial Superintendency of Colombia (SFCC) from 2005 to 2019. This standardized data-set covers approximately 40 percent of Colombia’s formal firms¹⁰.

The information is supplemented by the currency composition of assets and liabilities, firm-level Foreign Direct Investment (FDI) and the use of financial derivatives, all from BdR. The data-set also contains firm level imports (CIF) and exports (FOB) from DANE-DIAN¹¹. The definition of all variables are reported in annex A. All firm level variables are in constant 2008 Colombian Peso (COP) deflated with the CPI¹². For the construction of exchange rate shocks, we use the BdR’s survey to analysts of financial institutions resident in Colombia.

On average, between 2005 and 2019, these firms’ FC debt accounted for 66 percent of the private corporate non-financial sector’s FC debt, 67 percent of total FDI, 73 percent of exports, 65 percent of imports, 26 percent of long positions in the FC forward market, and 40 percent of short positions.

The number of firms per year in the data-set range between 19,744 and 33,247 with an average of 23,963 firms. On average, 14 percent of the observations are firms that belong to foreigners (who own more than 50 percent of the shares of the firm), 26 percent belong to the tradable sector, and 10 percent have financial FC debt.

Table 1 summarizes the composition of aggregate financial FC debt between bonds and loans. The stock of bonds present a positive trend until 2013, year after which the trend becomes negative. This is not the case for firms that have FC loans with banks. The stock of FC loans kept increasing after 2013. As a result, the accumulation of financial FC debt of the firms in our dataset increased significantly after 2013¹³.

¹⁰We compare with the data set that holds the universe of Colombia’s formal firms: Planilla Integrada de Liquidación de Aportes (PILA), the official registry and payment system of payroll taxes and social security contributions for formal employers and workers in Colombia.

¹¹DANE is the acronym for the Colombian National Administrative Department of Statistics. DIAN is the acronym for the Colombian National Tax and Customs Administration.

¹²For this section we used the nominal COP/USD exchange rate to express all variables in USD. This with the intention of the reader having clearer orders of magnitude for firm’s level variables.

¹³Table 1 does not include trade-credit. After 2013 firms are no longer required to report it to the Central Bank.

Table 1: Composition of Financial FC Debt

Year	Number of Firms with Bonds	Number of Firms with Loans	Bonds in USD Millions (1)	Loans in USD Millions (2)	Financial debt in USD Millions (3) = (1) + (2)
2005	5	1505	882	7219	8101
2006	4	1613	214	6829	7044
2007	4	1569	164	8271	8435
2008	5	1630	147	8376	8523
2009	6	1806	1571	9172	10743
2010	4	2135	1500	10458	11958
2011	4	2648	1446	17986	19432
2012	5	2850	2083	15953	18035
2013	4	3118	4231	15070	19300
2014	5	3458	1041	26940	27981
2015	5	3517	1452	25275	26726
2016	5	2979	1372	22387	23759
2017	3	2802	1289	21545	22834
2018	3	2910	1224	29835	31059
2019	2	2737	1177	19243	20419

Source: Authors' calculations based on SS, DIAN-DANE, SFC and BdR.

Table 2 contains the evolution of Balance Sheet exposure and its components. Balance sheet exposure is defined as the difference between FC liabilities, FC assets and net forwards. Net forwards is defined as the difference between long and short positions in the derivatives' market. Net exports are not included in the balance sheet exposure definition but must be accounted as off-balance sheet exposure (last column of table 2). The balance sheet exposure defined above is only a proxy because: i) The maturities between FC debt, FC assets and FC derivatives are not necessarily the same. ii) Data limitations do not allow to perfectly match the FC derivatives with the FC liabilities that they hedge.

Overall, aggregate FC liabilities grew faster than aggregate FC assets between 2005 and 2019. While on average, from 2005 to 2013, FC assets were 16 percent of FC liabilities, over the 2014-2019 period they represented 12 percent. Table 2 also shows a shift in the aggregate behavior of net forwards and net exports between the two periods of study. On the one hand, during the period of a depreciated exchange rate of equilibrium, the long positions in the FC forwards market became bigger than the short positions: firms were hedging more against balance sheet effects of FC debt through the purchase of FC on the forward market. On the other hand, the natural hedge of the economy decreased as net exports became negative. The economy started importing more than what it was exporting as a consequence of the collapse in the world demand of commodities. Despite of the increase in the financial hedge, balance sheet exposure expanded significantly while the natural hedge plumped.

Table 2: Foreign Currency Balance-Sheet Exposure (in USD Millions)

Year	FC Debt (1)	FC Assets (2)	Net Forwards (3)	Balance Sheet Exposure (4) (4) = (1)-(2)-(3)	(5) Net Exports
2005	8101	2153	-915	6863	3276
2006	7044	2406	-488	5126	1796
2007	8435	1944	-360	6850	1188
2008	8523	752	-258	8030	1565
2009	10743	917	-544	10370	3522
2010	11958	776	-5954	17136	4994
2011	19432	1118	-1321	19636	9549
2012	18035	2265	-1918	17688	9337
2013	19300	3221	-1331	17411	6194
2014	27981	4192	1909	21880	-2878
2015	26726	2607	1880	22240	-8437
2016	23759	3849	2257	17653	-7849
2017	22834	1081	2489	19265	-3745
2018	31059	4362	1267	25430	-3722
2019	20419	2131	1276	17012	-4873

Source: Authors' calculations based on SS, DIAN-DANE, SFC and BdR.

2.2 Firm Characteristics: 2005-2013 vs 2014-2019

Table 3 describes the evolution of the main firm characteristics in our data between the two periods of interest. In the second period, non-financial firms in Colombia are bigger (in terms of real assets) compared to the first period; both the intensive and extensive margin of exports are smaller –the economy has a smaller natural hedge; the intensive margin of FDI is also reduced, but the extensive margin is higher; the intensive margin of FC debt is higher while the intensive margin is lower; the long positions in the forward market are reduced but the number of firms that hedged is larger; the opposite case in the short side of the market where the shares of short position forwards are higher, while the number of firms is lower¹⁴. These movements have an effect in the increase of the firm-level balance sheet exposure between the two periods.

From the numbers shown in table 3, it is very difficult to disentwine if movements in FC transactions (e.g. FC debt and FC forwards) and balance sheet exposure are a firm's choice or a legacy given exchange rate movements. Although, it is true that by normalizing by total liabilities the exchange rate revaluation effect is also captured by the denominator, we cannot claim that the increase in the shares of FC transactions are fully explained by firm choices. To have a preliminary idea of the size of the legacy effect on FC debt, in figure 2, we compare the observed ratio of FC debt to liabilities with the FC debt to liabilities ratio with a constant exchange rate (2005 value for both numerator and the

¹⁴In annex B, we show the behavior of the distribution of these variables during both periods of study.

Table 3: Firm Characteristics

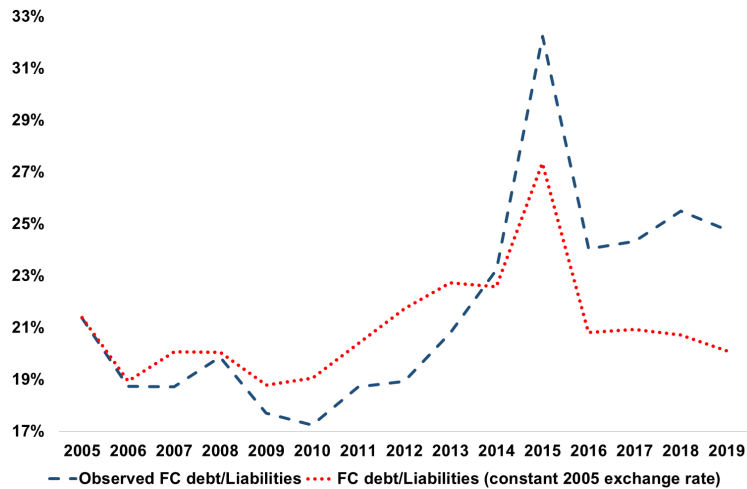
Period Variable	2005-2013			2014-2019		
	Average	Median	# of Firms	Average	Median	# of Firms
Size (Log of Assets)	3.4	3.3	–	4.1	4.1	–
Exports/Sales	18%	5.3%	31,399	16%	4.9 %	20,658
Share of FDI	65%	68%	10,569	58%	57 %	11,584
FC debt/Liabilities	18%	10%	18,649	23%	13%	17,637
Long Position Forward/Liabilities	23%	14%	1830	18%	11%	6453
Short Position Forward/Liabilities	16%	10%	5305	24%	14%	1498

Note: Liabilities do not include equity and therefore are not equivalent to total assets.

Source: Authors' calculations based on SS, DIAN-DANE, SFC and BdR.

FC component of the denominator). From 2005 to 2013, the ratio with a constant exchange rate was on average 1 p.p above the observed ratio. From 2014 to 2019, the ratio with a constant exchange rate was on average 3.6 p.p below the observed ratio. During the whole period of study, the ratio with a constant exchange rate was 0.7 p.p above the observed ratio. In section 4.1 we will control for different exchange rate definitions that will allow us to claim that the increases in the shares of these FC transactions are not driven by exchange rate legacy effects but by firm's choices.

Figure 2: Legacy effect - FC debt to liabilities ratio - Observed vs Constant Exchange Rate



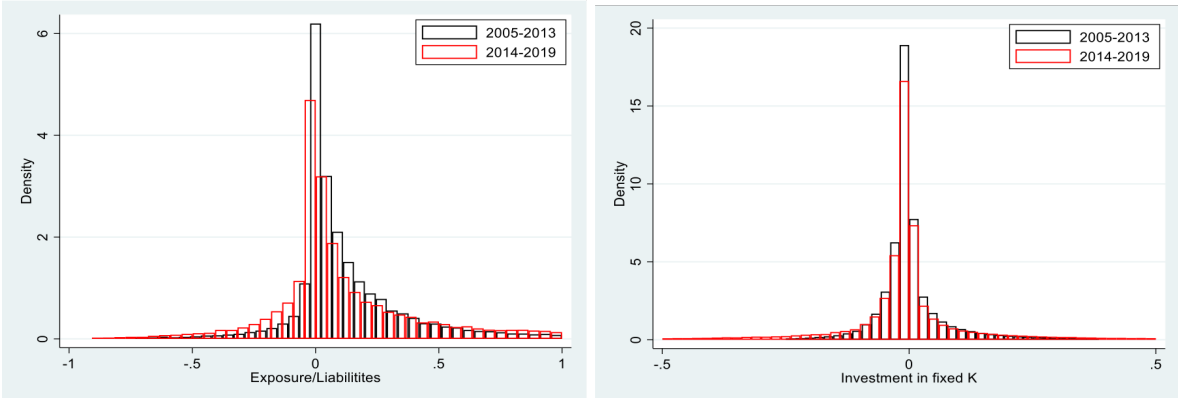
Source: Authors' calculations based on SS, DIAN-DANE, SFC and BdR.

2.3 Firm-level Investment in Fixed Capital and Balance Sheet exposure: 2005-2013 vs 2014-2019

Figure 3 shows the evolution of firm-level balance sheet exposure (panel (a)) and net investment, defined as the addition of physical properties as equipment, edifications and on going constructions as

a share of previous period's total assets (panel (b)). Between the two periods, balance sheet exposure did not only grow in the aggregate but also as a share of firm level liabilities. As it is shown, the distribution shifted right after 2014, in particular, the mass of firms with large exposures became bigger. The average balance sheet exposure increased from 10 percent of liabilities to 11 percent, while the median increased from 4 to 5 percent. With respect to net investment in fixed capital, the mass of firms with a negative investment increased after 2014, while the mass of firms with positive investment decreased. On average the investment in fixed capital as a share of assets decreased from 0.24 percent to -0.68 percent, while the median decreased from -0.4 percent to -0.44 percent. Figure 4 shows that an increase of the balance sheet exposure is associated with a decrease of investment in fixed capital. This negative relationship is more pronounced in the 2014-2019 period when balance sheet exposures were larger.

Figure 3: Investment and Balance Sheet Exposure: 2005-2013 vs 2014-2019

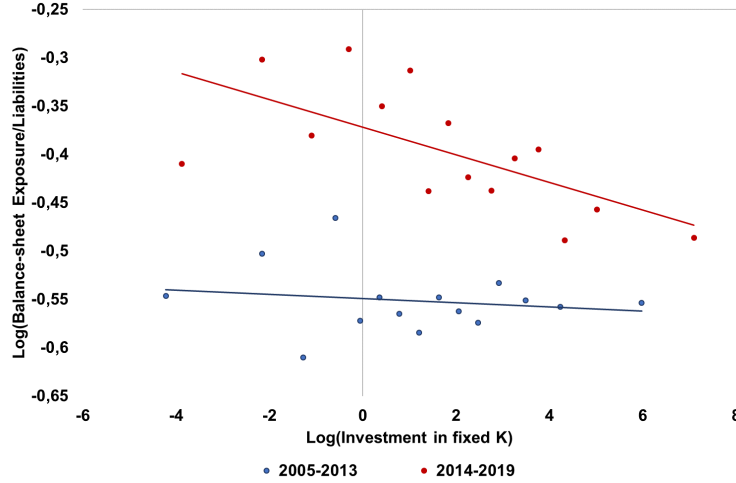


(a) Balance Sheet Exposure

(b) Net Investment

Source: Authors' calculations based on SS, DIAN-DANE, SFC and BdR.

Figure 4: Correlation of Investment with Balance Sheet Exposure: 2005-2013 vs 2014-2019



Note: Binscatter with 15 bins per period.

Source: Authors' calculations based on SS, DIAN-DANE, SFC and BdR.

2.4 Exchange Rate Surprises

A fundamental component of the identification strategy is the construction of exchange rate surprises.

The exchange rate surprise is defined as:

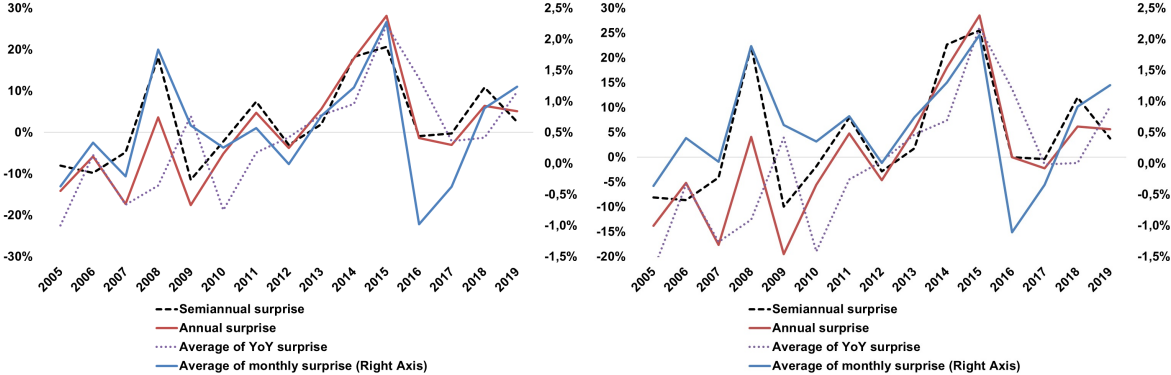
$$\epsilon_t^{ER} = \frac{NER_t - E_{t-1}[NER_t]}{NER_t}. \quad (1)$$

Where NER_t is the realized nominal exchange rate against USD in t ; $E_{t-1}[NER_t]$ is the analysts' expectations from BdR's survey to analysts, formed in $t - 1$ about the nominal exchange rate in t . We construct 8 series of surprises in total, using either the average or median expectation of analysts: i) the year average of monthly surprises; ii) average of YoY surprises over 12 months; iii) the surprise in December with respect to what analysts expected 12 months before; iv) the surprise in December with respect to what analysts expected 6 months before. The year average of monthly surprises and the six months ahead surprise were adjusted (multiplied by 12 and 6 respectively) to be comparable with the yearly surprise.

Figure 5 panel (a) shows the four series constructed with the average analyst expectation while panel (b) presents the series constructed with the median analyst expectations. The difference between the

series constructed with the average or median expectation is negligible. Table 4 shows how the great majority of series are highly correlated, with the exemption of the average YoY surprise (with the median or average expectation), which correlates much more weakly with the other exchange rate surprises.

Figure 5: Exchange Rate Surprises



(a) Shock with average analyst expectation

(b) Shock with median analyst expectation

Source: Authors' calculations based on BdR.

Table 4: Correlations between ER surprises, 2005-2019

[Correlation among surprises]

	month av	year av	semiannual av	month med	year med	semiannual med	YoY med	YoY av
month av	1							
year av	0.705	1						
semiannual av	0.741	0.878	1					
month med	0.992	0.660	0.726	1				
year med	0.684	0.998	0.875	0.638	1			
semiannual med	0.768	0.872	0.996	0.751	0.869	1		
YoY med	0.389	0.677	0.414	0.309	0.672	0.430	1	
YoY av	0.395	0.676	0.411	0.314	0.671	0.427	0.9998	1

Source: Authors' calculations based on BdR.

3 Theoretical Framework

In this section we do a summary of the theoretical framework presented by Cowan and Hoyt (2002). This framework guides our reduced form estimations. We describe its setup, and analyze the equation that depicts the economic channels of how the exchange rate movements have an effect on firm-level capital accumulation. We comment on how some of these effects can be weakened by the use of FC hedging and by the invoicing of exports in the dominant currency. Finally, we explain the plausibility for non-linear effects of FC hedging on investment.

3.1 Setup

The model has two periods: t and $t + 1$. There is a continuum of firms indexed by $\beta \in [0, 1]$, which corresponds to the fraction of firm debt denominated in FC inherited from period t . Liabilities are equal to 1. Profits in domestic currency for each firm in period $t + 1$ are given by:

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

Where e_{t+1} is the nominal exchange rate in period $t + 1$ and K_{t+1} is the amount of capital and $g(e_{t+1})F(K_{t+1})$ are earnings before interest payments. Firms inherit a predetermined capital stock, K_t , in period t , and receive $g(e_t)F(K_t)$ of profit. The function F has the usual properties: $F' > 0$ and $F'' < 0$. The function $g(e)$ captures the response of profits to the exchange rate e . The simplest way to interpret g is that it is a relative price that depends on the exchange rate. This interpretation justifies the multiplicative separability of e_{t+1} and K_{t+1} in the profit function. Possible variations across firms in $g(e)$ are allowed.

Firms cannot borrow at the risk-free rate but must pay a firm-specific risk premium that is decreasing and convex in period t 's net-worth W_t . Capital fully depreciates after one period of use, so that firms have zero collateral. Then, net-worth is defined as:

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

As mentioned above, firms inherit β units of debt denominated in FC. If $\beta > 0$, then a depreciation will lead to a reduction in the firm's net-worth due to the inflated domestic currency value of its

foreign liabilities¹⁵. For example, assume the polar cases in which the firm has domestic currency debt exclusively ($\beta = 0$) or FC debt exclusively $\beta = 1$. For the same level of profits π_t , the net-worth of the firm in each case would be:

$$\text{If } \beta = 0 \quad \rightarrow \quad W_t = \pi_t - 1.$$

$$\text{If } \beta = 1 \quad \rightarrow \quad W_t = \pi_t - e_t.$$

As a consequence, for a given profit π_t , a currency depreciation (rise in e_t) only reduces net-worth in the latter case, implying higher cost of capital and less capital accumulation.

At time t , the firm's only choice variable is $t + 1$ capital. Firms face a time-to-build constraint, so that in period t they determine K_{t+1} so as to maximize π_{t+1} , as described in equation (2), subject to equation (3). Allowing for persistence in the exchange rate, such that $e_{t+1} = \mu(e_t)$, Cowan and Hoyt show that the optimal level of capital is a function of the current exchange rate and the firm's net-worth, itself a function of the exchange rate:

$$K_{t+1}^* = \hat{K}^*(e_t, r(W_t(e_t))); \tag{4}$$

or simply as a function of the exchange rate:

$$K_{t+1}^* = \tilde{K}^*(e_t). \tag{5}$$

Where \tilde{K}^* is a non-linear function of the exchange rate.

3.2 The competitiveness and net-worth channels

Taking the derivative of \hat{K}^* and \tilde{K}^* with respect to the exchange rate we have that:

$$\frac{\partial \tilde{K}_{t+1}^*}{\partial e_t} = \frac{\partial \hat{K}_{t+1}^*}{\partial e_t} + \frac{\partial \hat{K}_{t+1}^*}{\partial r} r'(W_t) \frac{\partial W_t}{\partial e_t}. \tag{6}$$

Due to the persistence of the exchange rate variations ($e_{t+1} = \mu(e_t)$), equation (6) allows to decompose the response of investment to changes in the exchange rate into two channels. i) competitiveness

¹⁵The authors have two simplifying assumptions behind the definition of net-worth: i) future profits are not pledgeable; and ii) they ignore the effect of current-period investment on the interest rate. The authors obtain similar results with a more general specification.

channel¹⁶ (first term on the rhs): a depreciation of the domestic currency in t implies a change in relative prices of firm's production in t but also in $t + 1$ due to the persistence effect, increasing profits and the firm's expectation about tomorrow's marginal productivity of capital and therefore capital accumulation. ii) The net-worth channel (second term on the rhs) that can itself be divided into two opposite effects. The first is the balance sheet effect of FC debt: a depreciation of the exchange rate increases the domestic value of debt, decreases net-worth, increases the cost of capital and decreases investment. The second is the nominal revaluation effect of exports: a depreciation of the exchange rate in t changes the value of current earnings (in domestic currency), increases net-worth in t , reduces the cost of capital and increases capital accumulation for $t + 1$. Our reduced form estimations want to test for the presence of these three effects separately.

3.3 Mitigation factors

a. Dominant Currency Paradigm

In the context of an economy that invoices its exports in a dominant currency, the competitiveness effect of a depreciation can be muted (Casas et al. (2017)). As relative prices against the dominant currency do not change, there is no increase in external demand, profits do not change in FC, and neither do the firm's expectation about the marginal productivity of capital nor its capital accumulation. Nevertheless, the nominal revaluation effect of exports is still present as the value of production in domestic currency increases, increasing profits once expressed in peso, increasing net-worth, decreasing the cost of capital and therefore increasing investment.

b. FC Hedging

With respect to FC hedging and through the lens of this model, a firm that signs a forward contract might weaken the balance sheet effects of FC denominated debt. By setting the contracted exchange rate below of the second period's realized exchange rate, the firm will preserve its net-worth and investment in times of currency depreciation. Nonetheless, as shown by Rampini and Viswanathan (2010), FC hedging has a cost of opportunity in terms of real investment, specially in the case of firms for which financial frictions bind. Firms with low net-worth will find it optimal to pledge it for real investment (with the objective of increasing size/net-worth), while unconstrained firms will

¹⁶The authors do not present the case in which firms are net importers (e.g. retail sector). In this case the change in relative prices would be detrimental for firms' earnings.

take Arrow-Debreu securities where the marginal value of net-worth is maximized¹⁷. In comparison to smaller firms, non-constrained firms would invest less in order to hedge. We test for these hypotheses in section 4.

4 Econometric Specifications and Results

This section contains the econometric specifications, identification strategy and results. In the first part, we present the specification for the drivers of FC debt and FC hedging and their results. In the second part, we comment on the identification strategy for the competitiveness, net-worth and FC hedging effects on investment, and we provide the econometric specifications and results.

4.1 Drivers of FC debt and FC hedging

The objective of this section is to better understand the variance of our variables of interest between both periods. We want to unravel whether the changes seen in the descriptive statistics (section 2.3) correspond to legacy effects coming from the exchange rate, or to choices made by the firms according to their characteristics. We provide correlations (not casual relationships), of how the FC indebtedness and hedging behavior might have changed for more-export oriented, foreign and large firms as a function of the exchange rate of equilibrium, conditional on the exchange rate.

We use a tobit estimator as the data are censored in zero¹⁸. For some firms it might be optimal to choose a ratio of FC debt and/or FC forward with respect to liabilities equal to zero (a corner solution). The tobit model takes this into account and yields consistent and unbiased estimates. Equation (7) contains the econometric specification. $y_{i,t} = y_{i,t}^* \mathbb{1}[y_{i,t}^* \geq 0]$ is the outcome variable (FC debt or the long position FC forward as a share of liabilities) of firm i in year t ; $Exports_{i,t-1}$ is the ratio of exports to sales of firm i in year $t-1$; $Size_{i,t-1}$ is the log of total assets of firm i in year $t-1$; $FDI_{i,t-1}$ is a dummy that takes a value of 1 if firm i in year $t-1$ is owned by foreigners (firms for which at least more than 50 percent of shares are owned by a foreigner); $Change_t$ is a dummy variable that takes a value of one after 2013 and captures the period in which the exchange rate of equilibrium was more

¹⁷This in the context of an economy with complete markets and limited commitment; where, in the case of default by firms, lenders can seize a part of the firm's capital (collateral) but not the firm's cash-flow. Firms are not excluded of capital markets in the case of default.

¹⁸We prefer a Tobit over the Heckman procedure as we do not have a problem of selection or missing data. We observe firms with and without FC debt/forwards without missing information. We would need to use a Heckman procedure in the case in which we only had in our dataset firms with FC debt/forwards or firms with missing information about their FC indebtedness and hedging, clear selection bias problems.

depreciated; X_{it-1} is a vector of firm level characteristics such as leverage, FC assets and cash-flow (all as a share of total assets); and η_t is year fixed effects. All firm-level independent variables are lagged one year to reduce endogeneity concerns:

$$\begin{aligned}
y_{i,t} = & \beta_1 Exports_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 FDI_{i,t-1} \\
& + \beta_4 Exports_{i,t-1} * Change_t + \beta_5 Size_{i,t-1} * Change_t + \beta_6 FDI_{i,t-1} * Change_t \\
& + \Theta X_{it-1} + \eta_t + \epsilon_{it}.
\end{aligned} \tag{7}$$

Alternatively, we introduce different definitions of the exchange rate instead of year fixed effects. This to see whether the variation in our outcome variables are driven by a valuation effect of the exchange rate (legacy), rather than firm's decisions in their quantities of FC debt and FC forwards conditional on the valuation effect¹⁹. It is important to clarify that in these set of regressions it is not possible to control for changes in aggregate demand and the legacy effects of the exchange rate simultaneously. Given perfect multicollinearity we cannot introduce both year fixed effects and the exchange rate as controls.

Table 5 presents the drivers of FC debt. In column (1) we only include firm-level controls, column (2) includes year fixed effects, column (3) includes the interaction between our firm-level variables of interest (e.g size, exports, foreign) and the dummy that indicates the change of the exchange rate of equilibrium. From column (4) to column (6) we exclude the year fixed effects and include as a control different definitions of the exchange rate. Column (4) has the average nominal exchange rate, column (5) the end of period nominal exchange rate and column (6) the end of period real exchange rate.

The fact that the interaction coefficients of columns (1) - (3) do not change with respect to those of columns (4) - (6)²⁰, allows to interpret our results as a change in the quantities of FC debt and not as a mere revaluation effect of the exchange rate depreciation. Columns (4) to (6) show how the shares of FC debt are negatively correlated with the exchange rate (although in column (6) the relationship is not statistically significant). Furthermore, no matter the specification, all coefficients are statistically significant, and their magnitude and direction of the correlation does not change (with the exemption of the foreign dummy coefficient that halves after controlling for the interaction terms).

¹⁹In Annex C we provide the results for a specification with sector-year fixed effects. This to be sure our results are not driven by shocks suffered by a particular sector. Results hold.

²⁰The coefficients differ after the thousandths.

Column (3) follows our preferred specification (equation (7)). Larger firms are associated to larger shares of FC debt, nevertheless, in periods of a depreciated exchange rate of equilibrium they decrease their shares of FC debt. On average, an increase in the firm size of 10 percent is associated with an increase of FC debt to liabilities ratio of 0.01 percentage points (p.p). In periods of a depreciated exchange rate of equilibrium, an increase in the firm size of 10 percent is associated with an increase in the ratio of FC debt of 0.008 p.p.

Export-oriented firms are associated with larger shares of FC debt. Moreover, in periods of a depreciated exchange rate of equilibrium they increase even further their FC indebtedness. Firms seem to be (weakly) matching their FC revenues with their FC liabilities. On average, an increase of 26 p.p in the exports to sale ratio (1 standard deviation), is associated with an increase in the FC debt ratio of 0.05 p.p. In times of a depreciated exchange rate of equilibrium, an increase of 1 standard deviation of the exports to sales ratio increases the shares of FC debt by 0.16 p.p.

With respect to foreign firms, we see they present larger shares of FC debt. A foreign firm is associated with an increase on the FC debt ratio of 0.07 p.p. During a period of a depreciated exchange rate of equilibrium, foreign firms are associated with even larger increases in the shares of FC debt (0.24 p.p)²¹.

Table 6 presents the drivers of the long position FC forwards. In column (1) we only include firm-level controls, column (2) includes year fixed effects, column (3) includes the interaction between our firm-level variables of interest and the dummy that indicates the change of the exchange rate of equilibrium. From column (4) to column (6) we exclude the year fixed effects and include as a control different definitions of the exchange rate. Column (4) has the average nominal exchange rate, column (5) the end of period nominal exchange rate and column (6) the end of period real exchange rate.

The fact that the interaction coefficients of columns (1) - (3) do not change by much with respect to those of columns (4) - (6), allows to interpret our results as a change in the quantities of FC hedging and not as a mere revaluation effect of the exchange rate depreciation. Columns (4) to (6) show that

²¹The majority of results go in hand with Medellín and Restrepo (2024) where we estimate a similar specification on the 2005-2013 period. The coefficients to be compared are those of the firm level variables without interactions. The only difference with respect to Medellín and Restrepo (2024) is that exports have a negative impact on the FC debt shares. Nonetheless, in Medellín and Restrepo (2024) we introduce the interaction of exports with aggregate excess reserves of credit establishments. This interaction has a positive impact on the shares of FC debt.

Table 5: Drivers of FC debt - Tobit Estimation

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Size _{it-1}	0.107*** (.001)	0.106*** (.001)	0.114*** (.001)	0.114*** (.001)	0.114*** (.001)	0.114*** (.001)
Exports _{it-1}	0.002*** (0.000)	0.002*** (0.000)	0.002*** (.001)	0.002*** (.001)	0.002*** (.001)	0.002*** (.001)
Foreign _{it-1}	0.134*** (.004)	0.130*** (.004)	0.067*** (.005)	0.067*** (.005)	0.067*** (.005)	0.067*** (.005)
Size _{it-1} * Change _t			-0.026*** (.002)	-0.026*** (.002)	-0.026*** (.002)	-0.026*** (.002)
Exports _{it-1} * Change _t			0.004* (.002)	0.004* (.002)	0.004* (.002)	0.004* (.002)
Foreign _{it-1} * Change _t			0.172*** (.008)	0.173*** (.008)	0.173*** (.008)	0.173*** (.008)
Exchange Rate _t				-0.0002*** (0.000)	-0.0001*** (0.000)	-0.059 (0.067)
Constant	-1.050*** (.007)	-1.176*** (.093)	-1.026*** (.009)	-0.543 (.547)	-0.543 (.547)	-0.061 (1.093)
Observations	234317	234317	234317	234317	234317	234317
Other firm level controls	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	YES	YES	NO	NO	NO
Exchange Rate	NO	NO	NO	Average	End of Period	Real
Pseudo R2	0.155	0.160	0.164	0.164	0.164	0.164

Dependent variable is FC debt as a share of liabilities of firm i in period t .

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

the exchange rate is negatively correlated with the shares of FC forwards ((although in column (6) the relationship is not statistically significant). No matter the specification, all coefficients are statistically significant, and their magnitude and direction of the correlation does not change.

Column (3) follows our preferred specification (equation (7))²². Large firms are associated with larger shares of FC hedging. During periods of a depreciated exchange rate of equilibrium they increase even further their financial protection. A 10 percent increase in the size of the firm is associated with an increase in the long position forward ratio of 0.013 p.p. During a period of a depreciated exchange rate of equilibrium, a firm growth of 10 percent is associated with a increase in the long position of 0.016 p.p. During periods of a depreciated exchange rate of equilibrium, large firms reduce their FC financial exposure by reducing their FC debt and increasing their FC hedging²³.

²²In Annex C we provide the results for a specification with sector-year fixed effects. This to be sure our results are not driven by shocks suffered by a particular sector. Results hold with the exemption of the interaction between exports and the change of exchange rate regime dummy. The sign of the coefficient holds but is not longer statistically significant.

²³At first glance, these results might seem at odds with Medellín and Restrepo (2024)'s model predictions. However, this is not the case. In periods when the equilibrium exchange rate is more depreciated, illiquidity rises, and the intensive margin of hedging is more constrained, especially for large firms. In Annex B, we show that the increase in large firms' hedging comes from the extensive, not the intensive, margin of hedging. Compared to the 2005-2013 period, in the 2014-2019 period, there are more large firms entering the hedging market (they are able to pay the fixed cost of entry)

Table 6: Drivers of FC Forwards - Tobit Estimation

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Size _{it-1}	0.157*** (.003)	0.150*** (.003)	0.134*** (.004)	0.134*** (.004)	0.134*** (.004)	0.134*** (.004)
Exports _{it-1}	0.003*** (.001)	0.004*** (.001)	0.004*** (.001)	0.004*** (.001)	0.004*** (.001)	0.004*** (.001)
Foreign _{it-1}	0.247*** (.010)	0.298*** (.010)	0.301*** (.010)	0.294*** (.016)	0.294*** (.016)	0.294*** (.016)
Size _{it-1} * Change _t			0.034*** (.006)	0.034*** (.006)	0.035*** (.006)	0.034*** (.006)
Exports _{it-1} * Change _t			-0.113** (.036)	-0.113** (.036)	-0.113** (.036)	-0.113** (.036)
Foreign _{it-1} * Change _t			-0.237*** (.023)	-0.237*** (.023)	-0.238*** (.023)	-0.237*** (.023)
Exchange Rate _t				-0.0004*** (0.000)	-0.0004*** (0.000)	0.214 (0.145)
Constant	-2.291*** (.032)	-2.102*** (.190)	-2.443*** (.041)	-4.203*** (1.192)	-1.575 (2.876)	-5.956* (2.378)
Observations	234317	234317	234317	234317	234317	234317
Other firm level controls	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	YES	YES	NO	NO	NO
Exchange Rate	NO	NO	NO	Average	End of Period	Real
Pseudo R2	0.121	0.159	0.161	0.161	0.161	0.161

Dependent variable is long position FC forward as a share of liabilities of firm i in period t .

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Export-oriented firms complement their natural hedging with financial hedging. Nevertheless, during periods of a depreciated exchange rate of equilibrium they change their behavior and substitute financial for natural hedging. On average, an increase of 26 p.p in the exports to sale ratio, is associated with an increase in the long position share of 0.1 p.p. During periods of a depreciated exchange rate of equilibrium, an increase of 26 p.p in the export share is associated with a decrease in the share of FC hedging of 2.8 p.p. Amid periods of a depreciated exchange rate of equilibrium, more export-oriented firms increase their FC financial exposure by increasing the shares of FC debt and decreasing their FC hedging.

Foreign firms use less intensively FC hedging during periods of a depreciated exchange rate of equilibrium. On average, a foreign firm increases the long position by 0.3 p.p with respect to a domestic firm. When the exchange rate regime switches, the foreign firm is associated with an increase in the FC hedging of 0.06 p.p. Foreign firms increase their FC financial exposure by increasing their FC debt and decreasing their financial hedging during periods with a more depreciated exchange rate of equilibrium but hedge smaller shares of their FC debt due to higher illiquidity.

equilibrium²⁴.

To summarize, we find that, during periods of a depreciated exchange rate of equilibrium, big firms reduce their FC indebtedness and increase their long positions in the FC hedging market, while more export-oriented and foreign firms do the opposite (their financial exposure increases). Big firms financially hedge, while export-oriented and foreign firms might be using natural hedge, and their relationship with headquarters to protect themselves. We also find that movements in the shares of FC debt and hedging are choices made by firms and not legacy effects of exchange rate revaluations.

4.2 Competitiveness, net-worth and FC hedging effects on investment

In this section, we test the impact of FC debt on investment depending on the transitory and structural movements of the exchange rate, in addition to the mitigation factors identified in section 3. Equation (8) depicts the reduced form specification for investment. $I_{i,t}$ is investment defined as the change in physical assets of firm i normalized by her level of assets in $t - 1$ (all in 2008 constant COP, deflated with CPI); $I_{i,t-1}$ is investment of firm i in $t - 1$; ϵ_t^{ER} is the exchange rate surprise at time t (defined as in equation (1)); θ_i is a firm fixed effect; and η_t is year fixed effects. All firm-level independent variables are lagged one year to reduce endogeneity concerns. Z_{it} is a vector that contains the double and triple interactions of firm characteristics (e.g. FC assets, FDI and firm size) in $t - 1$ with $Change_t$ and ϵ_t^{ER} . All other variables defined as in equation (7):

$$\begin{aligned}
I_{i,t} = & \beta_0 I_{i,t-1} + \beta_1 FCdebt_{i,t-1} + \beta_2 LongFwd_{i,t-1} + \beta_3 Exports_{i,t-1} + \\
& \beta_4 FCdebt_{i,t-1} * Change_t + \beta_5 LongFwd_{i,t-1} * Change_t + \beta_6 Exports_{i,t-1} * Change_t \\
& + \beta_7 FCdebt_{i,t-1} * \epsilon_t^{ER} + \beta_8 LongFwd_{i,t-1} * \epsilon_t^{ER} + \beta_9 Exports_{i,t-1} * \epsilon_t^{ER} + \\
& + \beta_{10} FCdebt_{i,t-1} * Change_t * \epsilon_t^{ER} + \beta_{11} LongFwd_{i,t-1} * Change_t * \epsilon_t^{ER} + \beta_{12} Exports_{i,t-1} * Change_t * \epsilon_t^{ER} + \\
& \Theta X_{it-1} + \gamma Z_{it} + \theta_i + \eta_t + u_{it}.
\end{aligned} \tag{8}$$

We are able to distinguish the competitiveness effect of exports from the nominal revaluation effect of exports. The former effect is captured by β_6 . A more depreciated exchange rate of equilibrium means

²⁴These results go in hand with Medellín and Restrepo (2024) where we estimate a similar specification on the 2005-2013 period. The coefficients to be compared are those of firm level variables without interactions in specifications with year fixed effects. In Medellín and Restrepo (2024) the coefficients for size, exports and foreign are very similar in terms of size, sign and statistical significance.

that there is a jump/increase in the expected marginal productivity of capital, given a structural change in relative prices. The latter effect is captured by β_9 and β_{12} . Given a surprise depreciation, there is an unexpected increase in the value of firm's earnings (in domestic currency) which increases net-worth and investment. The balance sheet effect of FC debt is captured by β_4 , β_7 and β_{10} . While β_4 captures a medium-run shrink on the firm's net-worth as a consequence of the structural depreciation of the exchange rate, β_7 and β_{10} capture temporal and unexpected shrinks of firm's net-worth. This allows to see if what matters for investment plans are structural or temporal exchange rate shocks transmitted by firm's FC debt. Finally, β_2 , β_5 , β_8 and β_{11} allow us to separate the hedging effect of FC forwards from its cost of opportunity in terms of investment. β_2 and β_5 show if firms that use more intensively FC hedging see a lower investment in comparison to firms that do not hedge. β_8 and β_{11} capture the protection of investment against surprise depreciations of the exchange rate.

As shown in Cowan and Hoyt (2002), investment follows a dynamic behavior, reason why we assume a dynamic panel structure on our data. As a consequence, we use a Generalize Method of Moments (GMM) for our estimations (Arellano and Bond (1991), Arellano and Bover (1995)). The GMM is suitable as we assume a data generating process that: i) is dynamic, with current realizations of the dependent variable influenced by past ones; ii) there are randomly distributed fixed effects; iii) some regressors may be endogenous; iv) idiosyncratic disturbances may have individual specific patterns of heteroskedasticity and serial correlation; v) idiosyncratic disturbances are uncorrelated across individuals; vi) some regressors may be predetermined but not strictly exogenous.

In specific, we follow Blundell and Bond (1998) two stage GMM system estimator²⁵. This estimator combines the regression expressed in first difference with the original equation expressed in levels. It uses lagged values of the independent variables in levels as instruments for the differenced equation, whereas the equation in levels is instrumented with lagged differences of the explanatory variables. This helps to fight the joint endogeneity of the regressors with the use of internal instruments.

In our case, the system GMM and its internal instruments provide a second layer of exogeneity on top of the exogeneity procured by the exchange rate surprises. We understand the exchange rate shocks as

²⁵The standard difference GMM estimator has a well-known drawback. The instruments available for the difference equation (the lag of the dependent variables in levels) are weak when the individual series have near unit root properties. If the series is highly persistent, their differences are nearly innovations and there is no good instruments for near white noise series. As a consequence, the difference GMM estimator can be subject to finite sample biases.

a "treatment" that is as good as random. Exchange rate surprises defined by equation (1) are orthogonal to firms' characteristics. Nevertheless, the exposure to the treatment is heterogeneous on firms' characteristics. This heterogeneity is what allows us to capture the differential effects on investment of having more or less exports, FC debt and FC hedging when faced with exogenous exchange rate shocks.

Then, in order to use the dynamic panel techniques, it is imperative to test for: i) no auto-correlation in first differenced errors. If the first differenced errors are auto-correlated, the internal instruments would not respect the exclusion restriction, which would mean that past shocks are persistent and determined future investment. We use an Arellano-Bond test for AR(1) and AR(2) in first differences of errors. ii) The exogeneity of the instruments. When there are more instruments than endogenous variables (this is our case given that we have more periods than endogenous variables), it is possible to test for the exogeneity of a subset of instruments (the implicit assumption is that instruments in the comparison subset are exogenous). We use a difference in Hansen tests for overidentifying restrictions.

Table 7 contains the results²⁶²⁷. Each column follows the specification of equation (8) with a different definition of the exchange rate shock (as defined in section 2.4). Columns (1) and (2) have the accumulation of the monthly surprises, columns (3) and (4) the semiannual shocks, (5) and (6) the year shocks, and (7) and (8) the YoY shocks. For the 8 specifications we accept the null hypothesis for the exogeneity of the instruments. We also accept the null hypothesis for zero auto-correlation of order 2²⁸.

In all specifications, there is statistical significance for the competitiveness, net-worth and FC hedging effects on investment. Lets start by the balance sheet effects of FC debt. We find that a structural shrink in firm's net-worth as a consequence of a depreciation of the exchange rate of equilibrium, reduces investment more than a transitory reduction in the firm's net-worth, as a result of exchange

²⁶There are two concerns in our estimates that relate to internal instruments: i) The proliferation of instruments. GMM estimators may over-fit the model by the introduction of excessive instruments. Having too many instruments is equivalent to not instrumenting at all. By over-explaining the instrumented variable we would also capture its endogenous variation. ii) Weak instruments. The marginal instrument may subtract explanatory power from other instruments, rendering the instruments weak and making the statistical inference not reliable. However, Roodman (2009) argues that these issues are only a matter of concern in small samples, which we believe is not our case (on average we have 24,000 observation units per year vs 240 instruments in total).

²⁷In annex J we show a specification in which we exclude exports and its interactions, and the long position forwards and its interactions. In this specification, the variables of interests (FC debt and its interactions) are not statistically significant.

²⁸We also marginally accept the null hypothesis for zero auto-correlation of order 1. This could indicate that the idiosyncratic error term in levels is highly serially correlated. In the extreme case, the error term in levels would follow a random walk such that the first-differenced errors are serially uncorrelated. Such a situation would invalidate the assumptions done on the data generating process. We consider the test to be inconclusive given the low p-value.

rate shocks. An increase of 1 standard deviation (23 p.p) of FC debt to liabilities during a period of a depreciated exchange rate of equilibrium, reduces investment between 0.1 and 0.6 standard deviations (between 1 and 6 p.p). For the maximum exchange rate surprise, the increase in 1 standard deviation of the FC debt ratio, during a period of a depreciated exchange rate of equilibrium, decreases investment between 0.06 and 0.07 standard deviations (between 0.6 to 0.7 p.p).

Table 7: Impact of exchange rate on investment depending on FC debt and hedging

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FC Debt _{it-1}	-0.007 (.008)	0.003 (.004)	0.003 (.002)	0.003 (.002)	0.004 (.003)	0.004 (.004)	0.002 (.002)	0.002 (.001)
FC Debt _{it-1} * Surprise _t	0.127 (.155)	0.112 (.074)	0.014 (.009)	0.014 (.008)	0.076 (.083)	0.067 (.072)	0.123 (.152)	0.127 (.155)
FC Debt _{it-1} * Change _t	-0.048* (.023)	-0.071* (.028)	-0.239* (.102)	-0.251* (.108)	-0.082* (.034)	-0.082* (.034)	-0.041* (.016)	-0.041** (.016)
FC Debt _{it-1} * Surprise _t * Change _t	0.028 (.102)	0.143 (.111)	0.173* (.078)	0.145* (.067)	0.187 (.125)	0.192 (.117)	0.004 (.159)	0.001 (.162)
Long Fwd _{it-1}	-0.006 (.006)	0.009 (.015)	0.011 (.010)	0.012 (.011)	0.001 (.008)	0.002 (.008)	-0.00582 (.006)	-0.00565 (.006)
Long Fwd _{it-1} * Surprise _t	-0.032 (.070)	-0.018 (.068)	0.003 (.009)	0.002 (.007)	0.053 (.071)	0.046 (.065)	-0.051 (.056)	-0.05 (.056)
Long Fwd _{it-1} * Change _t	-0.434** (.147)	-0.536** (.174)	-2.412** (.798)	-2.557** (.849)	-0.719** (.242)	-0.718** (.241)	-0.311** (.111)	-0.311** (.110)
Long Fwd _{it-1} * Surprise _t * Change _t	1.557*** (.078)	1.99** (.661)	1.904** (.632)	1.638** (.546)	2.367** (.803)	2.334** (.792)	1.076** (.401)	1.069** (.396)
Exports	0.002 (.002)	0.002 (.003)	-0.001 (.001)	-0.001 (.001)	-0.0004 (.001)	-0.001 (.001)	0.004 (.003)	0.004 (.003)
Exports _{it-1} * Surprise _t	-0.030 (.051)	-0.042 (.066)	-0.008 (.007)	-0.01 (.009)	-0.019 (.019)	-0.018 (.018)	0.018 (.016)	0.01841 (.016)
Exports _{it-1} * Change _t	-0.226*** (.009)	-0.330*** (.013)	-1.456*** (.055)	-1.529*** (.058)	-0.334*** (.013)	-0.332*** (.013)	-0.073*** (.004)	-0.07917*** (.004)
Exports _{it-1} * Surprise _t * Change _t	1.432** (.504)	2.141*** (.105)	1.336*** (.051)	1.134*** (.043)	1.893*** (.073)	1.857*** (.072)	0.995*** (.043)	1.006*** (.043)
Surprise	month av	month med	semiannual av	semiannual med	year av	year med	YoY av	YoY med
Observations	168812	168812	168812	168812	168812	168812	168812	168812
Instruments	240	240	240	240	240	240	240	240
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Arellano-Bond test AR(1)	-1.45 (0.14)	-1.47 (0.14)	-1.46 (0.14)	-1.46 (0.14)	-1.5 (0.15)	-1.45 (0.15)	-1.44 (0.15)	-1.44 (0.15)
Arellano-Bond test AR(2)	-0.68 (0.5)	-0.6 (0.55)	-0.55 (0.58)	-0.55 (0.58)	-0.64 (0.53)	-0.63 (0.53)	-0.55 (0.584)	-0.54 (0.589)
Difference in Hansen Tests	81.43 (0.589)	82.79 (0.548)	83.09 (0.538)	78.45 (0.679)	77.95 (0.693)	78.49 (0.678)	72.59 (0.829)	72.72 (0.826)

Dependent variable is investment defined as the change in physical assets of firm i normalized by her level of assets in $t - 1$.

H_0 of Arellano-Bond test: No Auto-correlation in first/second differenced errors.

H_0 of difference in Hansen Tests: Exogeneity of Instruments.

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

With regard to hedging against exchange rate uncertainty with the use of FC forwards, we find that firms face a trade-off between investment and financial protection during periods of a depreciated exchange rate. An increase of 1 standard deviation in the long position forward ratio (20 p.p), decreases investment between 0.6 and 5.1 standard deviations (between 6 and 51 p.p). Nevertheless, during

periods of a depreciated exchange rate of equilibrium, firms with FC forwards see a compensation in terms of investment when faced with exchange rate surprises (the decrease in investment is smaller). An increase of 1 standard deviation in the long position decreases investment between 0.02 and 0.1 standard deviations (between 0.2 and 1 p.p). This negative net effect might be a consequence of financial frictions faced by firms. In periods of a depreciated exchange rate of equilibrium, hedging against exchange rate uncertainty becomes more expensive, and the firm's trade-off with investment becomes more costly; the net-worth constraint binds, so firms decide to pledge net-worth towards protection against uncertainty instead of using it to lever real investment.

With respect to the competitiveness effect of exports, we find that export-oriented firms reduce their investment in periods with a depreciated exchange rate of equilibrium. An increase of 1 standard deviation in the exports to sales ratio (26 p.p) reduces the ratio of investment to the previous period stock of capital between 0.2 and 4 standard deviations (between 2 and 40 p.p)²⁹.

Nevertheless, the nominal revaluation effect of exports more than compensates for the negative competitiveness effect. We find that export-oriented firms invest more amid periods of a depreciated exchange rate of equilibrium, when faced with a surprise currency depreciation. For the maximum exchange rate shock, we find that an increase of 1 standard deviation in the exports to sales ratio, increases investment between 0.43 and 0.54 standard deviations (between 4 and 5.4 p.p)³⁰.

We further explore the plausible explanations behind the negative and statistically significant coefficient for the competitiveness effect of exports. We find two hypotheses to test: i) This might be a consequence of the reduction of the mark-up of exporting firms given the increase of their marginal costs, as a consequence of the inputs denominated in FC (an explanation out of the scope of the Cowan and Hoyt's framework); ii) This negative effect is driven by firms of the oil and mining sector as they see the price of their production fall after 2013. In annex L we test for the first hypothesis by controlling for imports as a share of operating costs. We reject this hypothesis. In annex H we test for the second hypothesis by excluding firms from the oil and mining sector: The negative effect becomes non-significant. From these exercises we conclude that for firms outside of the oil and mining sector

²⁹The calculation is as follows: $\partial I_{i,t} = \beta_6 \partial Exports_{i,t-1} * Change_t$ with $\partial Exports_{i,t-1}$ equal to the standard deviation of the exports to sales ratio.

³⁰The calculation is as follows: $\partial I_{i,t} = \beta_6 \partial Exports_{i,t-1} * Change_t + \beta_{12} \partial Exports_{i,t-1} * Change_t * \epsilon_t^{ER}$ with $\partial Exports_{i,t-1}$ equal to the standard deviation of the exports to sales ratio and ϵ_t^{ER} equal to the maximum value of the exchange rate shock.

there is evidence of the competitiveness effect being muted by the invoice of exports in a dominant currency: No change in the relative prices, no increase in the external demand, no increase in the marginal productivity of capital and therefore no increase in investment.

Robustness. – The rest of the results are not driven by shocks of a particular sector: in Annex C (for tobits) and G (for dynamic panels) we control for sector-time fixed effects. Our results are also robust to shifts in Tobin’s Q: in Annex I we control for publicly traded firms with the help of a dummy variable. Results hold.

In Annex K, we carry another robustness check in which we run our estimation on the 2014-2019 period. As a consequence, the $Change_t$ dummy and its interactions are no longer part of the specification. We find that the non-linear effects of both exports and FC hedging hold, while the balance sheet effects of FC debt are no longer statistically significant. When we only take into account the 2014-2019 period, investment becomes less sensitive to both the competitiveness and nominal revaluation effects of exports (the coefficients in absolute value are smaller), while it becomes more responsive to the non-linear effects of FC hedging (the coefficients in absolute value are larger).

We also present results for other variables of interest. Using the tobit estimator and equation (7), in Annex D we provide the results for short position forwards as a share of liabilities as dependent variable, in Annex E the results for Covered FC debt (=long position forward/FC debt), and in Annex F the results for the proxy of Balance Sheet Exposure as a share of liabilities. The Balance sheet exposure is larger for bigger firms, more export-oriented and foreign firms. Nevertheless, when the exchange rate of equilibrium depreciates, big firms reduce their balance sheet exposure, while exporters and foreign firms increase it. This goes in hand with the results presented in section 4.1.

5 Conclusions

In this paper we construct a data-base of the income statements and balance sheets of non-financial firms in Colombia from 2005 to 2019. A period of time with two distinct exchange rates of equilibrium. With the help of tobit and dynamic panel techniques, coupled with the construction of different exchange rate shocks, we find that firms present heterogeneous FC indebtedness and hedging behavior. Large, foreign and exported oriented firms change their financial FC exposure as a function of the ex-

change rate of equilibrium. When the exchange rate of equilibrium depreciates, big firms reduce their FC debt and increase their long positions in the forward market; foreign and export-export oriented firms increase their FC debt and decrease their long positions in the forward market. While large firms use more intensively financial protection, export-oriented and foreign firms seem to substitute it with natural hedging and connections with headquarters. These movements in FC debt and hedging are firms' choices and not legacy effects of exchange rate movements.

These shifts in FC financial exposure also have a consequence on firm-level capital accumulation. We are able to disentangle the competitiveness from the nominal revaluation effects of exports, the medium vs short-run balance sheet effects of FC debt, and the non-linear effects of FC hedging. We find that export-oriented firms do not see a competitiveness effect on their investment. Firms in Colombia invoice almost 100 percent of their exports in a dominant currency. As a result, a currency depreciation does not render exports cheaper, external demand does not grow, and therefore, the marginal productivity of capital does not increase. Nevertheless, we find a positive nominal revaluation effect of exports during surprise exchange rate depreciations. The surprise revaluations of firms' income in domestic currency, increases net-worth, decreases the cost of capital and increases investment.

Our reduced form specifications, also allows to disentangle the medium from the short-run balance sheet effects of FC debt. We find that investment decreases more as consequence of structural shrinks of net-worth, during periods of a depreciated exchange rate of equilibrium, than as a result of transitory shrinks of net-worth caused by exchange rate shocks.

Finally, we find that during periods of a depreciated exchange rate of equilibrium, firms face a trade-off between investment and hedging against exchange rate uncertainty. Financial protection becomes more expensive, so firms need to choose whether to pledge net-worth towards investment or hedging. Financially constrained firms find it optimal not to hedge in order to grow, and therefore, firms that hedge see a reduction of their investment in comparison to non-hedgers. However, we find that long-position forwards protect firms' investment when faced with exchange rate shocks.

With respect to policy recommendations, the Central Bank could pursue policy interventions that may increase the liquidity of the FC hedging market, reducing the cost of financial protection, and therefore

its trade-off in terms of firm-level capital accumulation. More so, during periods of a depreciated exchange rate of equilibrium when aggregate internal demand is weakened, and external demand does not increase as a consequence of the invoicing of exports in a dominant currency.

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Annex A: Variables' definitions and sources

Table A.1: Definitions and sources

Variable	Definition	Source
Investment	Capital in t minus capital in $t - 1$. Capital is the addition of physical properties as equipment, edifications, and on going constructions.	SS and SSFC.
Exports	FOB value of exports of goods and services. We convert the value of exports into COP using the average exchange rate of the corresponding year.	DANE-DIAN.
Imports	CIF value of goods imported plus imports of services. We convert the value of imports into COP using the average exchange rate of the corresponding year.	DANE-DIAN.
Financial FC debt	Bonds and loans acquired with foreign and domestic banks or corporations.	BdR.
FC assets	Deposits in FC outside of Colombia.	BdR.
Long forward	Value of the active long cop/usd forwards at December the 31st of the corresponding year.	BdR.
Short forward	Value of the active short cop/usd forwards at December the 31st of the corresponding year.	BdR.
Size	Logarithm of the real value of assets.	SS and SSFC.
Leverage	Long term debt (debt that needs to be repaid after a year) as a ratio of assets.	SS and SSFC.
Cash Flow	A revenue/expense stream that changes a cash account over a given period.	SS and SSFC.
Tradable	Takes the value of 1 if the firm belongs to any of the following sectors: agriculture, mining or industry. Zero otherwise.	DANE.
Foreign	Firms for which more than 50 percent of shares are owned by foreign investors.	SS and SSFC.

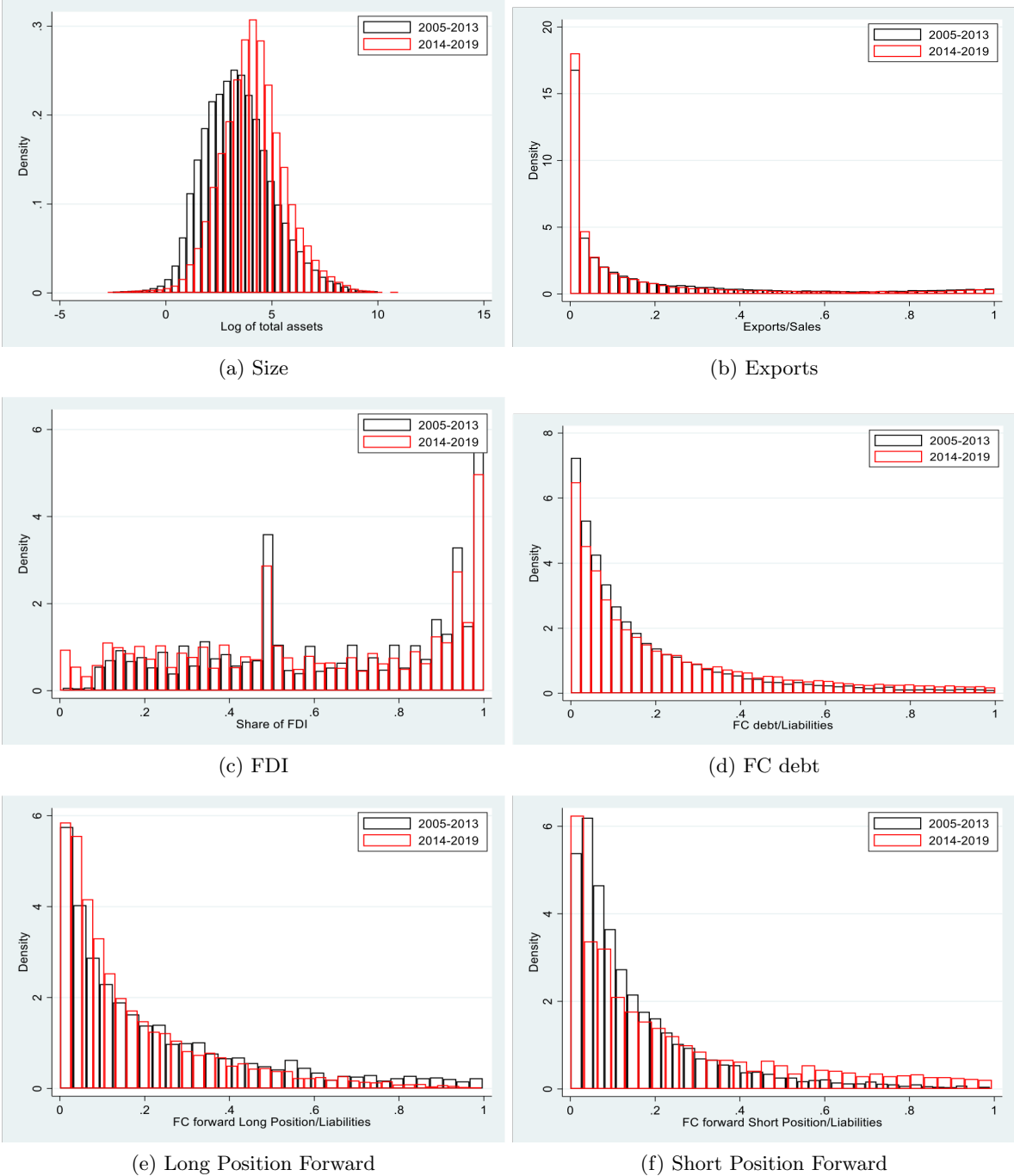
Source: Author's calculations.

Annex B: Distribution of firm characteristics: 2005-2013 vs 2014-2019

Panel (a) shows how, in comparison to the 2005-2013 period, there are more large firms in 2014-2019. Nonetheless, panel (e) demonstrates how, in comparison to 2005-2013, firms in 2014-2019 hedged smaller shares of their FC liabilities. The number of observations with long position forwards increased from 1,830 to 6,453, but the median (average) share of long position forwards decreased from 14 (23) percent in the 2005-2013 period to 11 (18) percent in 2014-2019. This means that, from the perspective of Medellín and Restrepo (2024), more firms are able to pay the fixed cost of entry to the FC hedging

market, but due to illiquidity, they hedge smaller shares.

Figure B.1: Distribution of firm characteristics



Source: Authors' calculations based on SS, DIAN-DANE, SFC and BdR.

Annex C: Drivers of FC debt and FC forward controlling for sector-year fixed effects

Table C.1: Drivers of FC Debt and FC Forward

Variables	(1) FC Debt _{it}	(2) FC Debt _{it}	(3) Long Fwd _{it}	(4) Long Fwd _{it}
Size _{it-1}	0.11353*** (.001)	0.11452*** (.001)	0.14784*** (.004)	0.14786*** (.004)
Exports _{it-1}	0.00189*** (0.001)	0.00190*** (0.001)	0.00363*** (.001)	0.00363*** (0.001)
Foreign _{it-1}	0.06280*** (.005)	0.06312*** (.005)	0.30282*** (.016)	0.30284*** (.016)
Size _{it-1} * Change _t	-0.02180*** (.002)	-0.02270*** (.002)	0.03181*** (.006)	0.03176*** (.006)
Exports _{it-1} * Change _t	0.00379* (.002)	0.00379* (.002)	-0.03067 (.031)	-0.0307 (.031)
Foreign _{it-1} * Change _t	0.16668*** (.008)	0.16696*** (.008)	-0.28210*** (.023)	-0.28210*** (.023)
Observations	234317	234317	234317	234317
Other firm level controls	YES	YES	YES	YES
Year fixed effects	YES	NO	YES	NO
Sector fixed effects	YES	NO	YES	NO
Year-sector fixed effects	NO	YES	NO	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex D: Drivers of short FC forwards

Table D.1: Drivers of short FC forwards

Variables	(1) Short Fwd _{it}	(2) Short Fwd _{it}	(3) Short Fwd _{it}
Size _{it-1}	0.135*** (.002)	0.138*** (.003)	0.147*** (.003)
Exports _{it-1}	0.002* (.001)	0.002* (.001)	-0.001 (.003)
Foreign _{it-1}	0.035*** (.008)	0.032*** (.008)	-0.013 (.010)
Size _{it-1} * Change _t			-0.044*** (.005)
Exports _{it-1} * Change _t			0.013*** (.004)
Foreign _{it-1} * Change _t			0.190*** (.019)
Constant	-1.701*** (.022)	-3.922 (219.292)	-1.675*** (.024)
Observations	234317	234317	234317
Other firm level controls	YES	YES	YES
Year fixed effects	NO	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex E: Drivers of Covered FC debt

Table E.1: Drivers of Covered FC debt

Variables	(1) Covered _{it}	(2) Covered _{it}	(3) Covered _{it}
Size _{it-1}	0.319*** (.018)	0.347*** (.017)	0.367*** (.023)
Exports _{it-1}	0.005 (.008)	0.011 (.006)	0.014* (.006)
Foreign _{it-1}	-0.516*** (.063)	-0.561*** (.060)	0.06 (.084)
Size _{it-1} * Change _t			-0.045 (.03)
Exports _{it-1} * Change _t			-1.303*** (.151)
Foreign _{it-1} * Change _t			-1.062*** (.117)
Constant	-4.379*** (.138)	-0.822 (1.409)	-5.933*** (.204)
Observations	234317	234317	234317
Other firm level controls	YES	YES	YES
Year fixed effects	NO	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex F: Drivers of a proxy for Balance Sheet Exposure

Table F.1: Drivers of a proxy for Balance Sheet Exposure

Variables	(1) Exposure _{it}	(2) Exposure _{it}	(3) Exposure _{it}
Size _{it-1}	0.098*** (.001)	0.099*** (.001)	0.107*** (.001)
Exports _{it-1}	0.002*** (.001)	0.002*** (.001)	0.002** (.001)
Foreign _{it-1}	0.201*** (.004)	0.202*** (.004)	0.155*** (.005)
Size _{it-1} * Change _t			-0.03*** (.002)
Exports _{it-1} * Change _t			0.009*** (.002)
Foreign _{it-1} * Change _t			0.145*** (.009)
Constant	-1.009*** (.007)	-1.307*** (.120)	-1.015*** (.009)
Observations	234317	234317	234317
Other firm level controls	YES	YES	YES
Year fixed effects	NO	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex G: Investment and the competitiveness, net-worth and FC hedging effects with sector-time fixed effects

Table G.1: Investment and the competitiveness, net-worth and FC hedging effects

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}
FC Debt _{it-1}	-0.00618 (.007)	0.00315 (.004)	0.00404 (.002)	0.00379 (.002)	0.00379 (.003)	0.00407 (.004)	0.00219 (.002)	0.0019 (.001)
FC Debt _{it-1} * Surprise _t	0.17865 (.104)	0.13557 (.088)	0.02 (.010)	0.01692 (.010)	0.07378 (.084)	0.06612 (.074)	0.10714 (.154)	0.11015 (.158)
FC Debt _{it-1} * Change _t	-0.05295* (.023)	-0.07517* (.030)	-0.25069* (.109)	-0.26243* (.115)	-0.08823* (.036)	-0.08830* (.036)	-0.04340** (.016)	-0.04367** (.016)
FC Debt _{it-1} * Surprise _t * Change _t	0.01957 (.105)	0.13658 (.117)	0.17846* (.083)	0.14899* (.071)	0.21041 (.129)	0.21317 (.122)	0.02929 (.162)	0.02735 (.165)
Long Fwd _{it-1}	0.00295 (.014)	-0.00001 (.013)	0.00131 (.008)	0.00208 (.008)	-0.00645 (.007)	-0.00604 (.007)	-0.01653* (.008)	-0.01646* (.008)
Long Fwd _{it-1} * Surprise _t	-0.02083 (.064)	0.00896 (.058)	0.0063 (.008)	0.00462 (.007)	0.03336 (.067)	0.03184 (.062)	-0.09152 (.064)	-0.08978 (.063)
Long Fwd _{it-1} * Change _t	-0.36857*** (.106)	-0.47580*** (.136)	-2.41203*** (.754)	-2.54754*** (.801)	-0.65093*** (.191)	-0.64973*** (.191)	-0.23305*** (.067)	-0.23224*** (.066)
Long Fwd _{it-1} * Surprise _t * Change _t	1.20871*** (.364)	1.76054*** (.521)	1.90946** (.60)	1.63569** (.517)	2.17186*** (.651)	2.13544*** (.639)	0.87121** (.269)	0.86146** (.265)
Exports	0.00023 (.001)	0.00017 (.002)	-0.0005 (.001)	-0.00043 (.001)	-0.00076 (.001)	-0.00078 (.001)	0.0046 (.004)	0.00462 (.004)
Exports _{it-1} * Surprise _t	0.0085 (.040)	0.00738 (.057)	-0.00784 (.007)	-0.009 (.008)	-0.02564 (.023)	-0.02399 (.022)	0.02264 (.018)	0.02248 (.018)
Exports _{it-1} * Change _t	-0.22425*** (.010)	-0.32782*** (.014)	-1.45430*** (.063)	-1.52777*** (.066)	-0.33312*** (.014)	-0.33128*** (.014)	-0.07431*** (.005)	-0.08002*** (.005)
Exports _{it-1} * Surprise _t * Change _t	1.51757*** (.079)	2.09041*** (.110)	1.33416*** (.057)	1.13163*** (.049)	1.89816*** (.082)	1.86220*** (.081)	0.99051*** (.048)	1.00227*** (.048)
Surprise	month av	month med	semiannual av	semiannual med	year av	year med	YoY av	YoY med
Observations	168811	168811	168811	168811	168811	168811	168811	168811
Instruments	293	293	293	293	293	293	293	293
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES
Year-sector fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex H: Investment and the competitiveness, net-worth and FC hedging effects excluding firms from the oil and mining sector

Table H.1: Investment and the competitiveness, net-worth and FC hedging effects - No oil and Mining

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}
FC Debt _{it-1}	-0.00746 (.008)	0.00401 (.005)	0.00339 (.003)	0.00411 (.003)	0.00431 (.004)	0.00457 (.004)	0.00345 (.002)	0.00289 (.002)
FC Debt _{it-1} * Surprise _t	0.22195 (.184)	0.12441 (.154)	0.01216 (.014)	0.01715 (.017)	0.08512 (.097)	.075 (.085)	0.19422 (.210)	0.19964 (.214)
FC Debt _{it-1} * Change _t	-0.07704** (.027)	-0.10892** (.034)	-0.37823** (.130)	-0.39780** (.138)	-0.12776** (.042)	-0.12767** (.042)	-0.06195** (.019)	-0.06224** (.019)
FC Debt _{it-1} * Surprise _t * Change _t	0.07093 (.176)	0.28142 (.164)	0.28618** (.098)	0.23691** (.083)	0.33924* (.151)	0.02191 (.143)	0.01164 (.211)	0.00773 (.215)
Long Fwd _{it-1}	-0.00339 (.013)	-0.00508 (.012)	-0.00497 (.008)	-0.00398 (.008)	-0.01102 (.007)	-0.01087 (.007)	-0.02226* (.009)	-0.02216* (.009)
Long Fwd _{it-1} * Surprise _t	-0.01609 (.057)	0.003 (.050)	0.0046 (.007)	0.00294 (.006)	0.02973 (.067)	0.02917 (.061)	-0.09993 (.065)	-0.09853 (.064)
Long Fwd _{it-1} * Change _t	-0.31537** (.097)	-0.41598** (.127)	-2.31558** (.718)	-2.46523** (.768)	-0.56853*** (.160)	-0.56782*** (.160)	-0.19558*** (.059)	-0.19444*** (.058)
Long Fwd _{it-1} * Surprise _t * Change _t	1.00846** (.338)	1.51685** (.490)	1.83341** (.572)	1.58340** (.496)	1.88114*** (.550)	1.85063*** (.541)	0.73597** (.250)	0.72678** (.247)
Exports	0.000 (.001)	0.00054 (.002)	-0.00047 (.001)	-0.00036 (.001)	-0.00092 (.001)	-0.00094 (.001)	0.00678 (.006)	0.00694 (.006)
Exports _{it-1} * Surprise _t	0.00725 (.038)	-0.00087 (.053)	-0.00724 (.007)	-0.00793 (.007)	-0.02781 (.025)	-0.02594 (.023)	0.03386 (.033)	0.03435 (.033)
Exports _{it-1} * Change _t	-0.00186 (.013)	-0.00108 (.020)	0.02307 (.093)	0.02097 (.097)	0.00685 (.023)	0.00678 (.022)	-0.00507 (.007)	-0.00524 (.007)
Exports _{it-1} * Surprise _t * Change _t	0.00329 (.098)	1.51685** (.490)	-0.01357 (.083)	-0.00737 (.069)	-0.00679 (.121)	-0.00772 (.119)	-0.06046 (.083)	-0.059 (.084)
Surprise	month av	month med	semiannual av	semiannual med	year av	year med	YoY av	YoY med
Observations	165801	165801	165801	165801	165801	165801	165801	165801
Instruments	291	291	291	291	291	291	291	291
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES
Oil and Mining Sector Exclusion	YES	YES	YES	YES	YES	YES	YES	YES
Year-sector fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex I: Investment and the competitiveness, net-worth and FC hedging effects controlling for publicly traded firms - Tobin's

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Table I.1: Investment and the competitiveness, net-worth and FC hedging effects - publicly traded firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}
FC Debt _{it-1}	-0.00649 (.008)	0.00366 (.004)	0.00366 (.002)	0.00327 (.002)	0.00378 (.003)	0.00399 (.004)	0.00248 (.002)	0.00213 (.001)
FC Debt _{it-1} * Surprise _t	0.15715 (.093)	0.11096 (.074)	0.01324 (.009)	0.01362 (.008)	0.07473 (.083)	.066 (.072)	0.12504 (.156)	0.12867 (.159)
FC Debt _{it-1} * Change _t	-0.04889* (.023)	-0.07155* (.029)	-0.24280* (.104)	-0.25526* (.110)	-0.08247* (.034)	-0.08251* (.034)	-0.04116** (.016)	-0.04112** (.016)
FC Debt _{it-1} * Surprise _t * Change _t	0.02852 (.101)	0.14595 (.111)	0.17624* (.080)	0.14815* (.068)	0.19086 (.125)	0.19541 (.118)	0.00284 (.162)	-0.00047 (.165)
Long Fwd _{it-1}	0.00988 (.016)	0.01082 (.016)	0.01135 (.011)	0.01252 (.011)	0.00132 (.008)	0.00202 (.008)	-0.00416 (.006)	-0.00401 (.006)
Long Fwd _{it-1} * Surprise _t	-0.04037 (.072)	-0.027 (.070)	0.00229 (.009)	0.00103 (.008)	0.05037 (.071)	0.04398 (.065)	-0.05317 (.060)	-0.05197 (.059)
Long Fwd _{it-1} * Change _t	-0.43602** (.146)	-0.53757** (.173)	-2.46691** (.817)	-2.61824** (.871)	-0.72286** (.240)	-0.72232** (.239)	-0.30548** (.106)	-0.30618** (.106)
Long Fwd _{it-1} * Surprise _t * Change _t	1.44333** (.503)	1.99916** (.658)	1.94826** (.648)	1.67741** (.560)	2.38188** (.797)	2.34823** (.786)	1.04035** (.378)	1.03621** (.376)
Exports	0.002 (.002)	0.00252 (.003)	-0.0006 (.001)	-0.00063 (.001)	-0.0004 (.001)	-0.00045 (.001)	0.00406 (.003)	0.00409 (.003)
Exports _{it-1} * Surprise _t	-0.03287 (.053)	-0.04455 (.067)	-0.008 (.007)	-0.00987 (.009)	-0.01889 (.019)	-0.01803 (.018)	-0.05317 (.060)	0.01885 (.016)
Exports _{it-1} * Change _t	-0.22523*** (.010)	-0.32978*** (.014)	-1.45443*** (.063)	-1.52787*** (.066)	-0.33306*** (.015)	-0.33121*** (.014)	-0.07342*** (.004)	-0.07913*** (.004)
Exports _{it-1} * Surprise _t * Change _t	1.55726*** (.084)	2.14076*** (.113)	1.33460*** (.058)	1.13277*** (.049)	1.89002*** (.082)	1.85486*** (.080)	0.99241*** (.048)	1.00406*** (.048)
Publicly Traded _t	-0.53308** (.192)	-0.54325** (.192)	-0.52015** (.186)	-0.52102** (.186)	-0.50126** (.182)	-0.50048** (.181)	-0.49473** (.176)	-0.49358** (.176)
Surprise	month av	month med	semiamnual av	semiamnual med	year av	year med	YoY av	YoY med
Observations	168811	168811	168811	168811	168811	168811	168811	168811
Instruments	240	240	240	240	240	240	240	240
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex J: Investment and Balance Sheet effects of FC debt (mitigation factors not included)

Table J.1: Investment and Balance Sheet effects of FC debt - No mitigation factors

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}
FC Debt _{it-1}	-0.01487 (.016)	-0.01946 (.024)	-0.00524 (.005)	-0.00489 (.005)	-0.00266 (.004)	-0.00331 (.004)	0.00054 (.005)	-0.00168 (.007)
FC Debt _{it-1} * Surprise _t	-0.08892 (.117)	-0.05803 (.136)	-0.02047 (.016)	-0.01866 (.016)	-0.04496 (.031)	-0.05206 (.032)	0.13498 (.089)	0.14201 (.096)
FC Debt _{it-1} * Change _t	-0.0566 (.055)	-0.083 (.078)	-0.49548 (.346)	-0.529 (.369)	-0.12163 (.086)	-0.122 (.087)	-0.03597 (.030)	-0.03383 (.030)
FC Debt _{it-1} * Surprise _t * Change _t	0.34338 (.250)	0.46131 (.356)	0.42209 (.285)	0.3657 (.247)	0.48056 (.319)	0.48333 (.318)	-0.00506 (.130)	-0.01311 (.135)
Surprise	month av	month med	semiannual av	semiannual med	year av	year med	YoY av	YoY med
Observations	178976	178976	178976	178976	178976	178976	178976	178976
Instruments	132	132	132	132	132	132	132	132
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex K: Investment and the competitiveness, net-worth and FC hedging effects in the 2014-2019 period

Table K.1: Investment and the competitiveness, net-worth and FC hedging effects - 2014 to 2019

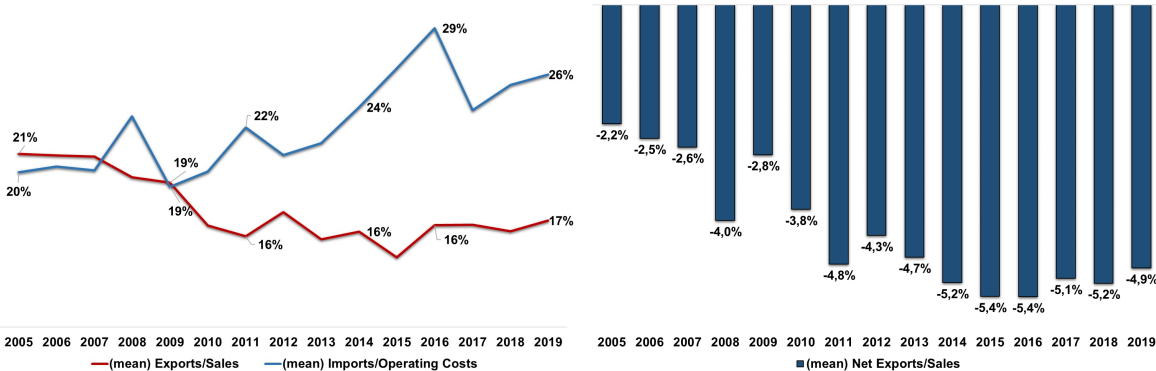
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}	Investment _{it}
FC Debt _{it-1}	-0.03213 (.061)	-0.04883 (.049)	-0.19866 (.219)	-0.202 (.227)	-0.07152 (.076)	-0.07134 (.075)	-0.10315 (.073)	-0.10474 (.074)
FC Debt _{it-1} * Surprise _t	0.08435 (.226)	0.16074 (.314)	0.1554 (.176)	0.12805 (.148)	0.22621 (.269)	0.2223 (.264)	0.03797 (.670)	0.40068 (.286)
Long Fwd _{it-1}	-0.52269 (.274)	-0.73235* (.361)	-6.24709*** (1.827)	-6.66702*** (1.921)	-1.45293** (.504)	-1.46121** (.505)	-0.41362* (.183)	-0.41030* (.184)
Long Fwd _{it-1} * Surprise _t	1.50496 (.905)	2.52948 (1.360)	4.96329*** (1.457)	4.29644*** (1.242)	4.80027** (1.711)	4.75745** (1.687)	1.16449* (.583)	1.14214* (.581)
Exports	-0.07239*** (.007)	-0.31622*** (.031)	-1.42943*** (.143)	-1.50271*** (.150)	-0.32464*** (.033)	-0.32292*** (.032)	-0.06688*** (.007)	-0.07239*** (.007)
Exports _{it-1} * Surprise _t	1.47590*** (.146)	2.03146*** (.201)	1.30385*** (.130)	1.10442*** (.110)	1.82568*** (.182)	1.79245*** (.179)	0.98647*** (.098)	0.99742*** (.099)
Surprise	month av	month med	semiannual av	semiannual med	year av	year med	YoY av	YoY med
Observations	41929	41929	41929	41929	41929	41929	41929	41929
Instruments	45	45	45	45	45	45	45	45
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Annex L: Competitiveness effect and the role of costs denominated in FC

One puzzling result is the negative effect found for the competitiveness effect of exports on investment: For the period with a depreciated exchange rate of equilibrium more export-oriented firms invest less. A plausible explanation for this result is the increase in the marginal costs denominated in FC during an exchange rate depreciation. In Figure L.1 panel a, we show how the average ratio of exports to sales declined from 21 percent in 2005 to 17 percent in 2019, while the mean ratio of imports to operating costs increased from 20 to 26 percent. Panel b depicts the average ratio of net-exports to sales. On average, between 2005 and 2013 net-exports represented -3.5 percent of sales. From 2014 to 2019 the average ratio was -5.2 percent. These stylized facts are suggestive evidence of costs denominated in FC being the driver of the negative effect found for the competitiveness effects of exports.

Figure L.1. Exports vs Imports 2005-2019



(a) Average exports as a share of sales and imports a share of operating costs. (b) Average net-exports as a share of sales. Net exports = Exports - Imports.

Source: Authors' calculations based on DAND and DIAN.

To properly test for this hypothesis we carry two exercises. First, we follow the specification of equation (8) but instead of using the exports to sales ratio we use the net-exports to sales ratio. Second, we expand equation (8) and control for the imports to operating costs ratio, and its double and triple interactions with the $change_t$ dummy and with the exchange rate surprise variable. This with the objective of disentangling the competitiveness effect of exports from the negative effect of the increase in the marginal costs via inputs denominated in FC.

Table L.1 presents the result for the first exercise. As it is shown, the sign and the significance of the coefficients for net-exports and their double and triple interactions persist. It does not matter if we use the net-export definition, the negative competitiveness effect is still present.

Table L.2 exhibits the result for the second exercise. Once we control for the imports to operating costs ratio and its interactions, the negative competitiveness effect of exports persists. The negative competitiveness effect of exports is not driven by an increase in the marginal costs denominated in FC during exchange rate depreciations. Moreover, the imports to operating costs ratio and its interactions are not statistically significant. A plausible explanation for this lack of statistical significance is that the negative effect of the increase in the share of the costs denominated in FC is dampen by a switch to domestic inputs that are cheaper (unfortunately we cannot directly test for this hypothesis as we do not have the firm-level wage-bill).

Table L.1. Impact of exchange rate on investment depending on Net-Exports as a share of sales

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FC Debt _{it-1}	-0.008 (.014)	0.00461 (.010)	0.00461 (.002)	0.00243 (.002)	0.00301 (.003)	0.00309 (.003)	0.00255 (.002)	0.00222 (.002)
FC Debt _{it-1} * Surprise _t	0.14013* (.057)	0.07593 (.089)	0.00987 (.007)	0.01041 (.006)	0.06162 (.068)	0.05219 (.060)	0.12821 (.143)	0.13258 (.146)
FC Debt _{it-1} * Change _t	-0.05117* (.023)	-0.07766* (.035)	-0.26552* (.131)	-0.27921* (.139)	-0.08761* (.038)	-0.08760* (.038)	-0.04255** (.015)	-0.04256** (.015)
FC Debt _{it-1} * Surprise _t * Change _t	0.05837 (.089)	0.19906 (.159)	0.19823 (.107)	0.16722 (.092)	0.22266 (.147)	0.22757 (.143)	0.00363 (.151)	0.000 (.155)
Long Fwd _{it-1}	0.00403 (.022)	0.00467 (.019)	0.00607 (.014)	0.00731 (.013)	-0.00415 (.018)	-0.00338 (.018)	-0.00864 (.018)	-0.00852 (.018)
Long Fwd _{it-1} * Surprise _t	-0.00109 (.004)	0.000 (.003)	0.00228 (.009)	0.00037 (.007)	0.07175 (.095)	0.06267 (.086)	-0.03877 (.048)	-0.03757 (.047)
Long Fwd _{it-1} * Change _t	-0.44941** (.157)	-0.58975** (.227)	-2.93823 (1.770)	-3.11325 (1.890)	-0.78749 (.410)	-0.78726 (.413)	-0.28624** (.108)	-0.28689** (.105)
Long Fwd _{it-1} * Surprise _t * Change _t	1.55435** (.486)	2.28022** (.831)	2.34345 (1.411)	2.01375 (1.221)	2.65826* (1.349)	2.62347 (1.341)	1.04840** (.361)	1.04297** (.349)
Net-Exports	0.000 (.001)	-0.00005 (.001)	0.00011 (0.000)	0.00011 (0.000)	0.0001 (0.000)	0.00009 (0.000)	-0.00018 (0.000)	-0.00023 (0.000)
Net-Exports _{it-1} * Surprise _t	-0.02662 (.079)	-0.01846 (.068)	-0.00011 (0.000)	-0.00009 (0.000)	-0.00327 (.009)	-0.00252 (.007)	-0.00138 (.002)	-0.00174 (.003)
Net-Exports _{it-1} * Change _t	-0.07385*** (.003)	-0.32609*** (.013)	-1.45014*** (.057)	-1.45000*** (.057)	-0.33186*** (.013)	-0.33004*** (.013)	-0.06818*** (.003)	-0.07385*** (.003)
Net-Exports _{it-1} * Surprise _t * Change _t	1.52653*** (.059)	2.09677*** (.081)	1.32361*** (.051)	1.32350*** (.051)	1.87281*** (.072)	1.83780*** (.071)	1.01441*** (.039)	1.02646*** (.040)
Surprise	month av	month med	semiannual av	semiannual med	year av	year med	YoY av	YoY med
Observations	168812	168812	168812	168812	168812	168812	168812	168812
Instruments	240	240	240	240	240	240	240	240
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Dependent variable is investment defined as the change in physical assets of firm i normalized by her level of assets in $t - 1$.

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table L.2. Impact of exchange rate on investment depending on Imports as a share of operating costs

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FC Debt _{it-1}	-0.00705 (.009)	0.00329 (.005)	0.00283* (.001)	0.00269** (.001)	0.00325 (.003)	0.00325 (.003)	0.00258 (.002)	0.00224 (.002)
FC Debt _{it-1} * Surprise _t	0.15256* (.070)	0.09478* (.039)	0.01117* (.005)	0.01161** (.004)	0.0664 (.070)	0.05775 (.060)	0.129 (.148)	0.13367 (.152)
FC Debt _{it-1} * Change _t	-0.05114* (.022)	-0.07407* (.029)	-0.24150* (.112)	-0.25352* (.119)	-0.08310* (.034)	-0.08302* (.033)	-0.04240** (.015)	-0.04236** (.014)
FC Debt _{it-1} * Surprise _t * Change _t	0.04258 (.086)	0.17228 (.108)	0.17759* (.090)	0.14926 (.077)	0.20218 (.125)	0.20607 (.119)	0.00206 (.156)	-0.002 (.160)
Long Fwd _{it-1}	0.0106 (.015)	0.01039 (.015)	0.00988 (.010)	0.01106 (.011)	0.00121 (.009)	0.00197 (.009)	-0.00606 (.013)	-0.00603 (.014)
Long Fwd _{it-1} * Surprise _t	-0.03197 (.071)	-0.027 (.067)	0.00311 (.014)	0.00174 (.012)	0.06477 (.164)	0.05754 (.152)	-0.03732 (.051)	-0.0362 (.050)
Long Fwd _{it-1} * Change _t	-0.37410** (.132)	-0.49301** (.186)	-2.51234 (1.411)	-2.66245 (1.518)	-0.67158* (.305)	-0.67070* (.308)	-0.24845* (.097)	-0.24761** (.095)
Long Fwd _{it-1} * Surprise _t * Change _t	1.20984** (.431)	1.81747** (.698)	1.98578 (1.115)	1.70704 (.973)	2.18524* (.905)	2.15375* (.907)	0.82485* (.322)	0.81627** (.314)
Exports	0.003 (.002)	0.00212 (.004)	-0.00094 (.005)	-0.00089 (.003)	-0.00272 (.017)	-0.00293 (.017)	0.00151 (.003)	0.00146 (.004)
Exports _{it-1} * Surprise _t	-0.08331 (.069)	-0.02829 (.121)	-0.01267 (.040)	-0.01484 (.037)	-0.06884 (.352)	-0.06724 (.326)	0.00449 (.013)	0.00419 (.017)
Exports _{it-1} * Change _t	-0.22787*** (.009)	-0.33050*** (.013)	-1.45757*** (.056)	-1.53123*** (.059)	-0.33190*** (.022)	-0.32988*** (.022)	-0.07129*** (.004)	-0.07693*** (.005)
Exports _{it-1} * Surprise _t * Change _t	1.61266*** (.092)	2.13137*** (.148)	1.34245*** (.065)	1.14041*** (.057)	1.94607*** (.357)	1.91008*** (.331)	1.01120*** (.041)	1.02314*** (.043)
Imports _{it-1}	-0.00783 (.030)	-0.00629 (.030)	-0.00443 (.014)	-0.0045 (.014)	-0.00105 (.004)	-0.00134 (.005)	0.00076 (.008)	0.00071 (.008)
Imports _{it-1} * surprise _t	0.12192 (.349)	0.06055 (.301)	-0.00248 (.010)	-0.00304 (.008)	0.02624 (.173)	0.02402 (.158)	0.02832 (.075)	0.0279 (.070)
Imports _{it-1} * Change _t	0.06564 (.044)	0.07337 (.051)	0.13097 (.186)	0.12609 (.186)	0.04929 (.053)	0.04821 (.053)	0.02493 (.028)	0.02641 (.029)
Imports _{it-1} * Surprise _t * Change _t	-0.41012 (.351)	-0.42192 (.301)	-0.12486 (.149)	-0.11992 (.150)	-0.28983 (.229)	-0.27989 (.215)	-0.22579* (.113)	-0.22695* (.112)
Surprise	month av	month med	semiannual av	semiannual med	year av	year med	YoY av	YoY med
Observations	168655	168655	168655	168655	168655	168655	168655	168655
Instruments	275	275	275	275	275	275	275	275
First lag of Investment	YES	YES	YES	YES	YES	YES	YES	YES
Other firm level controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Dependent variable is investment defined as the change in physical assets of firm i normalized by her level of assets in $t - 1$.

Author's calculations based on SS, SFCC, DIAN-DANE and BdR.
Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.