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Currency Mismatch and Balance Sheet Effects of Exchange Rate in Turkish Non-Financial Corporations

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CURRENCY MISMATCH AND BALANCE SHEET EFFECTS OF EXCHANGE RATE IN TURKISH NON-FINANCIAL CORPORATIONS

A Dissertation Presented

by

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DEDICATION

To my parents- for their enormous trust and belief in me.

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ABSTRACT

CURRENCY MISMATCH AND BALANCE SHEET EFFECTS OF EXCHANGE RATE IN TURKISH NON-FINANCIAL CORPORATIONS

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Until the East Asian Crisis of 1990s, literature exclusively focused on the assumed expansionary competitiveness channel of deprecation in the domestic currency. The East Asian and Latin American Crisis of 1990s proved that depreciation in the domestic currency caused fragilities through the deterioration in firms' balance sheet net-worth. Many have argued that excessive reliance on short-term debt and un-hedged foreign currency borrowings of firms were responsible of fragilities, and resulting poor performances of firms in these countries. The latter body of the literature introduced the contractionary balance sheet effects of foreign currency indebtedness through depreciation, and argued that if a portion of debt is denominated in a foreign currency, a depreciation may lead to a substantial real melt-down in the net-worth of firms. As a result, the expansionary competitiveness effect of depreciation may be limited or even be reserved due to contractionary balance sheet effect of depreciation.

The increase in the trend and the size of the foreign currency indebtedness of non-financial corporations in the emerging market economies in the aftermath of the Global Financial Crisis of 2007 galvanized similar discussions and raised the concern over the potential fragilities due to non-financial corporations' un-hedged currency risks.

Motivated from these recent discussions, this dissertation analyzes the size and the effect of foreign currency exposure of Turkish non-financial corporations (NFCs) thorough exchange rate fluctuations. Doing so, I constructed a novel hand-collected dataset which has detail information on the currency composition, break-down and maturity structure of firms' foreign currency debts and assets.

Chapter 1 of the dissertation introduces the theoretical background of the relationship between currency mismatch and depreciation. Chapter 2 introduces the sources, and then discusses strengths, weaknesses and potential uses and contributions of the dataset compiled for this dissertation. Chapter 3 descriptively analyses the evolution of the foreign currency indebtedness of NFCs in relation to firm level characteristics. Finally, chapter 4 analyses the effect of the foreign currency indebtedness on firm output; particularly capital expenditures. Specifically, chapter 4 seeks to understand whether the contractionary balance sheet effect of depreciation dominates the expected expansionary competitiveness effect of depreciation. The econometric results suggest that contractionary balance sheet effect of depreciation dominates the expected expansionary competitiveness effect; as a result, foreign currency indebted firms invest less following a depreciation. Furthermore, results indicate that firms with larger currency mismatches are constrained more than those firms with less currency mismatches in their balance sheets.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The East Asian crisis of the late 1990s promoted a new wave of discussion on the effect of currency composition of debt and its maturity structure on the emergence of financial fragilities and even a full-scale crisis. Once capital inflow slowed down and the domestic currency depreciated, explosion in the liability side of the balance sheets led to significant melt-down in net worth of the firms.

The literature has shifted from macro-level to micro-level analysis, with 'firm' as the unit of analysis. This latter body of work has drawn attention to foreign currency (FX) indebtedness through balance sheet effects of exchange rate depreciation. Specifically, when firms cannot match their FX debt with their FX revenues, they face a foreign currency open position in their balance sheet. This currency mismatch exposes firms to an exchange rate risk; and hence causes deterioration in their balance sheets by inflating the domestic value of their foreign currency debt. As a result, firm' productive activities are likely to be constrained due to a depreciation.

Increasing trend in the FX indebtedness of non-financial corporations in the aftermath of global financial crisis of 2007 raised the concern over the potential vulnerabilities due to non-financial corporations' un-hedged currency risks (Acharya, Cecchetti, Gregario, Kalemli-Ozcan, Lane, and Panizza. 2015).

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The case of the Turkish economy is quite relevant in that regard. As of February 2017, Turkish nonfinancial sectors hold the 65 percent of the total external debt (CBRT 2017). IMF (2016) points that the Turkish NFC indebtedness is well above the average level comparing EMC NFC debt (IMF Turkey Country Report, 2016).

In this dissertation, I study the determinants and the consequences of firm level foreign currency exposure in the Turkish non-financial corporations from 2003 to 2015. I specifically try to uncover: i) the nature of the relationship between firm characteristics and currency mismatch, and ii) the effects of currency indebtedness and currency mismatch on firm performances such as investment, sales, and profit due to depreciation in exchange rate.

1.2 Motivation

Since the crisis of 2001, the size and composition of private sector indebtedness is a source of concern in Turkish economy. The aggregate corporate FX debt of Turkish NFC has risen significantly in recent decade; and increased from 24 percent to 69 percent of GDP in September 215.Between 2009:Q2 -2015:Q3 (IMF Turkey Country Report, 2015)

Both banks and non-bank institutions got easy and cheap access to the credits as a result of unprecedented increase in the global money supply in the aftermath of the global turmoil of 2007. The domestic banks share of FX lending rose from 44 to 68 percent (IMF, 2015). As a result, NCF increased their domestic and foreign currency leverages.

The non-financial sector's is increasingly exposed to FX risks. NFCs' FX asset accumulation fell behind their FX debt stock, hence the net open FX position jumped

substantially from US$21.7 billion in 2005 to US$175.3 billion in September 2015, which makes up 27.9 percent of GDP in September 2015. Between 2005 and September 2015, more than three-fourths of the cumulative increase in FX mismatch took place after the 2008 global crisis due to a rise in FX loans (IMF Turkey Country Report, 2016).

Furthermore, in 2009, the Turkish authorities dismantled the prevailing law that prevented firms from borrowing in FX from the domestic banks unless they have FX income. As a result of this deregulation, firms can borrow in FX regardless of the denomination of their incomes. As a result of exceptionally accommodative monetary policy of global economy, domestic banks increased their external borrowing after 2008 and the banking sector's FX lending to the NFC between 2008 to mid-2014 increased substantially. Although banks' direct FX exposure is limited; their indirect exposure has risen through their FX lending to non-financial corporations

The prevailing monetary policy also contributed to NFCs' FX indebtedness because of the higher domestic real interest rates. The Central Bank of the Republic of Turkey (CBRT) commenced implementing inflation targeting (IT) framework in the aftermath of the 2001 financial crisis, in an effort to decrease the double-digits inflation rates. Under IT, the monetary authority has been actively using interest rates to combat inflationary pressures. As a result, domestic real interest rates have been kept well above international levels. This international interest rate differential has changed the borrowing patterns of firms, and caused them to borrow in FX. Moreover, capital inflows have brought about appreciation of the Turkish Lira.

Although financial and corporate sectors have shown resilience in the aftermath of the global financial crisis of 2007, coupled with regulatory changes and easy access to the

international credit, NFC's indebtedness remains high compared to historical levels as well as compared to public sector indebtedness. This increase in FX leverage exposes Turkish NFCs to currency risks.

Turkish financial markets have been extremely sensitive to both internal and external shocks. Because of political uncertainty in 2013, Turkish Lira lost 24 percent against US Dollar. Discussions of the US Federal Reserve tapering monetary policy, and ongoing domestic political uncertainty led to 15 percent depreciation in exchange rate in early 2014. This has led the Turkish economy to be identified as one of the "fragile-five.[1] Following the political crisis with Russia in late November of 2015, Turkish Lira vis-a-vis the US Dollar has been fluctuating significantly. Between December 31st, 2015 and December 31st, 2016, the Turkish Lira depreciated by more than 20 percent against the US Dollar. Similarly, within the first month of 2017 (January 1st to January 30th), the Lira depreciated by 11 percent. Reversal or a "sudden stop" in capital inflows remains one of the main risks to the Turkish economy, which can result in a large depreciation of the Lira, causing a severe slow-down of the economy.

The above discussion suggests that the increasing trend in Turkish private sector's external indebtedness could be a potential source of fragility, in the case of a significant depreciation of its currency. My motivation in this dissertation is shed light to size and the trend of FX exposure of Turkish nonfinancial corporations between 2003 and 2015. Doing so, I compiled a dataset which has detailed information on the composition and

[1] The term is a term coined by Morgan Stanley in August of 2013, to represent several emerging market economies, Brazil, India, Indonesia, South Africa and Turkey; those have become too dependent on unreliable foreign capital to finance their growth. https://www.morganstanley.com/institutional/research/pdf/FXPulse_20130801.pdf.

term structure of firms' assets and liabilities. This dataset will provide us with up-to-date information on the health of the firms, and help us derive indicators to test the sensitivity of risks associated with FX exposure as well as its impact on firm output.

1.3 Foreign Currency Debt, Currency Mismatch, and Firm Performance

Traditional open-economy models mainly discuss the competitiveness channel of exchange rate depreciation. For example, according to the Mundell-Fleming model, depreciation of a country's currency makes domestic goods and services cheaper in terms of FX, which leads to an increase in foreign demand for domestic goods and services. Hence, assuming Marshall-Lerner conditions holds, a depreciation in the domestic currency leads to an increase in export revenue, and in turn sales and investment increase. This is known as the expansionary competitiveness effect of depreciation.

Firms in developing countries tend to hold FX debts in their balance sheets.[2] By holding un-hedged foreign debt, firms are taking on the risk of an unexpected depreciation. Depreciation deteriorates the balance sheet primarily by inflating the domestic value of foreign debt, and hence deteriorating the balance sheet net worth.

Similarly, faced with the uncertainty of the future value of the domestic currency, firms in developing countries may choose to issue short-term debt denominated in foreign currency. Hence, firms are likely to face a currency and maturity mismatch in their balance sheets, given that their revenue is primarily in domestic currency and linked to business assets which are long term and therefore illiquid. This interplay between foreign

[2] The main reason is the failure of uncovered interest parity condition (UIP).

asset-foreign debt composition and the maturity structure of debt exposes risks to the firm's balance sheets.

Following a depreciation, firms that are leveraged in foreign currency and dependent on domestic currency revenues will find the increase in the domestic currency value of their debt more than the increase in domestic currency value of their assets and revenues. This mismatch increases their real debt burden. While, a maturity mismatch exposes a firm's balance sheet to rollover and interest rate risk. If liquid assets are not sufficient to cover matured debts, it leads to deterioration in debt service and hence a rollover risk. Given that firms are already credit constraint in developing countries, this deterioration in debt service puts significant pressures on firms' balance sheets especially during a currency and banking crises.

Furthermore, as a result of deterioration in debt service, firms will need to borrow more to service their outstanding debt. However, if the meltdown in net worth is substantial, firms may find themselves in a situation in which they cannot borrow because of an increase in their risk premium. Even if they manage to borrow, the cost of the borrowing will be substantially higher. As a result, firms will be constantly trying to roll over their outstanding debt, possibly by borrowing more, instead of expanding their productive expenditures. Any of the shocks described above can cause insolvency among firms and may even lead to bankruptcy of the highly leveraged ones. Because of the interplay between sectors in turn, may trigger widespread economic fragilities.

To understand the true effect of depreciation, we need to go beyond the textbook model, and include analysis of foreign currency holdings[3] of firms and their maturity structure. Doing so illustrates that, as opposed to the traditional open-economy models, a deprecation may not necessarily be expansionary. If firms have large FX open positions, the expected expansionary effect of depreciation may be limited, it may even be reversed. Meltdown in net worth, deterioration in debt services, and increase in cost of borrowing are likely to constrain firms' operating performances and their output.

There is a chance that depreciation of the currency may not necessarily deteriorate the net worth of FX leveraged firms. For instance, firms that operate in the tradable sectors may expect their future earnings to increase in the aftermath of a depreciation, and therefore hold a higher proportion of FX debt.

Likewise, firms may be holding FX assets in their balance sheets. If a portion of the assets are denominated in FX, depreciation will also inflate the asset side of the balance sheets. Under these circumstances, the impact of a depreciation on indebtedness, maturity mismatch, and hence balance sheet is ambiguous, and depends on the relative size of FX assets and FX derivatives on the balance sheet. In summary, firms that expect to match the FX composition of their debt with FX earnings and assets are less likely to be affected adversely by currency depreciation.

To sum up, in general, there two main channels through which depreciation affects firm output. First, depreciation changes the firms' internal funds by affecting the

[3] "Foreign currency holdings" refers to foreign currency debt, foreign currency assets and foreign currency derivatives.

price of their sales-trade channel. Second, depreciation changes the domestic currency value of FX holdings and affects the balance sheet net-worth channel.

1.4 Currency Mismatch and Monetary Policy

Some have argued that a flexible exchange rate regime helps reducing currency risks of firms by decreasing currency mismatch in the balance sheets Kamil (2012). The argument is that free floating exchange rate is self- disciplinary; as the central bank does not guarantee the level of exchange rate, firms does not take on currency risk as much as they do in the fixed exchange rate regime. However, as famously argued by Eichengreen and Hausmann (1999), the risk associated with un-hedged foreign currency debt is independent of the choice of exchange rate regimes. The main reason behind the risk is that developing country firms cannot borrow in their own currencies from the international market.[4] Goldstein and Turner (2004) point out that although countries officially claim to be adopting flexible exchange rate regime, exchange rates do not freely float in practice.

If currency exposure and maturity mismatch are potential threats for corporate financial fragility, then macroeconomic goals might be in conflict with the interest of the corporate sector. As Calvo and Reinhart (2002) argue in highly dollarized countries, central banks are hesitant to allow their currencies to depreciate in response to external shocks due to output costs associated to exchange rate fluctuations. Therefore, liability

[4] This phenomenon is called *original sin*. Eichengreen, Hausmann and Panizza (2003), find that the only variable that is robust in explaining cross-country differences in original sin is economic size. All other macroeconomic variables fail to explain much of the cross-country variation in liability dollarization.

dollarization limits the capacity of the central banks to implement effective monetary policy.

For instance, if achieving a specific inflation target is the main policy objective, then a higher domestic real interest rate and capital inflow can help achieve the targets. However, higher domestic real interest rate may change borrowing patterns of firms; it may lead domestic firms to borrow in FX due to the international interest rate differentials. Similarly, if currency exposure is large, officials can reduce the risk of excessive fluctuations in the exchange rate by increasing short-term interest rates. However, not letting exchange rate fluctuate can hamper export, which is the main source of financing FX debt and one of the main drivers of growth. Likewise, in case of a sudden stop in capital inflow and outflow causes excessive exchange rate fluctuations and inflates corporate sector indebtedness. Hence, higher FX open position of the corporate sector may limit policymakers' use of effective policies to achieve macroeconomic targets. Therefore, uncovering the depth and details of the currency exposure is the first step for the assessment of the policy choices.

1.5 Currency Mismatch and Need for Micro Data

Unfortunately, detailed micro level data is scarce. However, assessing of risks associated with FX mismatch, firm performance as well as designing and implementing policies in that regard require detail micro level data.

First, to understand the net effect of these two conflicting effects described above- expansionary trade and contractionary balance sheet effect- requires detailed firm-level data on the composition and maturity structure of FX assets and liabilities, as well as the

income stream tied to FX. Such a database would allow us to carry out thorough assessments on the relative size of FX exposure as well as the size of the net worth and competitiveness effects of depreciation through FX indebtedness. Such information will help us derive up-to-date indicators of sensitivity of firm balance sheet to foreign currency related risks.

Second, understanding the drivers of firms' choice of currency and maturity composition will allow policy makers to detect and prevent risks associated to currency exposure.

Third, understanding the origin of FX debt is also informative to prevent fragilities. If domestic banks are the main source of the foreign debt, fragilities on the corporate sector will eventually spillover to the banking sector balance sheets. If firms cannot fulfill their payment obligations, then banks have to underwrite these credits and their balance sheets will be adversely affected. Due to the interconnectedness of sectors, fragilities in one sector may spillover to the rest of the economy. To prevent such chain effect, policymakers may closely monitor the link between banks and borrowers. Doing so requires detail micro level data that helps uncover the interplay between sectors

Still, little is known about the true determinants of currency composition of debt. Micro-level empirical evidences are mixed and inconclusive regarding the channels through which depreciation alters firm's output in the presence of currency mismatches. One of main reasons for the ambiguous and inconclusive findings is the lack of detailed firm-level data. Data unavailability limits researchers' ability to effectively control for

factors[5] that correlate with exchange rate fluctuations, FX indebtedness, and investment opportunities. Failure to control for these factors potentially leads to biased results.

To overcome these difficulties, the availability of detailed micro level data is a necessity.

1.6 Contribution

Given the limitations of current research and relevant micro data, this dissertation contributes to the literature by filling an important gap in firm-level data for the Turkish economy. This dissertation will for the first time map out an evolution of the size and the effects of currency mismatch in the Turkish non-financial sector by using a novel firm-level data. To the best of my knowledge, the dataset used in this dissertation is unique in that it contains detailed information on firms' currency composition of assets, liabilities, derivative positions, and earnings as well as the term structure of their foreign currency debts and assets.

This study will also shed light on recent concerns over the impact of credit flows to emerging market economies (EMEs) in the aftermath of the Global Financial Crisis (GFC) of 2007. In that vein, the research question is very timely, and the results of this study will provide some knowledge on whether FX indebtedness causes fragilities for countries where domestic firms are highly dollarized. Furthermore, it will help us to understand the micro-macro dimension of these fragilities in non-financial firms rooted in

[5] Such factors include domestic and international credit market conditions, maturity mismatch, nonlinearity in the variables, etc. I will discuss these factors in detail in chapter 4.

"balance sheet mismatches", and it will contribute to the previous literature by providing a robust and thorough assessment of the impact of depreciation through FX indebtedness.

Finally, the few existing studies in this area, mostly focuses on either Latin American or Asian countries. This study contributes to the literature in the context of an emerging market economy, Turkey, on the effects of currency exposure in the most recent era.

1.7 Summary of Findings

The empirical analysis in the dissertation suggests that FX leveraged firms invest less than domestic currency indebted firms in the aftermath of a depreciation. As discussed before, this is because contractionary net-worth effects of depreciation dominate the potential expansionary competitiveness effects of depreciation. These results are based on data on Turkish non-financial firms between 2005 and 2014. The finding is robust to various robustness checks and alternative econometric estimators. To the best of my knowledge, this is the first firm-level empirical paper that shows that the contractionary net-worth effect of depreciation dominates the expansionary competitiveness effects without conditioning on any competitiveness measures[6] in the regression.

The rest of the dissertation is organized as follows. In chapter 2, I describe the dataset used in this dissertation. This dataset is distinct in that it has details information on the composition, maturity structure and currency breakdowns of the FX holdings of Turkish listed NFC. In chapter 3, I descriptively examine the size and the trend in FX

[6] Such as; export and import.

holdings and the currency mismatch of the firms in the dataset. I empirically test the determinants of the foreign currency indebtedness in chapter 3. The aim of the chapter is to uncover underlying relationship between FX exposure and on firm characteristics to draw some sterilized facts. The analyses suggest that although NFC FX debt as a share of total debt decreases in the entire period. FX debt as share of total assets increases between 2003 and 2010, then it decreases. However, the decrease in these ratios is not a result of a decrease in the level of FX debt, but rather a result of a increase in total debt and total assets. Indeed, the growth rate of FX debt increases after 2009 which is align with the literature that cites the increase in the trend in the debt accumulation of emerging markets NFC in the aftermath of the global financial crisis of 2007. Chapter also lays out that the debt maturity of NFC in the sample is fairly low and the assets to install long term is on average more than half of the total assets. Coupled with the NFCs' currency risks, this maturity structure in their asset and debt is a potential source of fragilities in the case of any unfavorable financial situation rooted from both global and domestic factors.

In chapter 4, I analyze the impact of currency debt and mismatch on firm output. I specifically ask the question that whether FX indebted firms perform better than those domestic currency indebted firm following depreciation. The empirical finding of the chapter suggests that FX indebted firms invest less in the aftermath of depreciation, and their export revenue is sufficient to match their FX debt. As a result, the firms output is constrained. This result implies that the expected expansionary effect of depreciation through trade channel is dominated by the contractionary net-worth channel of

depreciation. These results are robust to controlling correlates of investment opportunities, exchange rate and foreign currency debt.

CHAPTER 2

A NEW DATASET ON FOREIGN CURRENCY COMPOSITION OF TURKISH NON-FINANCIAL CORPORATIONS

2.1 Introduction

The increasing importance and need for firm-level data has been emphasized by international intuitions and policy makers especially after the Great Recession of 2007-2009. Policy makers need detailed micro data to understand the interplay between micro- and macro-economic factors that lead to fragilities, and thus manage risks.

NFC borrowing in EMEs has significantly increased in the aftermath of the global financial crisis of 2007. In particular, increase in NFC cross-border FX borrowing has caught the attention recently(See, Avdjiev, Chui, Shin 2014, Bruno and Shin 2015,McCauley, McGuire, Sushko 2015, Kuruc, Tissot and Turner 2016). In addition to NFCs' cross-border FX borrowing, their FX borrowing from domestic banks also exposes them, and the domestic banks to currency risks. Tarashev, Avdjiev, and Cohen (2016) point out that there is no international database on NFC financial holdings, including currency and maturity composition, and origin of country and sector of debtors. They argue that the lack of data prevents the detection of vulnerabilities associated with the size of FX exposure, interplay with the banking system, and the extent by which hedging reduces risk.

Understanding the details of currency composition and term structure of FX holding is particularly topical for Turkish policy makers. In addition to the level of FX

indebtedness, excessive fluctuations in the domestic currency in recent years raised the questions of the resilience of those highly FX leveraged Turkish firms.[7]

With these points in mind, I have constructed a novel hand-collected dataset on the composition, breakdown, and maturity structure of FX holdings of Turkish NFC for the period of 2003 to 2015. The dataset will be referred to as Foreign Currency Composition (FCC) of Turkish NFCs in the rest of the dissertation. The FCC dataset will help uncover the size of currency exposure in the Turkish economy. In addition, this dataset will contribute to recent debates around spillover of the global financial crisis of 2007 to emerging countries, in the context of the Turkish economy. In this chapter of the dissertation, I will document data sources and the construction of key variables of the FCC dataset. I will also discuss the strengths and the weakness of this unique dataset.

2.2 Data Sources of FCC

The FCC covers 425 listed and 25 non-listed[8] NFCs. I hand-collected information on FX holdings from the footnotes of firms' financial statements. Listed firms must disclose footnotes of their financial statements along with their accounting information. They are subject to strictly follow standardized accounting rules. Sources of these footnotes are Istanbul Stock Exchange (ISE), Public Disclosure Platform (PDP), and Capital Market Board (CMB). Data availability limits us to work mostly with listed

[7] Minister of Economy announced that they started to compile data of those heavily FX leveraged NFC to understand the size of the FX exposure.

[8] I have the information for 25 non-listed firms in the dataset. The non-listed firms are those that have raised capital through the stock market. Although they are not listed, they have to be approved by Capital Market Board (CMB), and they are required to disclose their financial statements based on the level of activities they engage in. The source of the information for non-listed firms is the Capital Market Board's web page.

firms.[9] However, because financial statements of listed firms have to be audited and disclosed regularly, the dataset used in this study is inarguably the most reliable data for Turkish NFCs.

The way the data is disclosed adds to the reliability of the dataset. As per "comparability principle" of accounting, the given year's financial information must be presented along with the previous year's information. This practice requires previous year's statements to be re-examined, and corrected if necessary. Hence for a given year, I have two observations: the first one is from the current year, the second one is from the following year. I constructed FCC for a given year by compiling data from the following year.[10]

Whenever a balance sheet item is reported in a FX, I converted it into Turkish Lira by using end of the year exchange rate. [11] Whenever an income statement item is reported in a FX, I converted it into Turkish Lira by using the average of the year exchange rate parity.

2.3 The Coverage and Details of FCC

The FCC dataset is unique in that it has detailed information on both FX liability and FX asset holdings of NFCs. To the best of my knowledge, with few exceptions,

[9] In Turkey, only listed firms and firms those raise capital through stock exchange are obliged to disclose their financial statements and their footnotes by law. The Turkish Central Bank compiles information on corporate sector balance sheet, but the only information publicly available is firms' FX bank borrowing. Information on "other financial", trade related debt, and FX assets are unavailable.

[10] Just to be concrete, data for 2010 is available both in 2010's and 2011's financial statements. I compiled the data for 2010 from the 2011 financial statement.

[11] Turkish accounting rules dictate the use of the end of the year parity for the balance sheet items.

existing datasets do not have information on firm-level FX assets. Having information on FX assets is important because the existing empirical literature only focuses on total foreign debt as a measure of FX exposure. However, doing so ignores the fact that firms may also hold FX assets to hedge their FX exposure. If firms carry both FX assets and FX debts, the effect of depreciation on the balance sheet is ambiguous and will depend on their relative sizes. Therefore, the lack of information on foreign assets prevents an accurate measure of currency exposure. FCC, which was constructed as part of this dissertation, provides detailed information on the size and breakdown of FX assets. The dataset shows that firms on average hold 11 percent of their assets in FX, and they carry on average 39 percent of their debt in FX.

In addition to the level of FX debt, the maturity structure of the FX debt and FX income is important. If firms hold a significant portion of FX debt in short term, depreciation may lead to a maturity mismatch in firms' debt services. Therefore, a thorough analysis of FX exposure through FX debt also requires detail information on the term structure of the debt. The FCC dataset differentiates between maturity structure of FX holdings as short term and long term. The descriptive statistics shows that whereas firms hold 10 percent of their FX assets in short term, they hold 27 percent of their FX debt in short term.

The currency breakdown of debt may also be crucial in analyzing FX exposure. If firms shuffle their FX debt among different currencies- for example, the US Dollar, Euro, Pound, Swiss Franc, etc-, the extent of fluctuations in different currencies will affect the balance sheet differently. The dataset includes breakdown of FX holdings in different

currencies.[12] However, on average, 65 percent of FX debt is in US dollars, 35 percent is in Euro. The remaining 5 percent is scattered among the other currencies. Moreover, I disaggregated information on the breakdown of FX denomination of more than 25 different accounting items. Namely, I can differentiate whether these FX holdings are trade related or financial.

Information regarding firms' income linked to a FX is crucial to evaluate the extent of natural hedging of firms. Firms that expect their future earnings to increase as a result of depreciation may also be the firms that carry more FX debts. Hence, the information on firms' export revenue is crucial to assess firms' capabilities of natural hedging. Information on foreign sales is available in the footnotes. However, sometimes sales information was not disaggregated into foreign and domestic sales; rather it is presented as total sales. Whenever, foreign sales information is missing, I fill the gaps by using Istanbul Chambers of Industry's (ICI) manufacturing sector datasets for the common firms in the datasets. [13]

Similarly, FX debt burden of importing firms increase due to depreciation. As much as import can boost investment and earnings, investment can be constrained by the increase in import cost. The FCC dataset covers information regarding firms' import expenditure as well. However, information on firm-level import is not perfect; only 40 percent of firm-year observations of import data are available in the dataset.

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[12] I have breakdown of FX holdings in more than 15 different currency including US Dollar Euro, Pound, Swiss Franc, Swinish Krona, Danish Krone, Japanese Yen, Russian Ruble, as well as the monetary units of the Euro Area countries before they join the monetary union, including Deutsche Mark, French Franc, etc.

[13] Every year ICI publishes main accounting information of its member manufacturing firms. 254 firms in my dataset are members of ICI. Whenever export information of these firms is missing, I obtain it from the ICI data.

In addition to standard accounting information such as short and long-term composition of assets and liabilities, operating income, net profit, etc. the database also contains information about institutional aspects of firms, including; ownership structure, multinational affiliation, and history of the main corporate events such as mergers, acquisitions, and privatizations, and the average number of the workers employed in given year. Firm's sectoral classification, ownership structure, and affiliation are particularly important when there are fluctuations in the domestic and international credit conditions. For example, firms with foreign and bank affiliations can relatively easily gain access to both the domestic and international credit markets. Likewise firms operate in the tradable sectors are expected to increase their FX earnings due to depreciation. The availability of such information will allow us to analyze firm exposure based on these firm characteristics.

Firms in the FCC dataset operate in 8 different main non-financial sectors,[14] but 77 percent of them are in the manufacturing sector. I classify the firms up to 3-digit ISIC (International Standard Industrial Classification) and 2-digit NACE (Nomenclature des Activités Économiques dans la Communauté Européenne) industry codes[15]. These classifications provide information on firms' production mix, and allow us to control for any industry effect at different levels of aggregation.

Due to entry and exit, mergers, acquisitions and bankruptcy, the panel is unbalanced. Table 1 displays the number of firms and total observations in each year

[14] They are agriculture, mining, manufacturing, construction, energy, transport and communication, retail and wholesale, and others (including, administrative activities, recreational activities, health-education, and other services).
[15] Bothe the ISIC and NACE classifications are based on revision number 2.

classified by sectors. The sample size changes as firms enter and exit. The reasons behind these changes can potentially be informative. For example, it is important to control for any corporate events such as mergers and acquisitions, privatization that leads to change in the sample size.

Likewise, firms exit and hence drop out of the sample due to bankruptcy. If the exiting firms have higher ratio of foreign debt, then we will observe an artificial reduction in average foreign exposure. Similarly, firms that are subject to mergers and acquisitions generally experience a significant increase in their fixed assets and investment. However, the reason behind this increase in investment is not their operating performance, but rather the consolidation of balance sheets.[16] Identifying and controlling for corporate events helps us avoid potential accounting and selection bias built into the sample. Firms that experienced corporate events including mergers, acquisitions, and privatizations are indicated by a dummy variable that takes the value of one, starting the year of the event.

If a firm has a parent -bank and holding-, or a foreign affiliation, it is indicated by a dummy variable that takes the value of one and zero otherwise. The dataset allows us to construct different measures of foreign affiliation.[17] First, if a firm is multinational,[18] and

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[16] To illustrate the importance of tracking corporate events, consider the following example in my sample. A listed firm which has been operating in furniture manufacturing was bought by a similar firm in the first half of 2012. After this acquisition, firm has changed its name and continued to be listed in the stock exchange. When I compare its investment as of the end of 2012, I see a significant increase in it. As a result, I moved this firm from my sample starting from 2012.

[17] I compiled the ownership structure, foreign affiliations information from the balance sheet footnotes. However, this information was not complete in the financial footnotes. To complete this information, I used the ICI dataset in which the percentage of firms' ownerships as foreign, private and public is presented in details.

if foreigners hold a share of the firm, regardless of the percentage of the share, firms are categorized as "foreign". If a firm is multinational, and if the foreign share of the firm is greater than 10 percent, they are categorized as "foreign-controlled". Similarly, if a firm is multinational, and if foreigners own the larger share, they are categorized as "foreign-controlled". Table 2 provides summary the number of firms in the dataset based on firm characteristics and affiliation. Foreign share decreases starting from 2009 and the average foreign share is 21 percent. Sixty one percent of the firms have a parent company affiliation, 49 percent of them are mature, 59 percent is large, 76 percent operates in the tradable sector, and 77 percent is exporters.

Finally, additional statistics of selected variables and measures are presented in Table 3.

2.4 Limitations of the FCC Dataset

Several cautionary remarks are necessary in terms of limitations of the dataset. First and foremost, this dataset is a product of a manual hand collection from financial reports, hence potential measurement errors are inevitable. With this point in mind, I dropped all inconsistent firm-year observations. In particular, I dropped observations if short-term assets exceed total assets, and if accounting variables did not accord with sign conventions.

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[18] Coca Cola and Ford are the examples of the multinationals.

The dataset only covers listed firms and a few non-listed firms that raise capital thorough the stock exchange. Therefore, sample selection bias is unavoidable, and is a result of data availability.

The sample consists of a mix of consolidated and nonconsolidated financial statements; however, most of the information is based on consolidated balance sheets.[19] By law, as long as firms disclose their consolidated financial statements, they do not have to disclose their sole financial statements. Hence, data availability prevents us from compiling data on sole balance sheets.

Quality and consistency of data are particularly important in empirical analysis. We would like to have a time series based on a consistent accounting standard. Unfortunately, accounting standards significantly differs before and after 2003.[20] This change in accounting standards leads to arbitrary increases in balance sheet variables. Therefore, although available, I do not present data before 2003 which are not accordance with the most recent accounting standards.

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[19] See Bond and Van Reenen (2003) for a discussion of the advantages and disadvantages of the use of consolidated and nonconsolidated data.

[20] Before 2003, all firms reported their financial statements in historical cost based accounting standard. However, the early 2000s were the years that Turkey was experiencing high level of inflation. In 2002 Capital Market Board announced that starting from the 2005, all listed firms were required to keep their books based on international financial standards (IRFS) which take the effects of inflation in to account. Starting from 2003 firms was given an option to adopt IRFS. 79 NFC chose to so, hence in 2003 I have a mix of IRFS and historical cost based financial information. Because of triple digits inflation in 2004, all listed firms were required to keep their books on either inflation-adjusted accounting standards, or in IFRS, as a result, for 2004; I have a mix of information based on IRFS and inflation-adjusted accounting. Starting from 2005, all firms were required to adopt IRFS. As a result, I work with the firms those adopted IFRS between 2003 and 2015.

Turkish accounting norms allow firms to choose their operational monetary units. I excluded firms that choose to report their financial statements in a FX.[21] I believe that this exclusion leads to a significant attenuation in the average foreign debt exposure.[22] Likewise, some firms use different fiscal calendars.[23] I only considered firms that report their financial statements through January 1st to December 31st.

Although the dataset contains detailed information on the composition of FX holdings, it does not have information on the sources, origins, and uses of these debts and assets. Namely, we do not know whether firms borrowed in a FX from domestic banks, international markets, or they issued bonds abroad.

Finally, a thorough analysis of currency exposure requires information on off-balance sheet positions. Foreign currency derivatives can substantially reduce currency exposure risk in the balance sheet. Due to inconsistencies in accounting standards over time, currency composition of financial derivatives such as forwards, futures, swaps have not been recorded separately on the balance sheet. The information on the uses of derivatives improves starting from 2008, since regulators imposed new requirements firms to report these kinds of transactions separately. Before 2008, such transactions could be recorded within a specific balance sheet item or as 'other'. As long as reported, our dataset contains information on derivative position of the balance sheet activities. The FCC dataset indicates that few of the largest firms in the sample use FX derivatives to

[21] I dropped 19 firms from the sample that keep their books either in Euro or US Dollars.
[22] I observe, in general, two groups of firms keep their books in a FX. The first group is multinationals. One example of such firm is the French owned Alcatel. The other group consists of firms that heavily rely on imported goods for production. One example is Turkish Airlines. Starting from 2011, they switched their accounts to US Dollar from Turkish Lira.
[23] Depending on the sectors in which the firms are operating, they have different fiscal periods such as through January to December, or March to February.

hedge their FX assets and liabilities. Specifically, 80 firms, which consist of 271 year-firm observation have information on currency derivatives.[24] Given these limitations, we cannot effectively uncover the use of the derivatives and its effects on hedging.

2.5 Conclusion

In depth and detailed information on the size, compositions, as well as the sectoral breakdowns of FX holdings help understand potential balance sheet fragilities attributed to currency exposure. Given that corporate sector has become the main vehicle of economic growth in developing countries, having detailed information is increasing necessity for policymakers to detect and prevent risks originating in corporate sector indebtedness. Availability of detailed data can help policymakers design and implement relevant economic policies to satisfy the economic stability.

This chapter introduced a new and unique dataset containing detailed information on the currency composition, and maturity structure of firms' assets and liabilities. As discussed briefly, having such detailed dataset can significantly contribute the existing empirical literature; and potentially help policy makers in designing the relevant policies.

[24] 271 year-firm observation is less than 8 percent of the total firm-year observations. One reason behind this is probably the fact that uses of derivatives are still costly

CHAPTER 3

EVOLUTION OF FOREIGN CURRENCY DEBT AND CURRENCY MISMATCH OF TURKISH NON-FINANCIAL CORPORATIONS

3.1 Introduction

The accommodative monetary policy in the global economy contributed to increasing trend in NFCs' borrowing in the post crisis period. The expansionary monetary policies in USA, and Euro area made foreign borrowing easy and cheap for the banking sectors. Firms those do not have access to the cheap credit from international markets could still borrow from the domestic banking sectors.

The recent surge in leverage; particularly in FX indebtedness raises concern over the potential risk may be associated with it in non-financial firms. Because of the lack of information, it is difficult to make judgments in regard to uses of these debts. Debt can be used both for expanding capital expenditures, and for servicing the outstanding indebtedness. As pointed by (IMF, 2015), in the aftermath of the global crisis of 2007, corporate investment has not returned to its pre-crisis level across the world. This weak recovery in the global economy is an extra concern on the size and the trend of the leverage in NFC. Whatever the reason why NFC carries foreign currency debt in their balance sheets, they bear risk of unexpected depreciation.

The case of Turkish economy is relevant in that regard because as of February 2017, the Turkish nonfinancial sectors hold the 65 percent of the total external debt (CBRT 2017). IMF (2016) points that the Turkish NFC indebtedness is well above the

average level comparing EMC NFC debt. A recent study[25] suggests that the corporate investment in Turkey is decreasing, at least not increasing, which suggests that debt is not used for the productive purposes (See Gezici, Orhangazi, and Yalcin 2017).

Uncovering the size and trend in foreign currency indebtedness is the primary step in understanding the potential risks associated with it. Hence, this chapter descriptively examines the evolution of FX indebtedness in relation to firm characteristics in Turkish NFC between 2003 and 2015. The aim of this chapter is shed lights the size and trend in FX leverage in Turkish nonfinancial corporations.

The chapter lays out three key results: First, the relative contributions of firm- and country-specific characteristics in explaining leverage growth, issuance, and spreads in emerging markets seem to have diminished in recent years, with global drivers playing a larger role. Second, leverage has risen more in more cyclical sectors, and it has grown most in construction. Higher leverage has also been associated with, on average, rising foreign currency exposures. Third, despite weaker balance sheets, emerging market firms have managed to issue bonds at better terms (lower yields and longer maturities), with many issuers taking advantage of favorable financial conditions to refinance their debt.

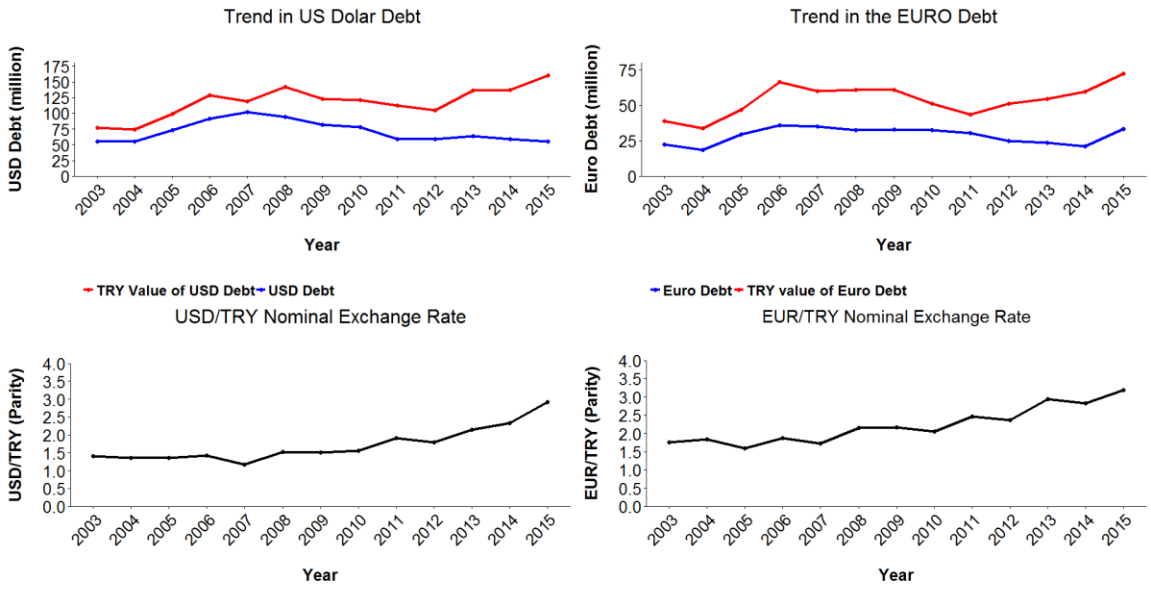
3.2 The Evolution of FX Leverage in Turkish NFC

The descriptive analysis illustrates that FX indebtedness of the firms in my sample does not really follow a certain trend the entire period of 2003-2015 is considered. Although, there is an increasing trend foreign currency indebtedness increases over time, the data

[25] Using a large firm level data, Gezici, Orhangazi, and Yalcin (2017) show that the rate of investment is decreasing in Turkish non-financial sectors.

illustrates that firms are responding to nominal exchange rate fluctuations and limits their indebtedness in original currencies.

Figure 1: Trend in the Original Values of FX Debts and Movement in the Nominal Exchange Rates



Note: This figure illustrates the trend in the original values of USD and Euro Debt, and corresponding nominal exchange rates. The red lines represents Turkish Lira value of USD debt (left panel) and Euro debt (right panel), the blue lines represents the original value of USD and Euro debts. Source: Author's calculations based on FCC dataset, and CBRT.

Figure1 illustrates the original values of both US Dollar and Euro debts and their domestic currency values along with the level of the corresponding nominal exchange rates. Because on average 95 percent of the FX debt are denominated into USD and Euro, the change in indebtedness in these two currencies will give us a clear idea in terms of the change in the trend in the total FX indebtedness.

The upper panel of the figure illustrates that the US Dollar indebtedness in original value increases between 2003 and 2007. The domestic value of USD indebtedness, however decrease in 2007. This suggests that this decrease is the result of

the appreciation in the domestic currency. NFCs' level of USD indebtedness in original currency remains same; however, its domestic currency value increases substantially. As Figure1 suggests that the main reason is the excessive deprecation in the domestic currency vis-à-vis US dollar. The change in level and trend of USD debt suggests that NFC responses to the nominal exchange rate depreciation by decreasing the level of their Dollar debt.

The movements in both original and domestic currency value of Euro debt behaves almost same as the movements in the USD debt until 2014. That is, the faster the depreciation in domestic currency vis-a- vis Euro, the faster the NFC limits their euro indebtedness in the original value. However, interestingly, the level of Euro indebtedness in original value increases although the Turkish Lira depreciates against Euro. Second, starting from 2013 Turkish Banks' Euro lending rates is lower than their USD lending. As a result of the ongoing sharp depreciation in the USD value of domestic currency and the lower interest rate of Euro lending, firms prefers Euro debt against USD debt.

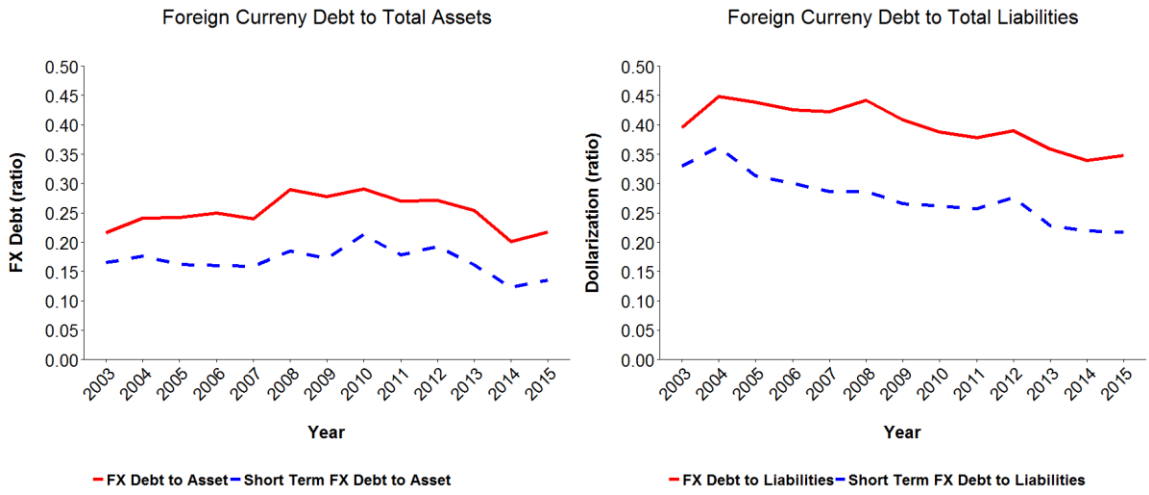
I believe that the main reason why firms demand Euro although TRY deprecates against it is that because Turkish Lira depreciates more against USD than Euro. As a result, firms switch from US Dollar to Euro to protect themselves against the excessive fluctuations in the domestic currency.

There are several conclusions that we can draw in regard to how NFC protect themselves against currency risks. As the figure 1 suggests that NFCs' demand for foreign currency debt is moving with the movement in the nominal exchange rate. When firms expect exchange rate to be stable, they increase the level of their FX indebtedness in original currency. Whenever domestic currency depreciates sharply against US Dollar,

firms shuffle their currency composition, and switch to domestic currency and Euro. This suggests that firms prefer the interest rate risk during the sharp fluctuations in the domestic currency vis-a vis US Dollar.

The level of debt is not a good indicator to assess to risks associated with it. When we analyze the foreign currency debt as a ratio of both total asset and total debt, as seen in Figure 2, we observe that FX debt as a ratio of total asset increases until 2008 and then start decreasing. Similarly, the ratio of FX debt to total debt, which is called as liability dollarization or dollarization ratio, the ratio has a decreasing trend between after 2008 as well. The main reason why these ratios decrease is that both total asset and total liabilities grow faster than total foreign currency indebtedness.

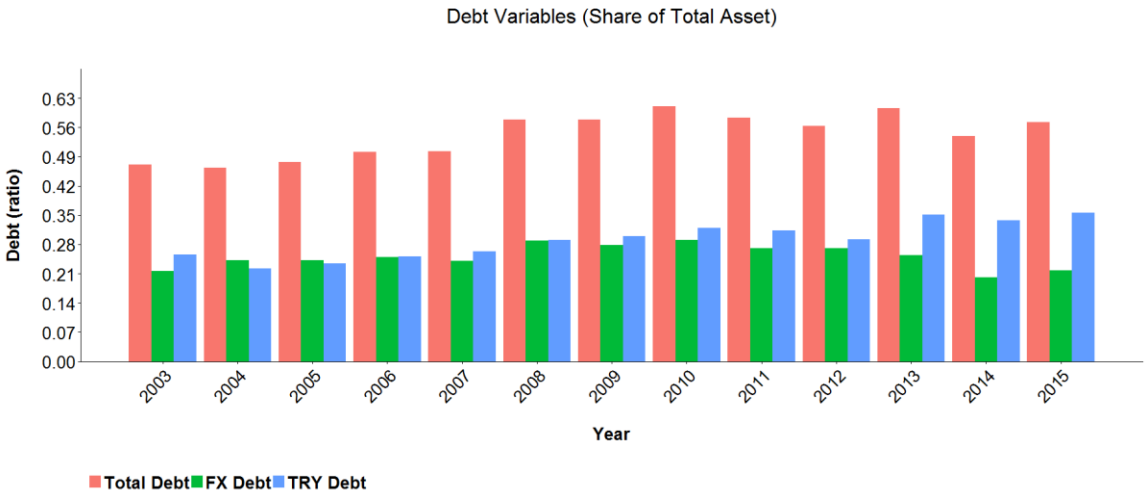
Figure 2: Foreign Currency Indebtedness of Firms



Note: This figure illustrates the ratio of the short and long term FX debts as a share of total assets and total liabilities. The red –solid-line in the left panel is the total TRY value of FX debt and the blue dotted line is the TRY value of short term FX debt to total assets. The red-solid- line in the right panel is total TRY value of FX debt and the blue-dotted-line is the TRY value of short term FX debt to total liabilities. Source: Author's calculations based on FCC dataset.

While financial debt and total debt is increasing, the trend in foreign currency debt follows them closely in our sample. NFCs in our sample carry almost equal share of FX and domestic currency debts in their balance sheets until 2010 as displayed in figure 3. While the debt ratio remains almost constant between 2011 and 2012, staring from 2013 the share of Turkish lira debt is increasing.

Figure 3: Trend in Debt Variables

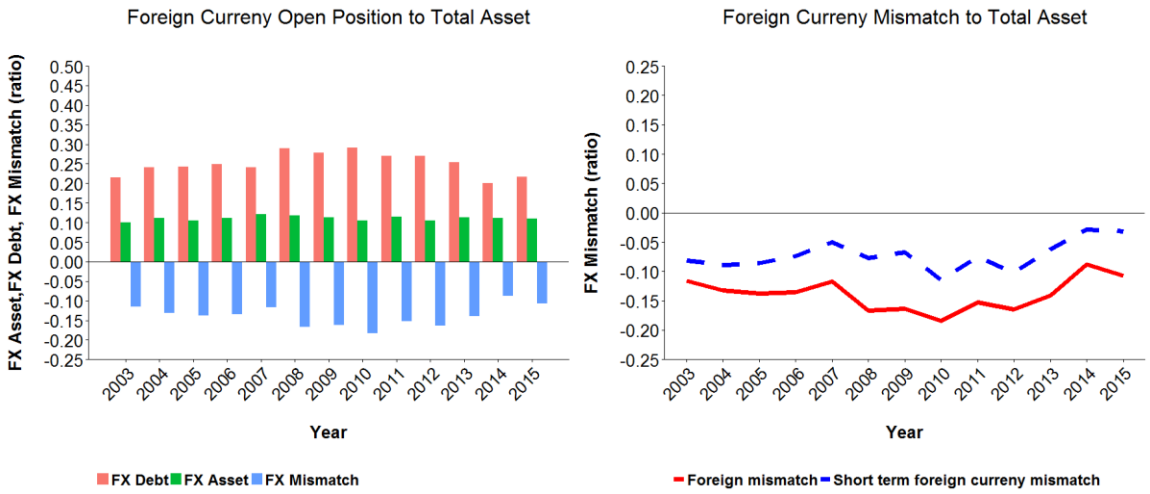


Note: This figure illustrates the changes of the FX and TRY debt within total debt. The red bar is total leverage (total debt/total asset), the blue bar is TRY debt to total asset; the blue bar is FX debt to total asset ratios. Author's calculations based on FCC dataset.

This suggests that firms in the sample switch their debt from foreign currency to domestic currency. Firms in the sample hold on average 11 percent of their total asset in foreign currency. FX asset accumulation fell behind those than FX debt accumulation; hence NFC has always had foreign currency open position during the period. The change in the FX open position follows the trend in both FX debt and total debt. While it widens up until 2010, the scissors starts narrowing after 2010 (Figure 4). The descriptive analysis suggests that main reason behind this decrease in the open position is not the

increase in FX assets, rather the fact that firms limit their USD dollar FX indebtedness in original value starting from 2013. As a result, as we see, the gap is getting closer faster. However, over the period that we are examining, firms carry a sizable FX open position in their balance sheet. Although firms are cautious and limits their level of indebtedness, as illustrated in the figure 1, domestic exchange rate significantly fluctuates against US Dollar and Euro. Couple with these sharp fluctuations, firms FX open position a potential source of vulnerability.

Figure 4: Foreign Currency Open Position



Note: This figure illustrates the FX open position of firms. The red bar is total FX debt, green bar is total FX asset, and the blue bar is total FX mismatch (FX asset-FX debt), as share of total assets. The red solid line is total currency mismatch, and the blue dotted line is short term currency mismatch (short term FX asset-short term FX debt) as share of total asset. Author's calculations based on FCC dataset.

One of the concerns of the Turkish NFC indebtedness has been specific to a deregulation took place in June 2009. Until 2009, firm only with FX revenue could

borrow from domestic bank branches[26] in foreign currency, at a maturity no longer than 18 month. As a result of the ease in this restriction, NFC those without FX earnings could borrow from the domestic branches of the domestic banks at any amount unless it is not less than five million USD, at a maturity no shorter than one year.[27] On the one hand the deregulation in FX borrowing condition, on the other hand the easy and cheap accesses to the international credit were expected to worsen the indebtedness of the NFC.

Unfortunately, our dataset cannot allow us to observe whether the structural change in the FX borrowing condition raised the FX indebtedness of NFC in our sample. Firms in the sample almost always have export revenues; therefore, they were not restricted to borrow in FX. Furthermore, firms could always borrow from the off-shore branches of the domestic banks in foreign currency. The fact that the listed firms are generally larger and well-established in the domestic financial sector, borrowing in FX would not be problems for them. The fact that domestic banking sector's FX lending to NFC increased significantly since 2009, it is reasonable to expect, firms in the sample probably switched the origin of their FX borrowing from off-shore to on-shore branches of the domestic banks. This implies that NFC distributed some of their FX risks to domestic banking industry. In other words, because domestic banks supply sizable FX loans to the NFC, the domestic banks FX risk are highly correlated with the NFC FX risks. In case a systemic bail-out in the NFC, the balance sheet of domestic banking industry will inevitably deteriorate. As a result, a significant problem in one sector can

[26] However, firms can barrow in FX-denominated terms through domestic banks' off-shore branches. Similarly, firms with no FX income could borrow in FX-indexed credits in on-shore banking branches

[27] With these new regulations, borrowers do not need to provide any reasons why they use the FX debts.

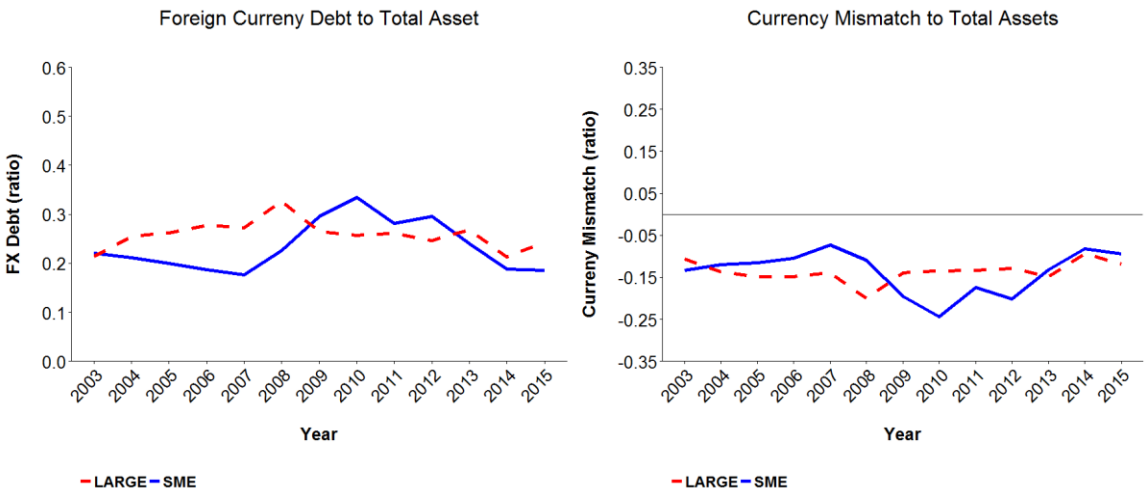
plague the entire economy. Hence, interplay between lenders and borrowers should carefully be observed.

3.2.1 Currency Mismatch of NFC by Size

The listed firms are generally larger, and there are a few small firms in the sample. Hence, I divided the sample as large and small and medium (SME).[28] While larger firms have higher FX debt and dollarization ratios, corresponding ratios for SME is not small at all. While larger firms' FX ratio is 26 percent, the same ratio for SME is 24 percent, on average. Similarly debt dollarization is 43 and 34 percent respectively. The data indicates a striking fact that FX debt to asset ratio of SME is above those larger firms between 2009 and 2013. Likewise, the figures suggest that SME cannot naturally hedge them during the same period; their export to sales ratio fell short of their FX debt and dollarization ratios as well. The fact that SMEs are already financially constrained in accessing credits in developing countries may further constrain them in the case of adverse shocks. One of potential source of such adverse shock is the re-normalization in the monetary policy in the advanced countries, and hence increases in the domestic interest rates. Under such circumstances, larger firms may crowd-out SMEs' access to new credits which deteriorates their debt services (Figure 5).

[28] Size is based on number of the employment.

Figure 5: Currency Mismatch and FX indebtedness of Large Firms and SMEs



Note: This figure illustrates the FX open position (right panel) and FX indebtedness (left panel) of large firms and SMEs. The red dotted line represents large firms, and solid blue line represents SME. Author's calculations based on FCC dataset.

3.2.2 Natural Hedge Capability of Non-Financial Corporations

Because on average 77 percent of the firms operate in manufacturing sectors, the analyses based on the sectoral concentration of FX debt will not be representative. Hence I prefer to analyze firms' natural hedging capacities. Firms may be relying on their export revenues to hedge themselves against exchange rate risk. As already discussed in the earlier chapters, if firms are expecting their current and future earnings to increase due to depreciation, they may be holding more FX debt with the expectation of matching their FX debt with those their FX income.

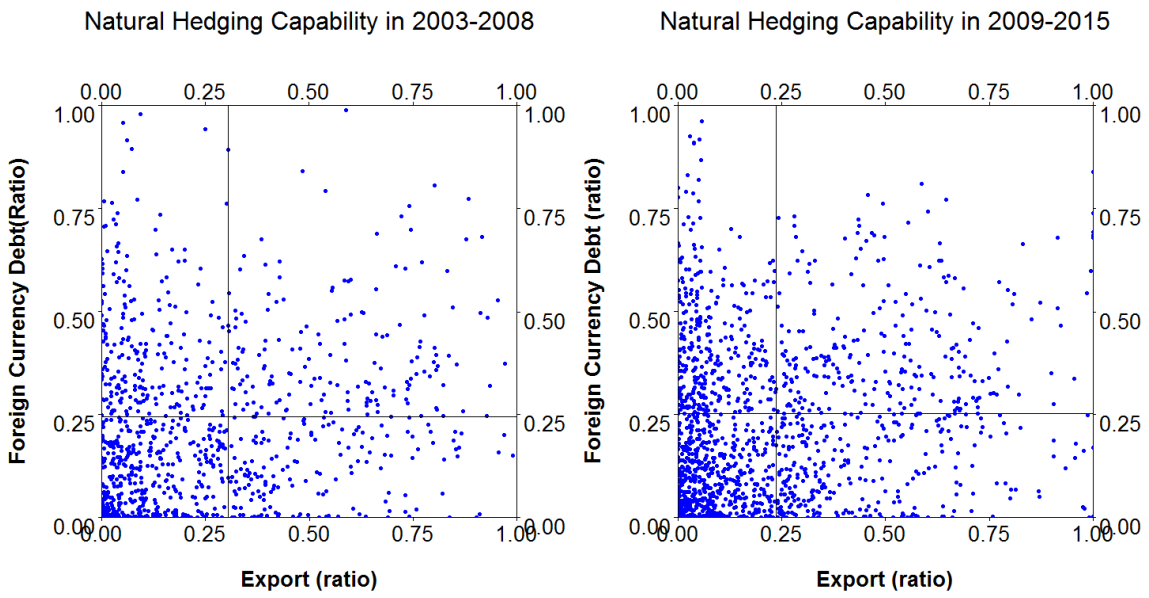
Keeping these points in mind, I divide the sample into two as 2003-2008 and 2009-2015, and compare firms' natural hedging behaviors respectively. There are two main reasons that I choose 2009 as the "treatment" year. First, Turkish economy was hit by the global financial crisis in 2009 and shrunk 5 percent. Second, starting from 2009,

the fluctuations in the Turkish lira have been excessive. Third, as we have been citing throughout this dissertation, the trend and the level of the FX indebtedness are increasing after 2008. Thus this exercise will give us a simple comparison between a "relatively stable" and a "relatively unstable" period.

Following the literature (See Echeverry 2003, Alp 2012), I classify firms based on their foreign currency indebtedness and their natural hedge ability. Their FX indebtedness and hedging capability are measured by FX debt to total assets, and export to asset ratios, respectively.[29] Accordingly, the following four quadrants identify firms based on their FX risks and natural hedge metrics. There is not a standard criterion to determine the quadrants. I choice to determine them based on the mean values of FX dollarization and export to sales ratios of the firms in the sample (Figure 6).

[29] One might argue that FX debt to total debt and export to sales ratios are better for this exercise. However, mean dollarization ratios are very different between two periods. While it is around 43 percent before 2008, it decreases to 37 percent after 2008. However, the mean of FX to asset ratios are almost same (0.245 and 0.253) in these periods. Second, because total debt is the sum of FX and TRY debt, I do not want my ratio to be driven by TRY debt. Hence, as much as possible, I prefer to divide both FX debt and Export to the same variable so that the variations mostly were driven by the dominators. Given that FX asset does not vary much around these period, I prefer scale both variables to total asset. By doing so is similar to plotting the levels of both FX debt and export revenue.

Figure 6: Natural Hedging Capability of Firms



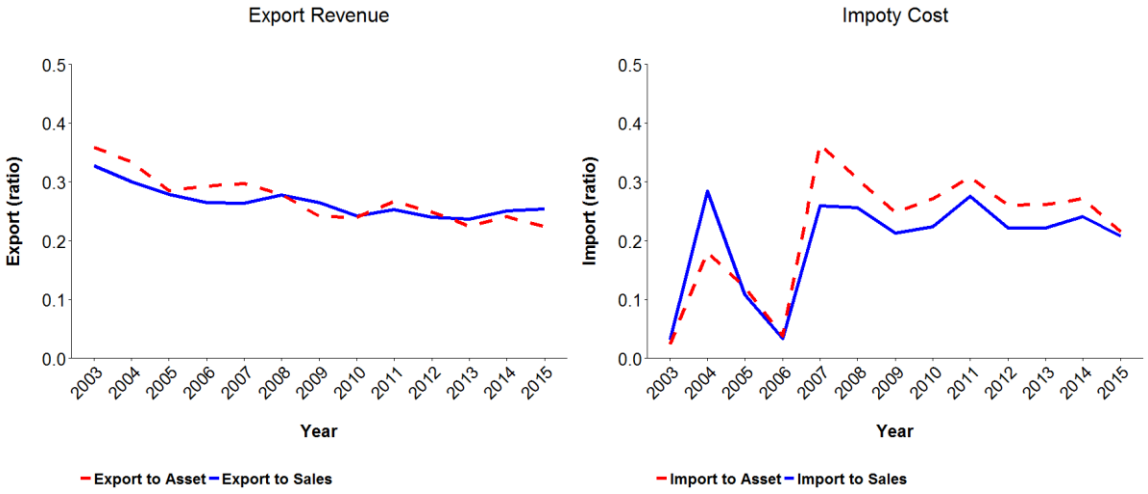
Note: This figure illustrates the hedging capabilities of firms. X axes is export to asset ratio, the y axes is FX debt to asset ratio. The quadrants are determined by the mean of the FX debt and export in each period. Author's calculations based on FCC dataset.

Upper left area represents firms with higher FX debt and lower export ratios. This area is where firms unable to naturally hedge themselves. Upper right quadrant contains firms with higher export and higher FX leverage ratios. These are the firms which see their export revenue to increase with their FX indebtedness. Lower left quadrant includes firms with both lower export revenues and lower FX leverage ratios. Finally, the lower right area contains firms with higher export and lower FX leverage ratios. Firms in this area do naturally hedge themselves.

The data illustrate that number of the firms in all quadrants increased after 2008. However, after 2008 firms are mostly clustered in the 3rd quadrants where both of their export and FX debt ratios are lower than the mean. This suggests that firms export

revenue is mostly affected by the demanded conditions for their goods and services. Although the domestic exchange rate is more competitive after 2008 firms' firms' export did not increase. Likewise, the times series of export to sales and export to asset ratios suggests the similar results that export revenue decreases in the entire period that we are analyzing and remain same in post 2009 period. The overall picture depicts that the natural hedge ability of the firms in my sample did not improved after 2008.

Figure 7: Export Revenue and Import Cost of Firms

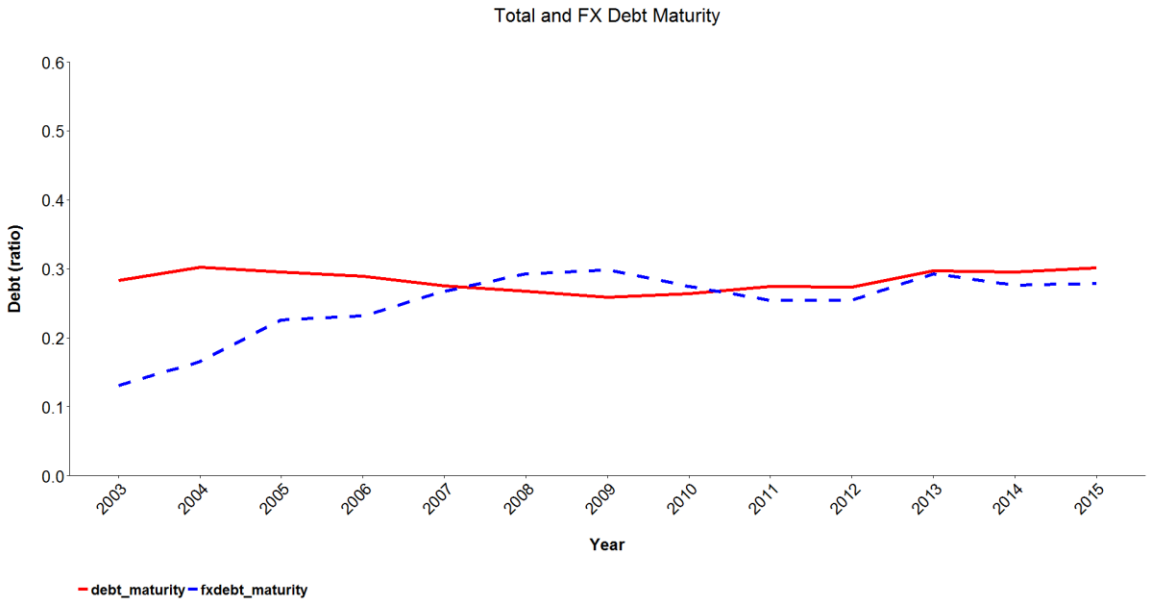


Note: This figure illustrates the export revenue (left panel) and import cost (right panel) of firms as a ratio of net sales and total assets. The red lines represent the share of total asset of export and import whereas blue lines indicates the share of net sales. Author's calculations based on FCC dataset.

We analyze firm's net export position in Figure 7 where we see that although the import cost of the firms fluctuates more than their export revenue, the overall it remains constant between 2007 and 2015. While the average of export revenue is 26 percent, their import cost is 24 percent of their sales in the entire period.

The maturity structure of debt is a potential source of vulnerability as well. If firms' overall indebtedness increases over time, they would prefer their debt to be long term rather than short term. If much of the debt is short term, this would result in a maturity mismatch in their debt services when overall credit condition got tighten, as well as domestic exchange rate depreciates.

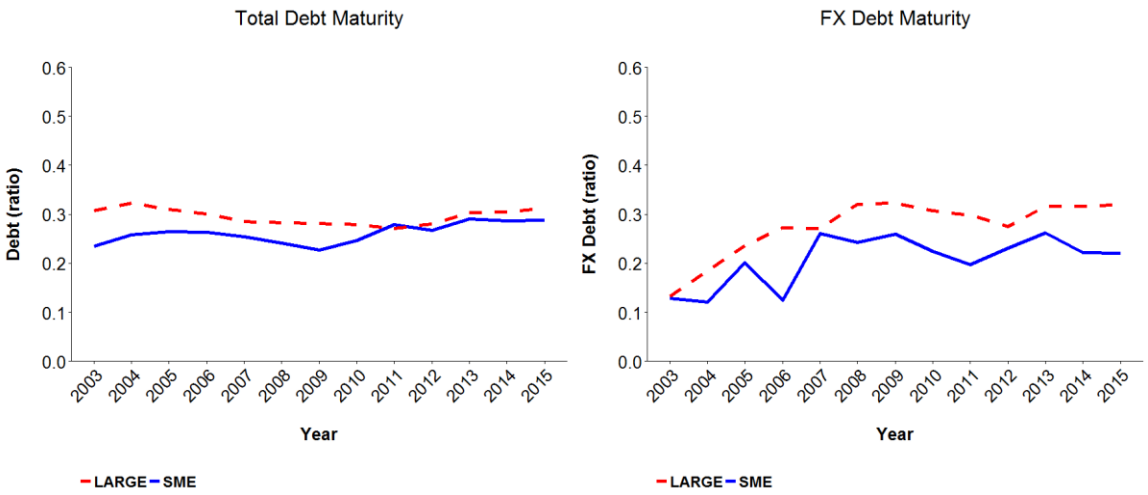
Figure 8:Debt Maturity of Non-Financial Corporations



Note: This figure illustrates the debt maturity of NFC. The red line is the total debt maturity (long term total debt/total debt) and dotted blue line is the FX debt maturity(long term FX debt/total FX debt) revenue (left panel) and import cost (right panel) of firms as a ratio of net sales and total assets. The red lines represent the share of total asset of export and import whereas blue lines indicates the share of net sales. Author's calculations based on FCC dataset.

Debt maturity is defined as the ratio of the long term portion of the total debt. The figure illustrates that long term portion of total debt is fairly low and remain on overage 30 percent of the total debt. Firms increase their FX maturity until 2009, e.g. while the long term FX debt within total F X debt increase until 2009, it decreases and remain around 28 percent afterwards.

Figure 9:Debt Maturity of Large Firms and SMEs



Note: This figure illustrates the debt maturity of large firms and SMEs. The red dotted line represents large firms, and blue solid line represents SME. Left panel illustrates total debt maturity, and left panel illustrates FX debt maturity. Author's calculations based on FCC dataset.

Debt maturity between large and SMEs differs as well. Large firms' total debt maturity deteriorates until 2012, and remains below 30 percent. After 2012, maturity structure of their total debt improves and goes below 30 percent. While their total debt maturity deteriorates, FX debt maturity improves until 2008. While it get worsens between 2008 and 2012, it improves after 2012.

Figure9 illustrates that while SMEs total debt maturity worsens, their FX debt maturity improves between 2003 and 2009. Starting from 2009, SMEs total debt maturity improves, approaches to 30 percent. FX debt maturity of SMEs fluctuates significantly between 2007 and 2015. While it deteriorates between 2007 and 2011, it improves until 2013, and then it deteriorates again. Comparing SMEs with large firms depict one important distinction in their FX debt maturities: SMEs carry more short term FX debt than larger firms. However, both large firms and SMEs have low debt maturities.

Namely, both SMEs and large firms hold sizable short term debt in their balance sheet. Hence, the maturity structure of NFCs' debt is likely to be a source of fragility.

The fact that we do not observe systemic bail-outs raises the question the sources of this resilience. Although it is hard to answer this question, we can say that the source of this resilience is not the result of is not a result of NFC's operating performance. As we show in the next chapter, FX indebted firms' investment is constrained through the fluctuations in the exchange rate.

3.3 Summary and Policy Recommendations

Descriptive analysis of the chapter revealed two key behavioral points. Firms have two main hedging strategies against their currency risks. First, they limit their FX debt in original currency during the excessive fluctuations in the domestic currency. NFC responds to the sharp depreciations in the domestic currency by decreasing the size of FX borrowing in original currency. The sharper the depreciation is, the lower the level of FX debt in a foreign currency. Likewise when the domestic currency was relatively stable between 2003 and 2009, firms prefer taking currency risk than taking interest rate risk. Thus the main factor drives the domestic value of their FX debt is the depreciation in the exchange rate. We can clearly observe this in Figure 1.

Second, they reshuffle currency composition of their debt during the exchange rate misalignments. Turkish Lira depreciates more vis-à-vis US Dollar than Euro. Because firms hold on average 65 percent of their FX debt in US Dollar, movements in the USD/TRY parity significantly affects NFC choice of debt. Especially, during the

excessive fluctuations between 2013 and 2015, firms shuffle the exchange rate composition of their debt and switch to Euro and TRY.

On the other hand, NFCs' total asset accumulations fell short of its FX debt accumulation in the entire period that we analyzed. As a result, they carry on average 14 percent FX open position. Although NFC responds to exchange rate fluctuations by limiting the size and the ratio of their FX debt, their overall debt do not follow the same trend, and remain constant. Furthermore, their export revenue does not improve over time. Therefore, their natural hedging capability is limited. Moreover their export cost is also sizable, around 24 percent. Finally, NFCs hold a sizable portion of their debts in short term. While they try to improve their FX debt maturity, their total debt maturity remains constant around 30 percent.

It should be remembered that that global monetary policy is highly accommodative will come to an end sooner than later. Hence, firms and policymakers should prepare themselves for the potential adverse effects of normalization in the global financial markets. The fact that private sector is replacing state involvement in economic growth in Turkey, policymakers should monitor those highly FX leveraged firms, firms in strategic sectors and their link to banking industry to prevent any systemic risk might be associated with their balance sheet.

Doing so, policymakers may prefer to implement policies limit the explosion of the corporate balance sheets due to foreign currency leverage. For instance, firms may be required to hedge their FX risks when they borrow over a certain level/ratio of FX debt. Likewise, the maturity structure of FX debt is also crucial; hence new regulations may policy may intend to affect the maturity structure of FX debt as in Korea. A regulation

was adapted in Korea in 2010 that raised the cost of dollar loans from domestic banks. By doing so, firms were discouraged to borrow from financial institutions; instead they were encouraged to issue bond which has a longer maturity than bank borrowings. Such regulations reduce the risk of sudden fluctuations on capital inflow and exchange rate. It also loosens the interplay between domestic banks and non-bank borrowers, and helps protect banks from their corporate borrowers' risk of default, and bankruptcy (see McCauley, McGuire, and Sushko 2016)

Although domestic banking system seems resilient, they share NFC's domestic and foreign currency risks. As documented that NFCs carry a sizable FX open positions and short term debt in their balance sheets. An excessive fluctuation in the exchange rate deteriorates not only NFC balance sheet but also banking sector balance sheet. Hence, banking sector's FX credit supply may be limited. One quick way is to restore the earlier regulation which was changed in 2009. Namely, firms without FX revenue should be prevented to borrow in FX. Similarly, firms with FX revenues should only borrow in FX up to a certain percent of their FX earnings.

Finally, while no systemic bailouts are observed, policy makers should be prepared for corporate sectors bailouts and work on plans for restructuring corporate debts while the advanced economies start normalizing their monetary policy.

Last but not least, as already stressed repeatedly such monitoring requires the availability of the detail firm level data.

3.4 Conclusion

When coupled with the lower natural hedging capacity of the firms, sizable open FX mismatch, and poor debt maturity may constrain firms. Furthermore, SMEs hold a significant portion of their debt in FX while they cannot naturally hedge themselves. Likewise, we show that while less of the total debt is short term, much of the total assets are in long term. This mismatch between the liquid form of debts and assets might be a source of concerns in case of adverse shocks. As normalization in the US monetary policy continues, the domestic interest rates will increase and hence the cost of borrowing will increase. On the other hand, the increase in US interest rates results in capital outflows which will cause exchange rare to depreciate. As we witnessed, Turkish Central Bank is fairly unsuccessful to manage the depreciation in Turkish Lira. Furthermore, political instability is another source for cause of uncertainty in the Turkish economy.

As we show in the next chapter, FX indebted firms' investment and operational profit have been constrained. This suggests that firms do not demand funds for increasing their investment expenditures, in turn decreases operating income. The persistent decrease in investment and operating income leads to more working capital. This in turn increases the need for new debts. As a result, firms will try to service their outstanding debt instead of expanding their capacities.

CHAPTER 4

BALANCE SHEET EFFECTS OF FOREIGN CURRENCY DEBT AND REAL EXCHANGE RATE ON CORPORATE INVESTMENT

4.1 Introduction

The recent global financial crisis has reawakened discussions on the role of currency composition of debt and its term structure in both micro fragilities, and firm performances in developing countries. After 2007, increase in FX debt among non-financial corporations has been a potential source of fragility in emerging market economies (EMEs). Firms take the risk of an unexpected depreciation in domestic currency by holding FX debt. If a portion of debt is denominated in FX, an unexpected depreciation inflates the domestic currency value of FX liabilities, and deflates FX value of domestic currency assets. Thus, depreciation immediately leads to a real melt-down in balance sheet net worth.

In addition to the net-worth channel, depreciation also leads to deterioration in the balance sheet through maturity mismatch and interest rate channels. If much of FX debt is short term, and a firm's short-term earnings are not sufficient to cover its short term liabilities, then a depreciation of the domestic currency leads to a 'maturity mismatch' in debt services by inflating short-term indebtedness. Hence, firms may need to borrow more to rollover their outstanding debt. Moreover, if the meltdown in net worth is substantial, firms may not be able borrow because of an increase in their risk premium. Even if they manage to borrow, the cost of borrowing will be substantially higher. As a result, firms will constantly try to roll over their outstanding debt, by borrowing more,

instead of expanding their productive expenditures. Meltdown in net worth, deterioration in debt services, and increase in cost of borrowing are likely to constrain firms' productive expenditures.

Traditional open economy framework does not take into account this balance sheet channel, while analyzing the stabilizing effects of currency depreciation on the monetary policy and international trade. According to the standard open economy model[30], assuming the Marshall-Lerner conditions hold, depreciation of the domestic currency is assumed to have an expansionary effect on domestic output through an increase in exports. However, as discussed above, when domestic firms carry substantial amount of un-hedged FX debt on their balance sheets, a significant deterioration in net worth due to depreciation may lead firm level investment, sales, and profitability to decline. As a result, the expected expansionary effect of depreciation on output through the trade channel might be limited, or even be reversed, i.e., depreciation may have a contractionary effect.

Many have argued that excessive reliance on short-term debt and un-hedged foreign currency borrowing of firms led to financial fragilities. Earlier works in this area have developed theoretical links between balance sheet net worth and firm output. Bernanke and Gertler (1989) and Bernanke, Gertler, and Gilchrist (1998) demonstrated that investment can be constrained by the erosion in net wealth due to an increase in the firm leverage. Along the same line, Krugman (1999), Aghion, Bacchetta, and Banerjee (2001) and Cespedes, Chang, and Valesco (2004) argued that depreciation could decrease firm level activities through the deterioration in the balance sheet net worth. The melt

[30] See Fleming (1962) and Mundell (1963).

down in net worth deteriorates creditworthiness, hence increases the risk premium for firms, which in turn further increases indebtedness. As a result, firm-level productive activities are likely to be constrained.

Previous empirical studies on the impact of depreciation on firm-level activity through FX indebtedness are mixed and inconclusive. Bleakley and Cowan (2002) is one of the earlier cross-country firm-level studies that explores the net worth channel of exchange rate fluctuations through firm-level FX indebtedness in select Latin American countries. They find no evidence of contractionary net worth effect of exchange rate. On the contrary, they find a positive balance sheet effect. This paper sparked off a new wave of empirical research on the balance sheet channels of depreciation on the topic. Individual country analyses find mixed evidence on the sign and significance of balance sheet effect of FX indebtedness through depreciation. Echeverry, Fergusson, Steiner, and Aguilar (2003) show that while depreciation adversely affects firms' profitability, the negative balance sheet effect is not significant for firm-level investment to be constrained in Colombia. Bonomo, Martin, and Pinto (2003) find no evidence of significant negative balance sheet effect on investment in Brazil. Benavente, Johnson, Morande (2003) find some evidence that devaluation increases investment of FX indebted firms in Chile, in the aftermath of the Asian Crisis between 1994 and 2001.

Several studies find significant negative balance sheet effects of deprecation on firm output. Pratap, Lobato, and Somuano (2003), and Aguiar (2005) find negative balance sheet effect in the aftermath of the Tequila crisis in Mexico where exporting firms were more indebted in FX. They argue that firm-level investment in Mexico was constrained because of the deterioration in the balance sheet net worth due to short term

FX exposure. Cowan, Hansen, Herrara (2005) provide evidence of very strong negative balance sheet effect that constrained investment expenditure in Chilean non-financial firms. Tkalec and Verbic (2012), and Endresz and Harasztosi (2014) illustrate that balance sheet "euroization" negatively affects investments and sales in Croatian and Hungarian non-financial sectors respectively. Most recently, Barajas, Restrepo, Mendelin, and Pabón (2016) and Kim (2016) find negative net worth effects for Colombian and Korean firms respectively. Kalemli, Kamil and Villegas-Sanchez (2016) also provide evidence on negative effects of depreciation on investment for select Latin American countries. They demonstrate that domestic exporters with un-hedged FX debt on their balance sheet experience a decrease in investments.

Studies that focus on the Turkish nonfinancial firms, are scarce and limited to sectoral data. Alp (2013); Kesriyeli, Özmen, Yiğit (2005, 2011); and Adanur, Aklan, and Nargelecekenler (2010) analyze sectoral composition of FX indebtedness and found that sectors with higher debt dollarization are generally exporters, and real depreciations in exchange rate decreases real investment. Gonenc (2005) is the only firm level study that finds a negative impact on Tobin's Q for the period of 2001-2003; however, their empirical approach is highly problematic.[31]

In this chapter of the dissertation, I explore whether FX indebtedness constraints firm-level capital expenditure through exchange rate fluctuations for the Turkish non-financial firms from 2003 to 2015, using the FCC dataset, discussed in Chapter 2.

By exploring the impact of FX indebtedness on firm performance, this chapter aims to contribute to recent discussions and concerns over the impact of capital flows to

[31] Their empirical analysis is based on 3-year averaged data.

EMEs in the aftermath of the global financial crisis of 2007. The results of this study may provide insight on whether FX indebtedness causes slow-down in investment in countries where domestic firms are highly dollarized, focusing in the context of the Turkish economy. This chapter will also help us understand the micro-macro dimension of some of these fragilities in non-financial firms rooted in "balance sheet mismatches". The empirical findings will contribute and extend earlier literature by providing an up-to-date assessment of the true impact of depreciation through FX indebtedness.

The empirical analysis in this chapter suggests that FX leveraged firms invest less than domestic currency indebted firms in the aftermath of a depreciation. This result implies that contractionary net-worth effects of depreciation dominate expansionary competitiveness effects of depreciation in Turkish non-financial firms. The finding is robust to various robustness checks and alternative econometric techniques. To the best of my knowledge, this is the first firm-level empirical analysis that finds that contractionary net-worth effects of depreciation dominates expansionary competitiveness effects, without conditioning on any competitiveness factors[32] in the regression.

The rest of the chapter is structured as follows. Section 4.2 details the econometric method and specification. In section 4.3, I discuss the empirical findings of the baseline specification. The following section extends the baseline estimation with different measures of exchange rate, FX exposure, and investment variables. In section 4.5, I discuss robustness of the baseline results by controlling for firm characteristics and macroeconomic correlates of exchange rate and firm indebtedness. In section 4.6, I present various alternative estimation techniques to address possible limitations of the

[32] Such as export, import, etc.

baseline specification. In section 4.7, I analyses the relative effects of competitiveness and balance sheet channels of depreciation. Section 4.8 considers the fact that firms hold FX assets in their balance sheet, and introduces new measures for currency exposure. In section 4.9, I divide the dataset into its subsets based on time as well as firm characteristic to explore net-worth effects. In section 4.10, I discuss the importance of the findings, and finally section 4.11 concludes the chapter.

4.2 Empirical Methodology

The empirical methodology of the paper follows the framework suggested by Bleakley and Cowan (2002, 2005, 2008, and 2009), and extends it in several ways. The empirical strategy centers on the estimation of the interaction of the lagged FX exposure with the logarithmic change in the real exchange rate:

$$\beta_{BS}\left(FX\ exposure_{i,t-1}\ x\ \ logarithmic\ change\ in\ real\ exchange\ rate_{t}\right)$$

This measure of FX exposure is the book value of FX liabilities converted into Turkish Lira by using end of year exchange rate. The real exchange rate (e), is constructed as the end of year nominal Turkish Lira value of one US Dollar (USD/TRY) multiplied by the ratio of end of the year US to Turkish consumer price index (CPI). Hence, in this definition, an increase in the real exchange rate leads to a depreciation in the domestic currency vis-à-vis the US Dollar.

I specify the following reduced form fixed-effects regression to assess the impact of FX exposure on firm output through exchange rate fluctuations:

$$y_{i,t} = \alpha\, y_{i,t-1} + \beta_{BS}\left(fxdebt_{i,t-1} \times \Delta e_{t}\right) + \beta_{X}\, \boldsymbol{X}_{i,t-1} + \beta_{W}\, W_{i,t-1} + \beta_{Z}\, Z_{i,t} + \lambda_{j\,x\,t} + \varepsilon_{i,t} \qquad (1)$$

where subscripts *i*, *j* and *t* stands for firm, industry, and year respectively. The growth rate of firm-level capital expenditure (y) is constructed as the logarithmic change in tangible fixed assets, net of depreciation.

The coefficient of the interaction term, β_{BS} is a point estimate of the differential effect of exchange rate fluctuations on firm investment with different level of FX exposure. Because this interaction contains all exchange rate related factors due to FX holdings, β_{BS} measures the *composite* effects of both the expansionary trade effect, and the contractionary balance sheet channels of depreciation. Therefore, the sign of the coefficient is ambiguous, and depends on the relative strengths of competitiveness and net-worth effects of depreciation. If the expansionary competitiveness effect dominates the contractionary net-worth effect, then the estimated coefficient will be positive and vice versa.

Vector **X** contains firm-level pre-determined accounting variables, including the main effects of FX debt as well as the total leverage and its interaction with the logarithmic change in real exchange rate. Vector **W** consists of aggregate macroeconomic variables such as domestic and international credit conditions and their interaction with exchange rate. Vector **Z** denotes time-varying firm characteristics such as firms' foreign and bank affiliation, size, age, and their interaction with exchange rate.

As the real exchange rate is fixed for each firm in each year, time dummies replace it. The industry-by-year dummies (λ)[33] control for time varying differences among the industries in our sample. Finally, standard errors (ε) are clustered by firm. The specification for the baseline regression is as follows:

[33] Industry dummies are constructed based on 3-digit ISIC-Rev.2codes.

$$y_{i,t} = \alpha\, y_{i,t-1} + \beta_{BS}\left(fxdebt_{i,t-1} \times \Delta\, e_t\right) + \beta 2\, fxdebt_{i,t-1} + \beta 3\left(debt_{i,t-1} \times \Delta\, e_t\right) + \beta 4 debt_{i,t-1} + \lambda_{i\,x\,t} + \varepsilon_{i,t} \quad (2)$$

The interaction term, $\left(fxdebt_{i,t-1} \times \Delta\, e_t\right)$ which is the variable of interest, captures the composite effects of the exchange rate fluctuations through FX indebtedness as discussed earlier. In addition to the interaction term, baseline regression includes the main effect of lagged FX debt to absorb any pre-existing differences among firms with different levels of FX indebtedness. Lagged total leverage is included to control for any pre-existing differences among firms' expenditures.[34] Finally, the lagged-dependent variable controls for any pre-existing differences among firms' capital expenditures.

If firms expect their current and future earnings to increase with depreciation, they may hold more FX debt with the expectation that they will be matching them with their earnings. To account for this 'matching' hypothesis[35], I follow Bleakley and Cowan (2008) and estimate the baseline regression in which dependent variable is from the future (t+1) and exchange rate is contemporaneous (t) to the lagged dependent variable. [36]

Before proceeding, explanations regarding the baseline specification and estimation strategy are in order. First, by interacting FX exposure and real exchange rate, we are explicitly denying that these variables affect investment individually. By interacting the two, we are arguing for the existence of non-linear and differential effects of FX debt on investment based on the different levels of exchange rate in addition to

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[34] For example, only a few firms might have made expenditures to expand production, to replace machineries, to renew production techniques, etc.

[35] Another way of putting it is that I test whether highly foreign-currency-leveraged firms in the current period perform better in the next period.

[36] Specifically, I estimate the following specification where dependent variable (investment) is from the future period (t+1); $y_{i,t+1} = \alpha\, y_{i,t} + \beta_{BS}\left(fxdebt_{i,t} \times \Delta e_t\right) + \beta_X \boldsymbol{X}_{i,t} + \lambda_{jxt} + \varepsilon_{i,t}$

their individual effects. Second, the baseline regression does not control for unobserved heterogeneities among firms, but it does for industries. Firm fixed-effects along with lagged dependent variable lead to "dynamic panel bias" (Nickell 1981).Therefore, my limited treatment of firm heterogeneity might be considered a weakness. I address this in detail in section 4.6.3, and show that the baseline results are not biased despite limited control for differences between firms.

The fact that the baseline specification includes only debt variables may be considered too restrictive for an investment regression. However, this is a deliberate choice. The purpose of this exercise is not to uncover the determinants of investment; rather to focus only on one of the determinants-FX exposure through exchange rate fluctuations, and assess its impact through the trade and balance sheet channels.[37] Hence, I start with debt variables, and subsequently augment the baseline regression to control for whether the results are sensitive to any correlates of exchange rate, investment, and FX exposure.

Likewise, this chapter aims to explore whether the contractionary net-worth effect of depreciation dominates its expansionary competitiveness effect. To access the net effect of these channels, the interaction term in the baseline specification, $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ proxies the composite measure of the expected expansionary trade and contractionary net-worth channels. If the net-worth effect of depreciation dominates, the next step is to assess how the resulting deterioration of the balance sheet net-worth impacts firm-level productive activities. An investment regression which includes

[37] Gezici (2007), Ozmen, Sahinoz, Yalcin (2012), Gezici, Orhangazi and Yalcin (2017) explore firm-level determinant of fixed investment in Turkey.

competitiveness and income measures; such as FX assets, export and import, will be discussed separately in section 4.7.[38]

4.3 Empirical Findings of the Baseline Specification

The findings of the baseline estimation suggest that FX indebted firms invest less than Turkish Lira-indebted firms in the aftermath of a depreciation. Table 2 presents the results of the baseline estimation, where in columns 1-3, the dependent variable is from the current period and the macro variables[39] are contemporaneous to the dependent variable. To account the 'matching hypothesis', columns 4-6 display the baseline estimation where dependent variable is for period (t+1) and macro variables are contemporaneous to the lagged dependent variable.[40]

The baseline estimation starts with estimating the interaction of FX debt with the logarithmic change in exchange rate $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ and the main effect of the lagged FX debt. As column 1 displays, the estimated coefficient of the variable of interest is negative although not significant at conventional levels. This initial estimation suggests that there is indeed a negative balance sheet effect.

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[38] See Bleakley and Cowan (2008, and 2009) for the discussion of the differences between estimating an "unconditional" approach , in which one variable proxies both the net-worth and the competitiveness effects of depreciation, and "conditional" approach , in which both the balance sheet and the trade channels are represented by separate variables. See Aguiar (2005), and Bleakley and Cowan (2002, 2005, 2008, and 2009) and for conditional and conditional approaches respectively.

[39] Macro variables refer to real exchange rate, inflation rate, interest rate, domestic and international credit variables. Micro variables refer to firm-level accounting variables.

[40] Alternatively, in case the previous year's macro variables affect investment decision, I estimate the baseline specification as exchange rate and all other macro variables are contemporaneous to lagged dependent variable when dependent variable is from period (t). The results are qualitatively same, and are available upon request.

Next, I augment the specification by including the interaction of total debt with logarithmic change in exchange rate, and the main effect of total debt to control for any pre-existing differences among firms' expenditure levels. Inclusion of total debt significantly increases the negative value of the estimated composite balance sheet effect; furthermore the coefficient becomes statistically significant. Finally, adding the lagged-dependent variable to control for any pre-existing differences in firms' differential level capital expenditure brings us to our final specification. As seen in column 3, in this final specification, the estimated effect of the FX indebtedness through exchange rate fluctuations $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ is still negative and statistically significant. In all of the estimations, the interaction of total debt to exchange rate is positive and significant, the main effect of total debt positive but insignificant.

The estimation of the dependent variable from period (t+1) suggests partial matching to a certain extent. Although the effect of the interaction between FX debt and exchange rate are negative in column 1, as columns 5-6 show, they are positive, although not significant. Furthermore, the coefficients of the main effect of FX of total debts, and the interaction of total debt with exchange rate are always negative in column 4-6. Although not significant, these results suggest some evidence that FX indebted firms expect their future investment to increase with depreciation.

4.4 Alternative Estimation of the Baseline Specification

Before moving on to exploring robustness of the baseline, I will briefly discuss alternative estimation of the baseline specification with different measures of exchange rate, FX exposure, and investment variables. Estimations based on different measures of

FX debt will shed some light on the relevance of the term structure and currency break down of FX exposure as well as the sensitivity of baseline estimation to these different measures.

The real exchange rate measure throughout the paper is the Turkish Lira value of US Dollar, USD/TRY. As on average, 60-65 percent of the FX debt is in the US Dollar, this choice of exchange rate is relevant for Turkish firms. However, perhaps different exchange rate measures will alter FX indebtedness and investment differently. With this in mind, I estimate the baseline specification with alternative exchange rate measures. Specifically, I replace US Dollar with, Euro, a basket[41] of US Dollar and Euro, and debt-weighted[42] real exchange rates respectively. As displayed in the Table 3, baseline results remain the same.

The FCC dataset allows us to construct short-term FX debt, monetary FX debt, and short-term monetary FX debt variables as new FX exposure variables. Estimation based on the new exposure variables is qualitatively as same as the baseline results. However, results suggest that maturity structure of FX exposure matters quantitatively. As seen in the columns 1 and 4 in the panel A of Table 4, the negative effect becomes more pronounced when the short-term characteristics of FX debt are taken as the exposure variable.

To account for whether firms shuffle the denomination of their FX debt between different currencies during an exchange rate misalignment, I estimate the baseline by interacting each FX debt variable with the corresponding real exchange rate, i.e. I interact

[41] A basket of real exchange rate of USD and EUR is constructed based on the weighs of the USD and EUR debts within the total FX debt in each year.
[42] The debt weighted real exchange rate is from BIS.

USD Dollar debts with USD/TRY, and Euro debts with EUR/TRY rates.[43] Columns 1-3 of panel B in Table 4 display the results. The new estimates indicate that the interaction of the Dollar and the Euro denominated debts with the exchange rate are negative and significant. Furthermore, the main effects of both the Dollar and Euro denominated debts are also negative, thus constrain investment.

Firms may shuffle the composition of their expenditures on fixed assets over time. To account for this possible reshuffling, I construct two new variables as sum of tangible and intangible fixed assets, and sum of tangible and intangible fixed assets and investment property[44] respectively. Then, I re-estimate the baseline regression with these new measures. Table 5 displays the results. These estimations yield a more negative effect compared to the baseline results, and hence confirm the baseline estimation of the negative balance sheet effects.

The estimation of the baseline specification and its variants with alternate exchange rate, FX debt, and investment measures suggest the existence of a strong and significant negative composite balance sheet effect of depreciation. These findings indicate that the negative net worth effect of depreciation dominates the expected positive competitiveness effect. As a result, FX indebted firms invest less than domestic currency indebted firms, following a depreciation.

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[43] The sum of the US Dollar and Euro denominated debt consists of around 95 percent of the total FX debt. In addition to USD and Euro, I also have foreign currency debt in 15 different exchange rates. The remaining "other currencies" denominated debts are added into the specification separately in column 2 in Table 5. They are also assumed as Dollar (Euro) debt and summed over the Dollar (Euro) debt in column3 (4). In either case, the results are remaining same.

[44] In some years firms make a significant amount of real estate investment.

4.5 Robustness of the Baseline Estimation

The baseline specification does not control for many micro and macroeconomic factors that are likely to be correlated with exchange rate fluctuations, firms' access to FX credit, and their investment opportunities. Omitting these variables are likely to result in a biased estimation and hence be misleading.

In this section, I will show that the findings of the baseline regression is robust after controlling for both firm-level and macro correlates, and in neither case do I find a positive composite balance sheet effect.

4.5.1 Controlling for Firm Characteristics

I control for firms' access to FX credit by constructing indicators for firms' foreign affiliation, parent company and bank affiliation, size, age, and their interactions with real exchange rate separately. Doing so will absorb any effect that is correlated with these characteristics and firm's FX indebtedness which are likely to affect investment decision.

Firms with foreign affiliates can relatively easily gain access to the international capital market. Affiliation with a bank and a parent company is likely to affect the availability of internal funds for necessary firm actives, especially when there is a credit crunch in the domestic financial market. Large and mature firms can easily gain access to domestic financial markets due to their long-established relationships. Therefore, we can expect their FX indebtedness to be greater than those of domestic, small, and young firms. On the other hand, large and older firms may be relying mostly on their internal funds instead of borrowing.

To account for these factors on firms' access to foreign debt, I constructed indicator variables as described in chapter 2.[45] Then, I augmented the baseline regression by interacted these indicators with exchange rate.

As displayed in Table 6, controlling for the micro characteristic that are likely to affect firms' access to foreign funds and investment opportunities do not change the results presented in the baseline regression. We still obtain a negative and significant balance sheet effect.

4.5.2 Controlling for Macro Factors

By focusing only on exchange rate fluctuations, we might have ignored the possibility that the exchange rate and FX indebtedness might be correlated with fluctuations in the domestic and global economic conditions. For example, the quantitative easing of the US Federal Reserve during and after the Great Recession of 2007- 2009 led to excessive USD flow to emerging market economies.[46] If FX borrowing and investment is simultaneously affected by the fluctuations in both domestic and international credit conditions, all else constant, then our baseline results might be biased for not controlling for credit conditions.[47] On the other hand, fluctuations in credit conditions may worsen firms' liquidity and credit conditions through currency exposure. As a result liquidity and credit constrained firms may be experience a 'maturity

[45] I follow the corporate finance literature and use the natural logarithm of total assets as size variables in addition size indicator constructed based on the number of workers employed

[46] For the details, see Chui, Fender and Sushko (BIS, 2014).

[47] The purpose of this exercise is not to uncover the effect of the domestic bank credit on investment through exchange rate fluctuations, rather to understand whether the change in the credit conditions affect firm indebtedness and exchange rate fluctuations, and investment.

mismatch' in their short-term debt services. Therefore, I control for any potential bias that might have emerged from such simultaneous movements in both domestic and international credit market conditions.

Credit Market Conditions

Similar to Bleakley and Cowan (2008 and 2009), I construct proxies to control for fluctuations in domestic and international credit market conditions. I control domestic credit condition by the domestic-banking sector credit to private sector and I control for international credit condition by a slew of credit measures[48] including the total credit inflow, and total and short-term credit received from abroad by non-financial corporations. As usual, I subsequently interact logarithmic changes of these variables with FX and total debt variables. The results of new estimations do not change the baseline results: as displayed in Table 7, in all cases I find a negative and significant balance sheet effect.

Currency Mismatch versus Maturity Mismatch

Firms may be borrowing in FX not only to finance their productive activities, but also to roll over their outstanding debt.[49] Indeed, in the sample there is no evidence that NFC investment moves together with FX debt. If the income stream to pay outstanding debt is long term and if a significant portion of the FX debt is short term, an adverse

[48] Details of the variable definitions and variable construction are in Appendix A.
[49] Bastos, Kamil, and Sutton (2015) documents that after the 2007-2009 crisis, Latin American firms have been borrowing in foreign currency to roll over their debt.

shock through either exchange rate or credit condition will worsen the maturity structure of debt services. Similarly, fluctuations in the credit conditions may restrict firms' access to credit, which in turn results in a maturity mismatch. Keeping these points in mind, I control for these possibilities through both exchange rate and credit market fluctuations.
I control for the maturity mismatch by interacting short-term debt, accounting definition of maturity mismatch and working capital with the exchange rate. Likewise, I also interact short-term debt with credit market variables. Results are displayed in Table 8. They suggest that in neither case do I reject the negative composite balance sheet effect of the baseline model.

4.5.3 Non-Linearity in Debt and Exchange Rate

A reasonable assumption to make regarding the relationship between debt and investment is that of non-linearity. For a given level of exchange rate, capital expenditure may increase with indebtedness up to a certain point, and beyond it, it may be constrained. To assess non-linearity in debt variables, I estimate the baseline regression by allowing foreign debt and total debt variables to interact to each other. Results are presented in Panel A in Table 9.

To ensure that highly FX leveraged firms are not driving the results, I control it by constructing currency exposure indicators that take on value 1 if a firm's total and short term FX debts to total asset ratios are greater than the sample's FX debt to total asset ratio in each year. Subsequently, I interact these indicators with $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ to control for the effects a possible non-linearity. Results are presented in Panel B in Table 9.

Last but not the least, I control for non-linearity in exchange rate. So far, I have implicitly assumed that exchange rate has been depreciating, and have ignored the possibility that it has appreciated. In other words, I have treated depreciation and appreciation as if both have symmetrical effects on investment. To account for differential effects of appreciation and depreciation, I construct an 'appreciation' indicator that takes value 1 if exchange rate appreciated in a given year. I then estimate the new regression by interacting the appreciation dummy with $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ as well as including all main effects of the interaction. Results are presented in Panel C of Table 9. The effect of appreciation and depreciation on short term FX debt is more negative on investment. The estimations that controls for non-linearity indicate that the baseline results are not driven by non-linearity; the results are consistent with the baseline model.

4.5.4 Controlling for Differences in Pre-existing Firm Performances

To assess whether the pre-existing differences in firm performance are likely to be responsible for firms' differential response to investment expenditure in our sample, I augment the baseline specification by adding lagged performance outcomes- operating earnings, capital, and inventory investments, and their interaction with logarithmic change in real exchange rate. Table 10 presents the results. Interactions of these variables suggest some evidence of differential effects on lagged performances. The interactions of the lagged inventory investment with exchange rate are always positive and significant. However, the composite balance sheet effect remains negative and significant.

4.6 Alternative Approaches to Estimations

In this section, I will discuss different estimation strategies. First, I will take the 'unexpected component' of exchange rate into account. Next, I will address possible weaknesses of implementing Ordinary Least Squares (OLS) fixed effect estimation technique. To do so, I will address concerns regarding the possible of endogeneity in the debt variables. Next, I will address limited treatment of heterogeneities among firm fixed-effects.

4.6.1 Expected and Unexpected Exchange Rates

If the expected (*ex-ante*) exchange rates are significantly different than the realized (*ex-post*) exchange rates, assuming that firms position themselves based on their expectations, fluctuations on the unexpected component distorts both indebtedness and capital expenditure. Given the irreversibility of investment decisions, the unexpected component of exchange rates may be crucial for balance sheet channel of investment.

To illustrate the effects of fluctuations in realized and expected exchange rates on capital expenditure, I construct industry level *'expected'* real exchange rates.[50,51,52,]

[40] I constructed the expected real exchange rates based on the "Economic Condition Expectation" survey conducted by the Istanbul Chamber of Industries' (ICI) of Turkish manufacturing firms. I compiled data on firms' end of the year expectations on USD/TRY and EUR/TRY exchange rates, and CPI. The survey was conducted twice a year with the largest manufacturing firms from 1997 to the first half of 2013. Firms' responses are classified based on 2-digit NACE REV.2codes, and their size. Therefore, I was able to construct expected sectoral real exchange rates for each year. I used manufacturing sector's averages for non-manufacturing sectors in my sample. The average number of manufacturing firms participated into the survey between 2002 and 2013 is as follows: 546 small, 184 medium, and 112 large firms. Given that the average

Subsequently, I estimate the baseline specification with these 3 different measures of the "expected" real exchange rate as well manufacturing sector's expected exchange rate and expected exchange rate constructed from CBRT's expectation survey. Next, I construct the '*unexpected component'* of exchange rate fluctuations as the difference of the expected and the ex-post real exchange rates[53]. Subsequently, I interact both the ex-post and the unexpected component of the real exchange rates with debt variables and credit market variables, respectively.

Panel A and Panel B in Table 11 presents the results of baseline estimations for the total and short term FX exposures and *'expected'* exchange rate. Except in one case, the new estimations confirm the baseline result of negative balance sheet effect, although they are almost always insignificant. The interaction of short term FX debt with averaged

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number of firms in our sample is around 300, the survey can be considered as representative of our sample. The missing years of 2014-2015 are filled by the CBRT's expectation survey.

[51] Turkish Central Bank has been conducting a similar survey. However, their sample size is small and response rate is low; around 100 surveys are sent and only 60 percent is returned. Moreover, 75 percent of the participants are from the financial sector. Since our concern is currency exposure of the real sector firms, I used ICI survey which is more relevant in this case.

[52]Data allows us to construct 3 different real exchange rates for a given year. The survey is conducted twice a year. The survey conducted in the 1st half of the year, collects firms' end-of-the-year expectations. The survey conducted in the 2nd half of the year collects firms' end-of-the *next*-year (1-year-ahead) expectations. Therefore, I have 2 observations for a given ear from 2 different periods; one from the current year, I call this "same period", and the other is from the second half of the previous year, I call this "pre-period". I also have the number of firms that participated into the surveys; I constructed an average of these two, just in case firms are shuffling their investment decisions based on their average current and pre-period expectations. To put it in a perspective, consider firms' the end of year exchange rate expectations for 2012. The survey conducted in the 2nd half of 2011 (pre-period) and the 1st half of 2012 (current period) collects firms' end of year expectations for 2012. As a result, I have 2 observations for the end of 2012, and their averages.

[53] I constructed 7 different measures of the "unexpected component" of the exchange rate. The first 5 of them are based on ICI survey. The first one is the difference between the ex-post and expectation from the pre-period. The second one is the difference between the ex-post and expectation from the same-period. The third one is the difference between the ex-post and the average of expectations from the pre- and the current periods. The 4th and 5th are similar to the 1st and second for the entire manufacturing sector. The remaining two are based on CBRT's expectation survey which is constructed similar to 1st and 2nd.

expected exchange rate is negative and significant. The results suggest that as long as exchange rate expectations matching the realized exchange rate, the negative effect of composite balance sheet is gets smaller and insignificant.

Furthermore, results suggest that firms fail to estimate the future level of exchange rate. If the expectations came true, the negative balance sheet effect would be less negative and insignificant compared to the baseline results. Hence, if firms plan their future financial decisions, specifically investment expenditure based on their expectations, and if the realized exchange rate is different that the expectations, which is apparently the case in Turkey, fluctuations of the expected real exchange rate puts extra pressure on the balance sheet by increasing the FX portion of indebtedness.

Finally, the Panel C of Table 11 presents the results of estimation with the *"unexpected component"* of the exchange rate. I interact both the realized and the unexpected component of exchange rate variables with debt variables. By doing so will isolate the effects are embedded into the unexpected portion of real exchange rate. Interactions of foreign exposure measures with unexpected components of exchange rates are almost always negative. Furthermore, in all cases, we obtain a negative composite balance sheet effect.

4.6.2 Instrumental Variable Estimator

If firms expect a depreciation, and they reshuffle their debt composition accordingly before the depreciation, the baseline results will be biased for ignoring the possible endogeneity of debt variables. I instrument lagged dependent variable, FX, and total debt variables with their twice-lagged values to control for potential endogeneity.

Results are presented in Table 12. Estimates based on instrumental variables do not change the baseline findings regarding the existence of a negative and significant balance sheet effect. [54]

4.6.3 Different Fixed-Effects

The fixed effect OLS technique is subject to criticisms for its inability to control for firm-level unobserved differences in the dynamic model. Estimation of a fixed effect OLS regression along with lagged dependent variable (LDV) leads to an 'attenuation bias' (Nickell 1981). One way of controlling for unobserved firm heterogeneities and lagged dependent variable is using Arelleno-Bond type Generalized Method of Moments (GMM) estimation techniques (Arellano and Bover 1995, Blundell and Bond 1998, Arrellano and Bond 1998). However, GMM has its own problems and weaknesses. The main one is that the system is almost always over-identified due to instrument proliferation (see Roodman 2007)[55]. As already discussed earlier, we are not interested in the determinants of investment, hence *estimating* the LDV is not an interest of our research. I am interested in the impact of only one variable which captures the effects of FX debt on investment through exchange rate fluctuations. Therefore, I rely on an OLS fixed effect difference-in-difference estimation technique which is simple, explicit, exactly identified, and easy to understand.

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[54] F values for first stages are high, which implies that our instruments are good.

[55] Statistical tests for over-identification are extremely sensitive to the number of selected lags, and using longer lags of the variables as instruments without proper statistical testing to assess whether they are statistically valid instruments, causes the system of GMM to suffer from "instrument proliferation".

With these points in mind, I address concerns over the limited treatment of firm fixed-effects in two different ways. First, I estimate the baseline specification with and without lagged dependent variable by adding the appropriate fixed effects into the specification.[56] The results are presented in Table 13, and they are qualitatively same as the baseline results. I obtain a negative and significant balance sheet effect, except in column 3, where only year fixed-effect is controlled, the result is insignificant.

Nevertheless, we still have not addressed the problem of not controlling for firm heterogeneities and LDV in our regressions. I address this concern by using a method suggested by Guryan (2001) in which we can control for unobservable firm differences together with LDV. Specifically, I estimate the baseline regression for constrained values of the lagged dependent variable that satisfy the stability condition of the system[57], and sum the dependent and lag dependent variables over each other.[58] Consequently, I illustrate the estimated coefficients and the corresponding student's t statistics of the variable of interest; $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ in Figure 2**.**

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[56] Namely, I estimate the baseline regression as follows: 1. firm and year fixed effects added, no lagged dependent variable is included; 2. firm and industry-by-year fixed effects is included, no lagged dependent variable is included; 3. only year fixed effect along lagged dependent variable is included; and finally 4. industry-by-year fixed effects and lagged dependent variable added. The last specification is the baseline.

[57] When lagged dependent variable, which is an AR (1) process, is equal and greater than 1, the system becomes explosive; that is, it is not going to converge to its long run equilibrium. If AR (1) equals to -1, system oscillates around the mean, but there are concerns that LDV is close to the near unit root. In addition, if capital stock is persistent, we can expect LDV to be greater than zero, and perhaps smaller than 0.5. However, I stick to statistical condition and suggest that $-0.7 \leq LDV \leq 0.7$ is the stability condition for the system.

[58] Specifically, I estimate the following regression in which α, the value of the LDV ranges within [-1, 1] by 0.01:

$$y^{new}_{i,t} = y_{i,t} - \alpha\, y_{i,t-1} = \beta_{BS}\left(fxdebt_{i,t-1} \times \Delta e_t\right) + \beta_X X_{i,t-1} + \eta_i + \tau + \varepsilon_{i,t}$$

where η is firm and τ is year fixed effects.

As illustrated, for all the ranges of the lagged dependent variable that satisfy the stability condition of the system, the composite estimates of the balance sheet effects are always negative. This exercise suggests that our baseline results are not biased for not controlling for firm-level heterogeneities, and hence there is no need for GMM.

4.7 The Relative Effects of FX Debt and Exchange Rate

The absence of positive composite balance sheet effect indicates that the contractionary effect of depreciation dominates its expansionary effect. To get a better idea about the relative strengths of these contractionary net-worth and expansionary competitiveness effects, we will separately look at the trade and the net worth channels of depreciation.

4.7.1 Competitiveness Effect of FX Debt and Exchange Rate

We should expect a significant increase in firm outcome in the aftermath of depreciation, if the competitiveness effect is strong. For instance, we should observe a surge in firm profits that operate in the tradable sectors following a depreciation. Therefore, the aim of this section is to assess whether FX indebted firms performs better and witness a significant increase in investment, sales, and earnings with respect to their domestic currency indebted counterparts in the aftermath of a depreciation.

First, I estimate the baseline investment regression by including contemporaneous earning, which also proxies for cash flows from operations. As seen in column 1 of Table 14, inclusion of the cash flow variable and tradable dummy improves the estimation, but

only marginally. As expected both the interaction of operating income, tradable, and exporter dummy and their main effects are positive.

Subsequently, I add contemporaneous sales and sales costs into the regression. Although they have the expected signs and both are significant, I cannot rely on this estimation. As sales and cost are endogenous, I instrument them for the interaction of 3-digit ISIC.Rev-2 industry codes with the interaction of export to sales and the logarithmic change in real exchange rate. The main effects of export to sales and its interaction with real exchange rate are treated as excluded instruments. The new estimation improves the composite balance sheet effect. As expected, the results suggest that competitiveness effect of exchange rate increases investment, but only marginally.

To observe relative changes in firm profitability, I estimate a new regression[59] with sales, sales growth, and operating income as dependent variables. Results are presented in Panel A and B in Table 15. Although not significant, operating earnings of FX indebted firms decrease following a depreciation. Furthermore, FX indebted firms that expect their future earnings (t+1) to increase in the aftermath of a depreciation, find their earning to decrease. Similarly, the level of contemporaneous sales of the FX indebted firms decreases with a depreciation, whereas sales growth rate is increasing. FX indebted firms that expected their future sales to increase, find it to increase with a depreciation. These findings indicate that some degree of matching takes place.

[59] Specifically, I estimate regressions by adding firm and industry-by-year fixed effects without lagged dependent variables.

4.7.2 The Balance Sheet Channel of Exchange Rate

The fact that FX indebtedness increases with depreciation does not necessarily mean that depreciation is contractionary. Hence in this section, I evaluate if the change in net worth for depreciation is contractionary.

I assess whether overall debt of FX indebted firms increase due to depreciation. I estimate the baseline specification without lagged dependent variable by adding firm and industry-by-year fixed effects, where total debt, financial debt, working capital, net worth and their change are dependent variables. Panel A in Table 16 shows that total debt and financial debt substantially increases with a depreciation. Similarly, Panel B of Table 16 shows that in the aftermath of a depreciation, firms' net worth decreases and their need for working capital increase substantially. The evaluation of competitiveness and net worth channels of depreciation (Tables 16 and 17) indicates that firms find their earnings decreases, sales increases, whereas their indebtedness increases substantially in the aftermath of a depreciation. As a result, their need for working capital increases, and there is a net worth melt-down. Because the increase in total indebtedness is greater than the increase in earnings, the net-worth effect of depreciation dominates the competitiveness effect. As a result, foreign-currency-indebted-firms invest less than domestic-currency-indebted-firms.

4.8 Foreign Currency Debt versus Currency Mismatch

With a few exceptions, the existing empirical work exclusively focuses on FX debt as the main exposure variable. However, firms match their currency composition of liabilities with not only FX earnings, but also foreign assets and FX derivatives. If a

portion of firm assets are denominated in a FX, depreciation also inflates the domestic currency value of FX assets, and the change in the net-worth will be ambiguous. Indeed, firms in our sample hold on average, 11 percent of their assets in FX. Therefore, estimates based on FX debt alone may not be sufficient to understand balance sheet exposure of depreciation.

Having detailed information on FX assets and derivatives enable us to disentangle the negative balance sheet effects of depreciation from its positive competitiveness effects. Another question to investigate is whether firms with larger currency mismatches invest relatively less in the aftermath of a depreciation. Hence, in this section I present the results of a slew of estimation of conditional balance sheet effects to check whether firms with more mismatches in their balance sheet are more constrained, in the aftermath of a depreciation. With these points in mind, first I augment the baseline specification by adding firms' FX assets, FX derivatives, exports, imports, and their interactions with exchange rate.

Table 17 displays the results. Once the effect of FX asset is accounted for, the magnitude of the estimated coefficient of our key variable, $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ becomes more negative, and remains significant. It implies that firms with FX denominated assets experience a higher increase in their fixed capital expenditure relative to those that only hold Turkish Lira denominated assets. This is in itself an indication of a strong balance sheet effect. Next, I only include export to sales and interact with exchange rate. Although the main effect of export is positive and significant, its interaction with exchange rare is positive but insignificant. In column 5, I include FX assets, export, and import; and in column 6, I also add FX derivatives. These new estimations yield

surprising results. First, the interaction of export to exchange rate is negative and significant, although the main effect of export remains positive. Unfortunately, I do not have any explanation for such a surprising result. The interaction of lagged import to exchange rate is negative as expected and the main effect is positive. The result suggests that the cost of imports increase with depreciation, but imports is used for investment and hence the main effect of imports on investment is positive. Finally, I add FX derivative into the specification, results suggest that the interaction of FX derivatives with exchange rate is positive but insignificant.

The number of the observations for FX assets, derivatives, and exports differ in our dataset. To compare the relative effects of these variables, I only consider firm-year observations that have both FX assets and export revenues in the sample. The new results are displayed in Table 18. First, I consider the effect of FX derivative used on hedging in columns 1-2. Column 1 presents the results of the baseline regression for the firms with FX derivatives without FX derivatives, whereas column 2 presents the result of baseline regression for firms with FX derivatives and adds the FX derivative into the regression. Results suggest that if used, FX derivatives are effective to hedge FX exposure. However, the use of FX derivatives are limited; only 80 firms which makes up 271 year-firm observation, use FX derivatives.

Next, I consider firms with export revenue and FX assets in their balance sheets. I gradually add exports to sales ratio and its interaction with the logarithmic change in the real exchange rate into the baseline model[60] to understand how much FX assets and exports affect the magnitude of the composite effect individually. This exercise allows us

[60] I exclude foreign currency assets and its interaction with exchange rate.

to make some judgments about which of these variables are relatively more effective in hedging negative net-worth effects of depreciation. Results are displayed in columns 3-5 of Table 18. Once FX assets are added, the coefficient of the variable of interest improves significantly. Although the interaction of FX asset to exchange rate is not significant, the main effect of FX asset is positive and significant. Similarly, once I add exports to sales ratio and interact with exchange rate, the estimated coefficient of (export x Δ log real exchange rate) is positive but insignificant, but the main effect of exports is significant. However, the coefficient of the variable of interest, $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ does not change much compared to the baseline, it only improves marginally. This implies FX earnings are not sufficient to match the composition of FX debts, and FX assets are more effective to hedge FX exposure. Furthermore, the coefficients of the interaction of FX assets and exchange rate and the main effect of FX assets are greater than those of the interaction of exports to sales and the main effect of exports to sales. Hence, the result suggests that if we are to make an argument about some degree of partial hedging, it is not due to the firms' FX earnings, but rather due to their foreign asset holdings.[61]

Next, I substitute FX variables with their short term measures, and present the results in Table19. The results are qualitatively same as previous estimations: in all cases I find a negative and significant balance sheet effect.

Last but not the least; I construct accounting definition of both total and short-term currency mismatch as the exposure variables. Then, I augment the specification

[61] Why do real sector firms hold 11 percent of their assets denominated in a foreign currency when the average growth rate of investment is around 0 percent (in our sample), is in itself a question that requires detailed analysis which is out of the scope of this paper.

with exports as presented in Table 20. Again, I do not find a positive balance sheet effect, which implies that depreciation is contractionary for firms with larger FX open positions.

4.9 Foreign Currency Exposure in the Subset of the FCC Dataset

Finally, I analyze the subset of the dataset. Doing so, I divided the dataset into its subsets based on firm sectors they operate and firm characteristics. I also divided the date as before 2009 and later to account for the global financial crisis in Turkey. Turkish economy was hit by the global crisis in 2009. Furthermore, Turkish firms that did not have FX revenues were not allowed to borrow in a FX before 2009. Results of the baseline investment regression of each subset are displayed in Table 21, where in column 1 the FX exposure is FX debt whereas in column 2 it is FX mismatch. The results mostly align with the baseline estimation.

4.10 Discussion and Implications of the Findings

The findings of this chapter suggest that increasing NFC leverage does not contribute to investment growth**.** This finding suggests that there is not a correlation between NFC FX debt growth and their investment expenditures. As documented above, this disconnection apparently related with in firms' lower operational profitability and their increasing need for working capital. Furthermore, the results show that refinancing needs of FX indebted firms for servicing their debt increase with depreciation. This finding is align with the results of recent CBRT's Bank Loans Tendency Surveys where NFCs indicated that while their financing need for fixed investments has declined, they borrow more for working capital and debt restructuring.

If this FX debt is not channeled into capital/productive expenditure and if this disconnection between FX debt and investment growth is permanent/persistent, we should expect even weaker investment when the ongoing accommodative conditions in the global monetary policy reversed. As a result, the balance sheet exposure will hinder investment even further through the channels that I have discussed in this chapter.

Moreover, firms cannot match their FX debts with their FX earnings. Firms that expect their future earnings to increase with depreciation, observe a decrease in their earnings and investment. As a result, they cannot naturally hedge themselves. Therefore, the negative net-worth effect of depreciation dominates its expected positive competitiveness effect. Our findings contrast similar studies in the literature. For example, Bleakley and Cowan (2008) and Allayannis et. all (2001) find that nonfinancial firms match their FX debts with foreign earnings for a selective East Asian and Latin American countries respectively.

In the analysis, I also consider the fact that firms hold FX assets in their balance sheet. This information allows us to assess whether having a larger FX open position makes depreciation more contractionary. It also allows us to disentangle the balance sheet and competitiveness effects. As the results suggest, indeed having a large FX mismatch is contractionary. Furthermore, export revenues only marginally improve the balance sheet effect. If a degree of "matching" takes place, it is through FX assets, not through export revenues.

These findings are robust and consistent to controlling and estimating variables those are correlated with the exchange rate fluctuations, firms' FX indebtedness, and their

investment opportunities, that is; in all cases I find a negative composite balance sheet effect.

4.11 Conclusion

This chapter contributes to the empirical literature on the balance sheet effects of exchange rate fluctuations through FX indebtedness and currency mismatch. Although theoretical models demonstrate that depreciations may be contractionary on output by putting pressures on firm balance sheet, the empirical literature finds mixed and inconclusive evidence. In this chapter, I use a new dataset that allow us to carry out comprehensive analysis on currency exposure, while controlling for many correlates of FX indebtedness, exchange rate fluctuation, and firm-level investment opportunities to overcome omitted variable bias.

Our findings indicate that firm-level total indebtedness and the need for working capital increases more than earnings. As a result, the net worth effect of depreciation dominates the assumed competitiveness effect. However, firms that expect their future earnings and investment to increase as a result of depreciation, observe a decrease in their future earnings and investment. Because firms cannot match currency composition of their liabilities with FX earnings, the contractionary effect of depreciation dominates its positive effect. As a result, we see a substantial decrease in firms' net worth.

Furthermore, the term structure of FX indebtedness matters for the magnitude of the exposure. The negative composite effect becomes more pronounced when I take short-term FX debt as the exposure variable. On the other hand, I find that the interaction of the Turkish Lira debt with exchange rate are almost always positive and significant,

i.e. while FX indebtedness is contractionary, the Turkish Lira indebtedness is expansionary.

The findings of this chapter regarding FX indebtedness can provides evidence from an emerging market perspective, which has been a concern during the implementation as well as normalization of non-traditional monetary policy in the advanced countries.

CHAPTER 5

CONCLUSION

The increase in the trend and the size of the foreign currency indebtedness of non-financial corporations in the emerging market economies in the aftermath of the Global Financial Crisis of 2007 ignited discussions in regard to the concerns over the potential vulnerabilities due to non-financial corporations' un-hedged currency risks.

Motivated from these recent discussions, this dissertation analyzes i) the size and ii) the effect of foreign currency exposure of Turkish non-financial corporations thorough exchange rate fluctuations. Doing so, I constructed a novel dataset which has detail information on the currency composition, currency break-down and maturity structure of firms' foreign currency debts and assets.

Chapter1 of the dissertation introduced the theoretical background of the relationship between currency mismatch and depreciation. In the chapter, I discussed that although the channels through which exchange rate fluctuations alter firm output are theoretically well grounded, the empirical assessments are mixed and inconclusive. The main conclusion of the chapter is that an in depth and detail assessment of currency exposure on firm output and vulnerabilities associated with it requires a detailed micro level data on currency composition of the firms' FX holding, origin of the debt, and the link between borrowers and lenders. Having such detail data enables thorough assessment of the underlying channels. Furthermore, I argued that having a rich micro level data enables policymakers to detect the risks and design optimum monetary policies achieve financial stability.

Chapter 2 introduced the "Foreign Currency Exposure" dataset of the Turkish NFC, which was constructed for this dissertation. The FCC dataset is unique in that it is one of the few dataset in the literature that contains information on firms FX asset. Many of the existing datasets only has information on firms' FX debts. Hence, literature takes FX indebtedness as the sole proxy for the FX exposure. Having information on FX assets, FX derivatives, and income stream and costs tied to foreign currency enables us to effectively disentangle to true effect of FX exposure. Chapter described the FX holdings of non-financial firms the sources, and then discusses strengths, weaknesses and potential uses/contributions of the dataset compiled for this dissertation.

In chapter 3 of the dissertation, I descriptively analyzed the evolution of FX exposure in Turkish NFC. The chapter illustrated that firms respond depreciation by decreasing the level of FX debt in original currency and reshuffle their currency composition between TRY and Euro. Furthermore, the chapter showed that while firms hold sizable FX open position in their balance sheet, their debt maturity do not improve. Also, their ability to of natural hedging is limited.

Finally, chapter 4 analyses the impact of the foreign currency indebtedness on firm output; particularly capital expenditures. Specifically, I asked the following two questions that following a depreciation i) whether FX indebted firms perform better than those domestic currency indebted firms, ii) whether firms with larger currency mismatch are constrained more than those firms with less currency mismatch in their balance sheets. The empirical results suggest that foreign currency indebted firms invest less, and firms with larger FX mismatch are constrained more in Turkish NFC. These results are robust to a slew of controls and alternative estimations. The chapter also shows that the

maturity structures of both FX indebtedness and currency mismatch matters, and the contractionary effect of short term FX exposure are more pronounced on investment.

APPENDIX A

VARIABLE CONSTRUCTION AND SOURCES

Capital Investment: Investment calculated as natural logarithmic change in tangible fixed assets. Source of tangible fixed assets are company balance sheets.

Tangible Fixed Assets (K): Tangible fixed asset is the sum of machinery, plants, equipment, buildings, land, property, other tangible assets, and construction-in-progress. It does not include depreciation. Inventories are reported separately and not included in the calculations. Source is company balance sheets.

Investment Expenditure: Investment expenditure is calculated as the change in the sum of tangible and intangible fixed assets, and change in the sum of tangible and intangible fixed assets, and property expenditures, respectively. Source of tangible, intangible, and property expenditures are company balance sheets.

Foreign Currency Debt (FX debt): Outstanding short and long-term FX liabilities in period t. These include financial and trade related liabilities. Source is company footnotes.

Foreign Currency Assets (fxast): Outstanding short and long term foreign currency assets in period t. These include cash and cash equivalent as well as financial and trade related receivables. Source is company footnotes.

Foreign Currency Derivatives (forex): Net of outstanding foreign currency derivatives in period t. Source is company footnotes.

Foreign Currency Mismatch (fxmm): Net of FX debt, FX assets and FX derivatives in period t. Source is author's calculation, and company footnotes.

Debt Dollarization: Outstanding total and short term FX liabilities in period t scaled by total liabilities and short term liabilities, respectively. Source is author's calculation

Asset Dollarization: Outstanding total and short term FX assets in period t scaled by total and short term total assets, respectively. These include financial and trade related liabilities. Source is author's calculation.

Total Leverage: Ratio of total liabilities to total assets in period t. Source is author's calculation.

TRY Leverage: Ratio of total Turkish Lira liabilities to total assets in period t. Source is author's calculation.

FX Leverage: Ratio of total foreign currency liabilities to total foreign currency assets in period t. Source is author's calculation.

Financial Debt: Outstanding liquid form of short and long term financial debts which are mostly bank credits. Source is company balance sheet.

Debt Maturity: Ratio of outstanding long-term liabilities to total liabilities in period t. Source is author's calculation.

Financial Debt Maturity: Ratio of outstanding long-term financial debt to total liabilities in period t. Source is author's calculation.

TRY Debt Maturity: Ratio of outstanding long-term Turkish Lira debt to total liabilities in period t. Source is author's calculation.

FX Debt Maturity: Ratio of outstanding long-term foreign currency debt to total foreign currency liabilities in period t. Source is author's calculation.

Asset Maturity: Ratio of outstanding long-term assets to total asset in period t. Source is author's calculation.

TRY Asset Maturity: Ratio of outstanding long-term Turkish Lira assets to total asset in period t. Source is author's calculation.

FX Asset Maturity: Ratio of outstanding long-term foreign currency assets to total foreign currency asset in period t. Source is author's calculation.

K Stock Maturity: Ratio of tangible fixed asset to total liabilities in period t. Source is author's calculation.

Sales: Total net firm sales; the sum of domestic and foreign sales in period t. Source is company income statements.

Sales Cost: Cost of sales in period t. Source is company income statements.

Export: Firm's foreign sales in period t. Source is income statements and company footnotes.

Import: Firm's import in period t. Source is income statements and company footnotes.

Net Worth: Ratio of net of total assets and total debt to total assets in period t. Source is company balance sheets.

Working Capital: Net of current assets and current liabilities in period t. Source is author's calculation.

Operating Income: Net of gross profit and operating expenses in period t. Operating expenses are general and administrative expenses, sales, distribution and marketing expenses and research and development expenses in period t. Operating expenses excludes other operating income and costs such as financial related items (i.e., interest income, dividend income, and interest expense), extraordinary items, and taxes (same as operating income) in period t.

Current Ratio: Ratio of current assets to current liabilities in period t. Author's calculation.

FX Current Ratio: Ratio of foreign currency current assets to foreign currency current liabilities in period t. Author's calculation.

Quick Ratio: Ratio of cash to current liabilities in period t. Author's calculation.

FX Quick Ratio: Ratio of foreign currency cash to foreign currency current liabilities in period t. Author's calculation.

Real Exchange Rate (e): The real exchange rate is constructed as end of year nominal Turkish Lira value of one US Dollar (USD/TRY) multiplied by the ratio of end of the year US to Turkish consumer price index (CPI). Similarly, it is constructed as the end of year Turkish Lira value of one Euro (EUR/TRY) multiplied by the ratio of end of the year 28 Euro countries to Turkish consumer price index. Alternative measure of real exchange rate also includes end of year Turkish Lira value of one US Dollar divided by end of year Turkish CPI. The source of CPIs is OECD. Hence, in this definition, an increase in the real exchange rate leads to a depreciation in the domestic currency vis-à-vis the US Dollar.

Debt Weighted Real Exchange Rate (dwer): The source is Bank of International Settlements.

Unexpected Real Exchange Rate: Calculated from Istanbul Chamber of Industry's manufacturing sectors survey data, and CBRT's expectation surveys.

Unexpected Component of Real Exchange Rate: The difference of expected and realized real exchange rate.

Domestic Bank Credit: Domestic credit supplied by the domestic financial sector as the ratio of lagged GDP. The source is World Development Indicators.

Credit Inflow: Credit received from abroad as the ratio of lagged GDP. This data was compiled from balance of payment statistics. Alternatively, measures of credit inflow include total and short-term credit and loans received by non-financial firms' from abroad. Source is CBRT.

Financial Account: Financial inflow into the country and the net of financial account as the lag of GDP in balance of payment statistics. Source is CBRT.

APPENDIX B

TABLES FOR CHAPTER 2

Table 2.1: Number of Firms Operating in Each Sectors

Sectors	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	Percent
Agriculture				1	1	2	5	6	8	11	11	7	5	57	2
Mining	1	1	1	1	2	3	5	5	5	5	5	4	2	40	1
Manufacturing	178	184	189	186	189	196	205	220	234	244	243	237	225	2730	77
Energy	4	4	4	4	5	5	5	6	7	11	13	10	9	87	2
Construction	1	1	1	1	1	3	3	5	8	9	11	12	11	67	2
Retail & Wholesales	18	19	21	19	23	23	29	33	38	42	40	39	35	379	11
Transport & Communications	5	6	6	6	8	10	11	12	13	14	13	12	10	126	4
Others	2	2	2	2	2	2	4	6	7	7	7	7	7	57	2
Total	209	217	224	220	231	244	267	293	320	343	343	328	304	3543	100

Each column displays the number of firms in each year in each sector. While the “Total” column and row indicate the total number of firms in each industry in each year, respectively, the “Percent” column displays the overall percentage of observation for each industry.

Table 2.2: Number of Observations Based on Firm Characteristics

	Listed		Foreign		Parent		Mature		Large		Tradable		Exporter		Total
Year	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	N
2003	209	100	52	24.9	153	73.2	105	50.2	138	66.0	169	80.9	171	81.8	209
2004	217	100	52	24.0	154	71.0	100	46.1	150	69.1	140	64.5	177	81.6	217
2005	224	100	57	25.4	157	70.1	105	46.9	151	67.4	175	78.1	182	81.3	224
2006	219	100	58	26.4	155	70.5	104	47.3	152	69.1	177	80.5	180	81.8	220
2007	230	100	59	25.5	157	68.0	115	49.8	154	66.7	191	82.7	184	79.7	231
2008	242	99	62	25.4	162	66.4	120	49.2	153	62.7	197	80.7	192	78.7	244
2009	264	99	63	23.6	166	62.2	135	50.6	156	58.4	213	79.8	207	77.5	267
2010	288	98	64	21.8	171	58.4	143	48.8	163	55.6	222	75.8	222	75.8	293
2011	308	96	63	19.7	175	54.7	159	49.7	171	53.4	243	75.9	237	74.1	320
2012	319	93	64	18.7	184	53.6	168	49.0	175	51.0	247	72.0	250	72.9	343
2013	322	94	62	18.1	185	53.9	172	50.1	176	51.3	254	74.1	249	72.6	343
2014	315	96	62	18.9	180	54.9	163	49.7	172	52.4	242	73.8	238	72.6	328
2015	295	97	56	18.4	164	53.9	153	50.3	166	54.6	223	73.4	224	73.7	304

Each column displays the number of and percentage of firms in each category displayed in the Table.

Table 2.3: Descriptive Statistics of Select Variables in the FCC Dataset

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Panel A: Foreign Currency Debt Ratios												
Foreign Currency Debt Ratio[62]	Mean	0.22	0.24	0.24	0.25	0.24	0.29	0.28	0.29	0.27	0.27	0.25	0.2	0.22
	Median	0.16	0.18	0.18	0.19	0.18	0.22	0.17	0.18	0.15	0.12	0.12	0.11	0.15
	Stand.Dev.	0.26	0.31	0.3	0.35	0.3	0.42	0.45	0.75	0.63	0.83	0.59	0.25	0.26
	N	209	217	224	220	231	244	267	293	320	343	343	328	304
Debt Dollarization	Mean	0.4	0.45	0.43	0.42	0.42	0.44	0.41	0.39	0.38	0.39	0.35	0.34	0.35
	Median	0.44	0.46	0.44	0.43	0.41	0.44	0.39	0.38	0.36	0.3	0.3	0.25	0.3
	Stand.Dev.	0.27	0.3	0.3	0.29	0.28	0.29	0.29	0.29	0.3	0.76	0.38	0.34	0.29
	N	209	217	223	219	231	243	266	292	320	342	342	327	304
Short Term Debt Ratio[63]	Mean	0.17	0.18	0.16	0.16	0.16	0.18	0.17	0.21	0.18	0.19	0.16	0.12	0.14
	Median	0.12	0.13	0.11	0.11	0.1	0.12	0.1	0.09	0.08	0.06	0.06	0.05	0.07
	Stand.Dev.	0.18	0.18	0.18	0.19	0.2	0.3	0.3	0.74	0.38	0.74	0.46	0.18	0.21
	N	209	217	223	219	231	243	266	292	320	342	342	327	304
Short Term Debt Dollarization	Mean	0.33	0.36	0.31	0.3	0.29	0.29	0.27	0.26	0.25	0.28	0.23	0.22	0.22
	Median	0.33	0.35	0.26	0.25	0.23	0.24	0.19	0.2	0.19	0.15	0.15	0.14	0.15
	Stand.Dev.	0.26	0.28	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.74	0.31	0.29	0.22
	N	209	217	223	219	231	243	266	292	320	342	342	327	304

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

[62] Ratio of Total Assets.
[63] Ratio of Total Assets.

Table 2.3: Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Panel B: Foreign Currency Asset Ratios												
Asset Dollarization	Mean	0.1	0.11	0.1	0.11	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11
	Median	0.07	0.08	0.08	0.07	0.07	0.07	0.04	0.05	0.05	0.04	0.05	0.05	0.06
	Stand.Dev.	0.1	0.12	0.11	0.12	0.14	0.15	0.15	0.15	0.16	0.18	0.16	0.17	0.13
	N	209	217	223	219	231	243	266	292	320	342	342	327	304
Short Term Asset Dollarization	Mean	0.08	0.09	0.08	0.09	0.11	0.11	0.11	0.1	0.1	0.09	0.1	0.09	0.1
	Median	0.05	0.06	0.04	0.05	0.07	0.06	0.04	0.04	0.05	0.03	0.05	0.05	0.06
	Stand.Dev.	0.09	0.1	0.09	0.1	0.13	0.14	0.14	0.14	0.15	0.16	0.15	0.12	0.13
	N	209	217	223	219	231	243	266	292	320	342	342	327	304

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

Table 2.3: Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Panel C: Foreign Currency Mismatch												
Currency Mismatch Ratio[64]	Mean	-0.12	-0.13	-0.13	-0.13	-0.12	-0.17	-0.16	-0.18	-0.15	-0.16	-0.14	-0.09	-0.11
	Median	-0.07	-0.08	-0.07	-0.06	-0.07	-0.09	-0.06	-0.06	-0.04	-0.04	-0.03	-0.03	-0.03
	Stand.Dev.	0.26	0.3	0.29	0.33	0.31	0.43	0.44	0.74	0.63	0.82	0.58	0.27	0.27
	N	209	217	223	219	231	243	266	292	320	342	342	327	304
Currency Mismatch to Liabilities	Mean	-0.05	-0.1	-0.11	-0.05	-0.05	-0.01	-0.03	-0.11	-0.02	-0.02	-0.02	0.04	0.03
	Median	-0.15	-0.17	-0.18	-0.15	-0.21	-0.21	-0.15	-0.13	-0.11	-0.09	-0.07	-0.06	-0.06
	Stand.Dev.	0.97	0.71	0.64	0.72	0.6	1.57	1.16	0.75	1.05	1.44	0.91	1.02	1.34
	N	209	217	223	219	231	243	266	292	320	342	342	327	304
Short Term Currency Mismatch Ratio[65]	Mean	-0.08	-0.09	-0.09	-0.07	-0.05	-0.08	-0.07	-0.11	-0.07	-0.1	-0.06	-0.03	-0.03
	Median	-0.05	-0.05	-0.05	-0.04	-0.01	-0.02	-0.02	-0.02	-0.01	0	0	0	0
	Stand.Dev.	0.18	0.17	0.17	0.2	0.21	0.31	0.3	0.74	0.38	0.72	0.44	0.19	0.22
	N	209	217	223	219	231	243	266	292	320	342	342	327	304
Short Term Currency Mismatch to Liabilities	Mean	-0.02	-0.07	-0.06	0.02	0.06	0.08	0.09	0	0.07	0.07	0.08	0.1	0.15
	Median	-0.12	-0.11	-0.11	-0.09	-0.03	-0.05	-0.04	-0.04	-0.02	-0.01	-0.01	-0.01	-0.01
	Stand.Dev.	0.96	0.7	0.55	0.67	0.55	0.91	1.13	0.72	1.02	1.42	0.86	0.84	1.31
	N	209	217	223	219	231	243	266	292	320	342	342	327	304

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

[64] Ratio of Total Assets.
[65] Ratio of Total Assets.

Table 2.3: Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Panel D: Debt Maturity												
Debt Maturity	Mean	0.28	0.3	0.3	0.29	0.28	0.27	0.26	0.26	0.27	0.27	0.3	0.3	0.3
	Median	0.24	0.27	0.26	0.24	0.23	0.2	0.24	0.22	0.22	0.23	0.25	0.25	0.26
	Stand.Dev.	0.21	0.23	0.22	0.21	0.22	0.22	0.2	0.21	0.22	0.21	0.22	0.22	0.22
	N	209	217	223	219	231	243	266	292	320	343	343	328	304
Financial Debt Maturity	Mean	0.14	0.15	0.15	0.16	0.15	0.16	0.15	0.14	0.15	0.15	0.18	0.18	0.19
	Median	0.03	0.04	0.06	0.08	0.07	0.06	0.08	0.07	0.07	0.07	0.11	0.1	0.12
	Stand.Dev.	0.2	0.2	0.2	0.2	0.19	0.2	0.18	0.18	0.2	0.18	0.21	0.21	0.21
	N	209	217	223	219	231	243	266	292	320	343	343	328	304
TRY Debt Maturity	Mean	0.41	0.56	0.33	0.3	0.25	0.21	0.2	0.19	0.27	0.25	0.23	0.3	0.29
	Median	0.28	0.3	0.25	0.23	0.19	0.15	0.18	0.18	0.19	0.21	0.23	0.21	0.22
	Stand.Dev.	0.44	1.65	0.52	0.42	0.42	0.26	0.35	0.54	0.48	0.31	0.74	0.8	0.36
	N	209	217	223	219	231	243	266	292	320	342	342	327	304
FX Debt Maturity	Mean	0.13	0.16	0.22	0.23	0.27	0.29	0.3	0.27	0.26	0.25	0.29	0.28	0.28
	Median	0	0	0	0	0.13	0.17	0.21	0.14	0.09	0.12	0.18	0.12	0.15
	Stand.Dev.	0.26	0.29	0.31	0.31	0.31	0.31	0.31	0.31	0.3	0.3	0.32	0.32	0.31
	N	209	217	224	220	231	244	267	293	320	343	343	328	304

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

Table 2.3: Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Panel E: Asset Maturity												
Asset Maturity	Mean	0.54	0.53	0.52	0.49	0.5	0.5	0.5	0.48	0.46	0.48	0.49	0.48	0.48
	Median	0.54	0.55	0.54	0.48	0.5	0.5	0.52	0.48	0.46	0.48	0.47	0.47	0.49
	Stand.Dev.	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.38	0.23	0.23
	N	209	217	223	219	231	243	266	292	320	343	343	328	304
TRY Asset Maturity	Mean	0.57	0.56	0.54	0.52	0.54	0.55	0.56	0.53	0.49	0.52	0.51	0.53	0.54
	Median	0.61	0.59	0.57	0.53	0.55	0.57	0.58	0.54	0.5	0.52	0.51	0.52	0.54
	Stand.Dev.	0.23	0.24	0.25	0.26	0.22	0.23	0.25	0.26	0.37	0.25	0.26	0.26	0.25
	N	209	217	223	220	231	243	266	293	320	342	342	327	304
FX Asset Maturity	Mean	0.14	0.17	0.34	2.83	0.07	0.07	0.07	0.08	0.07	0.08	0.07	0.07	0.06
	Median	0	0	0.02	0	0	0	0	0	0	0	0	0	0
	Stand.Dev.	0.27	0.31	1.78	38.4	0.19	0.19	0.2	0.21	0.2	0.22	0.19	0.19	0.18
	N	209	217	224	220	231	244	267	293	320	343	343	328	304

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

Table 2.3: Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
							Panel F: Leverage							
Total Leverage	Mean	0.47	0.46	0.48	0.5	0.5	0.58	0.58	0.61	0.58	0.56	0.61	0.54	0.57
	Median	0.41	0.41	0.42	0.44	0.44	0.53	0.51	0.52	0.51	0.48	0.52	0.52	0.54
	Stand.Dev.	0.35	0.36	0.36	0.4	0.41	0.55	0.62	0.96	0.82	0.83	1	0.34	0.48
	N	209	217	223	219	231	243	266	292	320	343	343	328	304
TRY Leverage	Mean	0.26	0.23	0.24	0.26	0.26	0.29	0.3	0.32	0.32	0.29	0.35	0.34	0.36
	Median	0.2	0.18	0.19	0.19	0.19	0.2	0.21	0.25	0.25	0.24	0.26	0.27	0.28
	Stand.Dev.	0.2	0.19	0.2	0.22	0.25	0.29	0.28	0.31	0.3	0.73	0.61	0.26	0.35
	N	209	217	224	220	231	244	267	293	320	343	343	328	304
FX Leverage	Mean	37.22	18.03	18.12	719.39	903.41	830.23	11393.54	5303.26	96.11	46.06	129.7	6599.3	446.52
	Median	1.78	1.77	1.92	1.91	1.94	2.08	2.38	2.03	1.94	1.78	1.75	1.64	1.74
	Stand.Dev.	244.3	78.6	69.8	7782.5	12127.2	12142.7	161771.7	66564.8	798.8	236.6	916.3	113065.5	4658.8
	N	199	209	215	210	217	227	249	270	295	313	312	300	285
Net Worth	Mean	-0.02	-0.01	-0.01	0	-0.02	-0.07	-0.08	-0.1	-0.05	-0.05	-0.04	0	-0.03
	Median	0.01	0.01	-0.01	0	0.02	-0.02	-0.01	0	0	0	0.01	0	0.01
	Stand.Dev.	0.27	0.24	0.26	0.28	0.32	0.44	0.6	0.95	0.58	0.73	0.72	0.3	0.46
	N	209	217	224	220	231	244	267	293	320	343	343	328	304

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

Table 2.3: Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Panel G: Export Revenue												
Export to Sales	Mean	0.33	0.3	0.28	0.26	0.26	0.28	0.27	0.24	0.25	0.24	0.24	0.25	0.25
	Median	0.28	0.25	0.22	0.18	0.18	0.23	0.22	0.16	0.18	0.16	0.18	0.19	0.17
	Stand.Dev.	0.27	0.25	0.25	0.24	0.25	0.24	0.26	0.23	0.24	0.23	0.23	0.24	0.25
	N	169	137	175	176	190	196	212	219	241	246	253	241	222
Export to Assets	Mean	0.36	0.33	0.29	0.29	0.3	0.28	0.24	0.24	0.27	0.25	0.22	0.24	0.22
	Median	0.24	0.24	0.18	0.16	0.17	0.15	0.14	0.14	0.14	0.15	0.12	0.13	0.12
	Stand.Dev.	0.36	0.33	0.3	0.34	0.36	0.33	0.28	0.26	0.3	0.29	0.26	0.3	0.27
	N	147	138	172	176	187	191	199	206	225	236	248	240	222
Import to Sales	Mean	0.03	0.28	0.11	0.03	0.26	0.26	0.21	0.22	0.28	0.22	0.22	0.24	0.21
	Median	0.03	0.28	0.11	0.03	0.21	0.19	0.14	0.16	0.21	0.16	0.14	0.22	0.18
	Stand.Dev.	0.03	NA	0.12	0.02	0.23	0.25	0.2	0.21	0.42	0.21	0.22	0.21	0.18
	N	3	1	2	2	160	170	168	171	189	165	150	131	127
Import to Assets	Mean	0.02	0.18	0.12	0.04	0.36	0.3	0.25	0.27	0.31	0.26	0.26	0.27	0.21
	Median	0.03	0.18	0.12	0.04	0.18	0.16	0.11	0.14	0.16	0.12	0.13	0.14	0.11
	Stand.Dev.	0.02	0.13	0.13	0.01	0.69	0.47	0.4	0.39	0.4	0.37	0.37	0.37	0.3
	N	3	2	2	2	161	171	168	172	190	165	150	131	127

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

Table 2.3 : Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Panel H:Select Accounting Ratios												
Tangible Fixed Assets[66]	Mean	0.44	0.41	0.39	0.38	0.37	0.37	0.35	0.33	0.31	0.32	0.31	0.30	0.30
	Median	0.44	0.41	0.38	0.36	0.35	0.37	0.36	0.34	0.30	0.30	0.30	0.27	0.29
	Stand.Dev.	0.21	0.21	0.21	0.21	0.21	0.21	0.20	0.21	0.21	0.22	0.21	0.21	0.21
	N	209	217	223	219	231	243	266	292	320	343	343	328	304
K Stock Maturity	Mean	12.66	15.12	12.56	9.29	20.2	15.33	36.3	10.09	7.82	7.64	81.3	7.43	22.78
	Median	4.34	4.65	3.97	3.66	3.71	3.49	3.49	3.32	3.06	3.42	2.31	2.44	2.1
	Stand.Dev.	28.4	58.99	43.63	25.8	153.63	83.31	378.55	34.42	21.63	19.07	1197	29.39	292.16
	N	208	217	223	218	230	241	265	291	317	341	342	328	302
Current Asset[67]	Mean	0.46	0.47	0.48	0.51	0.5	0.5	0.5	0.52	0.54	0.52	0.53	0.52	0.52
	Median	0.46	0.45	0.46	0.52	0.5	0.5	0.48	0.52	0.54	0.52	0.53	0.53	0.51
	Stand.Dev.	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.29	0.23	0.23
	N	209	217	224	220	231	244	267	293	320	343	343	328	304
Working Capital[68]	Mean	-0.02	-0.01	-0.01	0	-0.02	-0.07	-0.08	-0.1	-0.05	-0.05	-0.04	0	-0.03
	Median	0.01	0.01	-0.01	0	0.02	-0.02	-0.01	0	0	0	0.01	0	0.01
	Stand.Dev.	0.27	0.24	0.26	0.28	0.32	0.44	0.6	0.95	0.58	0.73	0.72	0.3	0.46
	N	209	217	224	220	231	244	267	293	320	343	343	328	304

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

[66] Net of depreciation, ratio of Total Assets.
[67] Ratio of Total Assets.
[68] Ratio of Total Assets.

Table 2.3 : Descriptive Statistics of Select Variables in the FCC Dataset, Continued

Variables/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	Panel H:Select Accounting Ratios, Continued													
Current Ratio	Mean	2.16	2.82	2.37	2.78	2.5	2.12	2.32	2.22	2.78	2.74	2.26	2.36	2.24
	Median	1.55	1.59	1.47	1.55	1.57	1.35	1.38	1.49	1.44	1.49	1.5	1.49	1.47
	Stand.Dev.	2.66	7.96	2.94	6.09	3.8	2.96	5.17	3.01	6.84	5.6	2.55	3.51	2.98
	N	209	217	223	219	231	243	266	292	320	343	343	328	304
FX Current Ratio	Mean	4.08	6.8	8.61	4.32	7.62	13.71	2.99	7.29	55.1	28.61	59.29	17.21	21.12
	Median	0.55	0.54	0.46	0.53	0.71	0.59	0.58	0.57	0.66	0.63	0.72	0.79	0.77
	Stand.Dev.	18.76	44.4	45.02	12.64	45.62	117.89	10.91	33.57	670	291.7	629.4	132.79	161.74
	N	196	203	209	202	214	226	242	263	292	304	304	297	280
Quick Ratio	Mean	0.42	0.47	0.57	1.02	0.74	0.55	0.59	0.72	1.11	1.15	0.66	0.61	0.64
	Median	0.12	0.11	0.1	0.12	0.14	0.1	0.11	0.1	0.1	0.1	0.14	0.13	0.13
	Stand.Dev.	1.28	1.12	1.29	4.91	3.15	2.1	2.32	2.39	6.33	5.25	1.99	1.85	2.05
	N	209	217	223	219	231	243	266	292	320	343	343	328	304
FX Quick Ratio	Mean	2.06	3.82	7.23	2.66	3.87	12.54	2.1	3.55	11.85	24.38	19.21	7.74	18.03
	Median	0.08	0.07	0.06	0.1	0.11	0.12	0.07	0.09	0.08	0.08	0.1	0.12	0.17
	Stand.Dev.	10.24	17.69	43.75	8.29	20.62	115.86	10.3	21.45	112.9	288.3	232.5	65.72	159.54
	N	196	203	209	202	214	226	242	263	292	304	304	297	280

Each column displays the summary statistics of variables indicated as in the table in each year. Definitions of the variables are in Appendix A.

APPENDIX C

TABLES AND FIGURES FOR CHAPTER 4

Table 4.1: Descriptive Statistics of the Variables Used in the Regressions

	Mean	Median	Standard Deviation	Number of Observations
Panel A: Micro Variables				
Capital Investment	-0.013	-0.053	0.395	3161
Lagged FX Debt	0.246	0.167	0.419	3015
Lagged Short Term FX Debt	0.162	0.093	0.287	3015
Lagged FX Asset	0.113	0.062	0.147	3015
Lagged Short Term FX Asset	0.097	0.050	0.132	3015
Lagged Currency Mismatch	0.131	0.056	0.409	3015
Lagged Short Term Currency Mismatch	0.065	0.018	0.279	3015
Lagged Total Debt	0.532	0.473	0.562	3017
Change in Total Debt	0.039	0.014	0.257	3159
Lagged Short Term Debt	0.383	0.318	0.454	3017
Change in Short Term Debt	0.028	0.012	0.243	3159
Lagged Financial Debt	0.250	0.179	0.409	3017
Change in Financial Debt	0.017	0.000	0.184	3159
Operating Income to Lagged Total Asset	0.043	0.038	0.120	3159
Sales to Lagged Total Asset	1.015	0.845	0.943	3159
Sales Growth	0.064	0.017	0.984	2962
Sales Cost to Lagged Sales	0.857	0.794	0.898	2962
Sales Cost to Lagged Total Asset	0.835	0.657	0.874	3159
Export to Lagged Sales	0.280	0.196	0.311	2409
Export to Lagged Total Asset	0.283	0.161	0.340	2548
Lagged Import to Sales	0.241	0.179	0.262	1276
Lagged Import to Total Asset	0.289	0.138	0.447	1280
Net Worth to Lagged Total Asset	0.620	0.530	1.814	3407
Change in Net Worth to Lagged Total Asset	0.159	-0.002	1.787	3407
Working Capital to Lagged Total Asset	0.176	0.155	1.060	3407
Change in Working Capital to Lagged Total Asset	0.056	0.003	0.960	3407
Panel A: Macro Variables				
Log Change in Real Exchange Rate	-0.006	-0.021	0.129	3409
Log Change in Domestic Bank Credit	0.101	0.114	0.108	3409
Log Change in Short Term Credit Received by NFC from Abroad	0.009	0.063	0.439	2992
Log Change in Credit Inflow	0.024	0.054	0.175	3409
Log Change in Credit Received by NFC from Abroad	0.029	0.028	0.242	3409
Growth Rate of Net Financial Account	1.189	-0.304	4.672	3409
Growth Rate of Capital Inflow	-0.118	0.026	1.484	3409

This table displays the descriptive statistics of the variables used in the regressions the way they enter into the regressions. Micro variable is scaled to the lagged of firm assets, liabilities or sales as indicated above. All accounting data is collected by from Istanbul Stock Exchange, Public Disclosure Platform, and Capital Market Board as described in the text. Macro data are compiled from the Central Bank of Republic of Turkey's web page and OECD statistic. All variables are author's calculation, and details of the descriptions of the variables and details of the variables descriptions and the data sources are in Appendix A.

Table 4.2: Effect of FX Debt and Exchange Rate on Firm Investment

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variables					
	Capital Investment(t)			Capital Investment(t+1)		
FX debt x Δ log real exchange rate	-0.087	-0.749*	-0.914**	-0.083	0.292	0.511
	(0.147)	(0.413)	(0.387)	(0.204)	(0.401)	(0.468)
FX debt	-0.004	-0.030	-0.094	-0.054	-0.105	-0.117*
	(0.051)	(0.108)	(0.062)	(0.039)	(0.066)	(0.066)
Total debt x Δ log real exchange rate		0.549*	0.667**		-0.306	-0.408
		(0.328)	(0.307)		(0.306)	(0.371)
Total debt		0.018	0.032		0.042	0.052
		(0.101)	(0.043)		(0.045)	(0.046)
Lagged capital investment			0.180***			0.183***
			(0.038)			(0.038)
Observations	3015	3015	2770	3015	3015	2770
R-squared	0.385	0.386	0.231	0.196	0.198	0.229
LDV	No	No	Yes	No	No	Yes
Firm FE	Yes	Yes	No	Yes	Yes	No
Industry-by-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. The real exchange rate is constructed as the end of year domestic nominal exchange rate multiplied by the ratio of US to domestic CPI. Firm-level independent variables are once-lagged, and are scaled by the lag of total assets. In columns 1-3, real exchange rate is from the current period, and hence they are contemporaneous with the dependent variable. In columns 4-6, dependent variable is from the next period, and hence is contemporaneous with the lagged dependent variable. Column 3 and 6 are the baseline regressions. The number of observations varies because of the specifications and data availability. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. Descriptions of the variables and data sources are in Appendix A.

Table 4.3: Effect of Different Measures of Exchange Rate on Firm Investment

Independent Variables	(1)	(2)	(3)	(4)
	Dependent Variable			
	Capital Investment			
FX debt x Δ log real exchange rate (EUR/TRY)	-0.795*			
	(0.411)			
FX debt x Δ log real exchange rate (basket)[69]		-0.871**		
		(0.432)		
FX debt x Δ log debt-weighted real exchange rate[70]			-0.817	
			(0.429)	
FX debt x Δ log real exchange rate[71]				-0.815**
				(0.360)
Observations	2770	2770	2770	2770
R-squared	0.232	0.231	0.231	0.231

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. The real exchange rate is constructed as the end of year domestic nominal exchange rate multiplied by the ratio of US (Euro Area) to domestic CPI. Real exchange rates are from the current period, and hence they are contemporaneous with the dependent variable. Firm-level independent variables are once-lagged, and are scaled by the lag of total assets. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed. The number of observations varies because of the specifications and data availability. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. Descriptions of the variables and data sources are in Appendix A.

[69] The real exchange rate is calculated as a FX debt-weighted basket of USD and EURO in the data.
[70] Debt-weighted real exchange rate is from Bank of International Settlements (BIS).
[71] The real exchange rate is constructed as the end of year domestic nominal exchange rate divided by domestic CPI.

Table 4.4: Effect of Different Measures of Currency Exposure on Firm Investment

Independent Variables	(1)	(2)	(3)	(4)
	Dependent Variable			
	Capital Investment			
Panel A: Term Structure of FX Debt				
FX debt x Δ log real exchange rate	-0.914**			
	(0.387)			
SFX debt x Δ log real exchange rate		-0.961**		
		(0.374)		
Monetary FX debt x Δ log real exchange rate			-0.692*	
			(0.369)	
SFX monetary debt x Δ log real exchange rate				-0.936**
				(0.368)
Observations	2770	2770	2770	2770
R-squared	0.231	0.230	0.231	0.229
Panel B: Currency Breakdown of FX Debt				
USD Debt x Δ log real exchange rate	-0.748*	-0.744*		-0.756*
	(0.397)	(0.400)		(0.388)
EUR Debt x Δ log real exchange rate (EUR/TRY)	-0.752*	-0.757*	-0.757*	
	(0.442)	(0.443)	(0.446)	
Other currency debt [72] x Δ log real exchange rate		0.676		
		(1.807)		
Other currency debt x Δ log real exchange rate (EUR/TRY)		-2.101		
		(1.488)		
USD debt[73] x Δ log real exchange rate			-0.748*	
			(0.383)	
EUR debt x Δ log real exchange rate (EUR/TRY)[74]				-0.775*
				(0.437)
Observations	2770	2770	2770	2770
R-squared	0.235	0.235	0.235	0.235

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, and corresponding main effects. Real exchange rate is from the current period and hence contemporaneous with the dependent variable. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1].

72 In column 2, "other currency debts" refers to total FX debts excluding USD and EUR debts.
73 In column 3, "other currency debts" are treated as Dollar debts and hence summed over total USD debt.
74 In column 4, "other currency debts" are treated as Euro debts and hence summed over total EUR debt.

Table 4.5: Estimates of Baseline Specification with Different Measures of Investment Expenditures

Independent Variables	(1)	(2)	(3)	(4)	(5)
	Dependent Variables				
	Investment Expenditures				
FX debt x Δ log real exchange rate	-1.830***	-2.329***	-1.108***	-2.202***	-1.025***
	(0.637)	(0.690)	(0.392)	(0.652)	(0.377)
FX debt	-0.075	-0.154**	-0.134**	-0.069	-0.097*
	(0.069)	(0.077)	(0.065)	(0.075)	(0.056)
Total debt x Δ log real exchange rate	1.573***	2.018***	0.815***	1.839***	0.705**
	(0.563)	(0.618)	(0.312)	(0.572)	(0.298)
Total debt	0.038	0.101	0.063	0.037	0.049
	(0.057)	(0.065)	(0.046)	(0.061)	(0.043)
Lagged capital investment	0.076				
	(0.049)				
Lagged investment		0.023			
		(0.026)			
Lagged investment			0.138***		
			(0.035)		
Lagged investment				0.017	
				(0.029)	
Lagged investment					0.103**
					(0.040)
Observations	2770	2770	2770	2770	2770
R-squared	0.211	0.270	0.245	0.224	0.222

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable in each column varies. In column1, the dependent variable is fixed capital investment which is constructed as the difference in tangible fixed assets scaled by the lagged tangible fixed assets. In column 2, it is constructed as the difference in the sum of tangible and intangible fixed assets scaled by the lagged of the sum of tangible and intangible fixed assets. In column 3, it is log change in the sum of tangible and intangible fixed assets. In column 4, it is the difference in sum of tangible and intangible fixed assets and property plants scaled by sum of tangible and intangible fixed assets and property plants. In column 5, it is constructed as log change in sum of tangible and intangible fixed assets and property plants. Estimates of the independent variables are listed in each row. Real exchange rate is from the current period and hence contemporaneous with the dependent variable. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1].

Table 4.6: Access to Credit and Firm Characteristics

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable					
	Capital Investment					
FX debt x Δ log real exchange rate	-0.696**	-0.902**	-1.249***	-0.902**	-1.015**	-0.905**
	(0.309)	(0.384)	(0.456)	(0.386)	(0.392)	(0.391)
I(Foreign) x Δ log real exchange rate	-0.351***					
	(0.124)					
I(Foreign)	-0.034*					
	(0.020)					
I(Foreign-controlled) x Δ log real exchange rate		-0.161				
		(0.144)				
I(Foreign-controlled)		0.001				
		(0.018)				
I(Parent) x Δ log real exchange rate			0.208			
			(0.179)			
I(Parent)			0.018			
			(0.024)			
I(Age) x Δ log real exchange rate				-0.089		
				(0.153)		
I(Age)				-0.023		
				(0.017)		
Log total asset x Δ log real exchange rate					0.125**	
					(0.052)	
Log total asset					0.009	
					(0.007)	
I(Labor) x Δ log real exchange rate						0.117
						(0.155)
I(Labor)						0.062***
						(0.019)
Observations	2770	2770	2232	2770	2770	2770
R-squared	0.228	0.231	0.247	0.232	0.235	0.236

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Real exchange rate is from the current period and hence contemporaneous with the dependent variable. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. I(.) denotes a dummy variable as indicated. Independent variables are once-lagged, and are scaled by the lag of total assets. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1].

Table 4.7: Controlling for Domestic and International Credit Conditions

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variables						
	Capital Investment						
FX debt x Δ log real exchange rate	-0.680	-0.758	-0.787*	-0.823*	-0.709	-0.953**	-1.391***
	(0.444)	(0.496)	(0.440)	(0.445)	(0.432)	(0.385)	(0.510)
FX debt x Δ log bank credit	-0.848						
	(0.845)						
Total debt x Δ log bank credit	0.295						
	(0.667)						
FX debt x Δ log credit inflow		-0.241					
		(0.424)					
Total debt x Δ log credit inflow		0.099					
		(0.326)					
FX debt x Δ log total credit from abroad			-0.170				
			(0.227)				
Total debt x Δ log total credit from abroad			0.051				
			(0.192)				
FX debt x Δ log credit from abroad by NFC				-0.080			
				(0.243)			
Total debt x Δ log credit from abroad by NFC				0.110			
				(0.209)			
FX debt x Δ log short term credit from abroad by NFC					-0.310*		
					(0.167)		
Total debt x Δ log short term credit from abroad by NFC					0.136		
					(0.140)		
FX debt x Net Financial Account						-0.012	
						(0.022)	
Total debt x Net Financial Account						0.001	
						(0.018)	
FX debt x Financial inflow							-0.080**
							(0.037)
Total debt x Financial inflow							0.044
							(0.037)
Observations	2770	2770	2770	2770	2652	2770	2770
R-squared	0.233	0.232	0.232	0.231	0.228	0.231	0.233

The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Real exchange rate, domestic and international credit variables are from the current period, and hence they are contemporaneous with the dependent variables. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Independent variables are once-lagged, and are scaled by the lag of total firm assets. Standard errors are clustered by firm and are in parentheses. NFC denotes Non-Financial Corporations. Details of the variables descriptions and the data sources are in Appendix A.

Table 4.8: Controlling for Maturity Mismatch

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable						
	Capital Investment						
FX debt x Δ log real exchange rate	-1.141***	-0.890**	-0.890**	-0.920**	-0.949**	-0.900**	-0.883**
	(0.388)	(0.378)	(0.378)	(0.385)	(0.384)	(0.389)	(0.395)
Short term debt x Δ log real exchange rate	-0.789						
	(0.514)						
Short term debt	-0.057			0.007	-0.041	-0.053	-0.019
	(0.090)			(0.062)	(0.069)	(0.083)	(0.060)
Working capital x Δ log real exchange rate		-0.134					
		(0.435)					
Working capital		0.156**					
		(0.069)					
Maturity mismatch x Δ log real exchange rate			-0.134				
			(0.435)				
Maturity mismatch			0.156**				
			(0.069)				
Short term debt x Δ log bank credit				-0.368			
				(0.512)			
Short term debt x Δ log credit inflow					-0.121		
					(0.248)		
Short term debt x Δ log credit from abroad by NFC						0.063	
						(0.136)	
Short term debt x Δ log short term credit from abroad by NFC							-0.091
							(0.119)
Observations	2770	2770	2770	2770	2770	2770	2652
R-squared	0.232	0.237	0.237	0.233	0.232	0.232	0.225

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Real exchange rate is from the current period and hence contemporaneous with the dependent variable. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Independent variables are once-lagged, and are scaled by the lag of total firm assets. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1].Descriptions of the variables and data sources are in Appendix A.

Table 4.9: Controlling for Non-Linearity in Debt Variables and Exchange Rate

Independent Variables	(1)	(2)	(3)	(4)
	Dependent Variable			
	Capital Investment			
Panel A:Non-Linarity in Debt Variables				
FX debt x Δ log real exchange rate	-0.917**	-0.886**	-0.832*	-0.798
	(0.387)	(0.388)	(0.433)	(0.527)
FX debt x Total debt	0.003			
	(0.006)			
Total debt x Total debt		0.002		-0.002
		(0.005)		(0.014)
Total debt x Total debt x Δ log real exchange rate		-0.015		0.011
		(0.026)		(0.073)
FX debt x FX debt x Δ log real exchange rate			-0.028	-0.046
			(0.047)	(0.137)
FX debt x FX debt			0.003	0.007
			(0.008)	(0.024)
Observations	2770	2665	2665	2665
R-squared	0.231	0.198	0.198	0.198
Panel B:Non-Linarity in FX Exposed Firms				
FX debt x Δ log real exchange rate	-0.869**	-0.888**	-0.682*	-0.752**
	(0.384)	(0.390)	(0.378)	(0.373)
Mean I(FX Exposure) x Δ log real exchange rate	0.139			
	(0.148)			
Mean I(FX Exposure)	-0.053**			
	(0.024)			
Median I(FX Exposure) x Δ log real exchange rate		0.094		
		(0.160)		
Median I(FX Exposure)		-0.044**		
		(0.022)		
Mean I(SFX Exposure) x Δ log real exchange rate			0.341**	
			(0.165)	
Mean I(SFX Exposure)			-0.000	
			(0.022)	
Median I(SFX Exposure) x Δ log real exchange rate				0.266
				(0.166)
Median I(SFX Exposure)				-0.030
				(0.022)
Observations	2770	2770	2770	2770
R-squared	0.234	0.233	0.232	0.233

Table 4.9: Controlling for Non-Linearity in Debt Variables and Exchange Rate, Continued

Independent Variables	(1)	(2)
	Dependent Variables	
	Capital Investment	
Panel C:Non-Linarity in Exchange Rate		
FX debt x Δ log real exchange rate	-1.657*	
	(0.967)	
I(Appreciation) x FX debt x Δ log real exchange rate	0.492	
	(1.347)	
SFX debt x Δ log real exchange rate		-2.596***
		(0.929)
I(Appreciation) x SFX debt x Δ log real exchange rate		-1.311
		(1.400)
Observations	2770	2770
R-squared	0.233	0.233

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Real exchange rate is from the current period and hence contemporaneous with the dependent variable. I(FX Exposure) and I(SFX Exposure) denote to total (short term) FX exposure dummy, it takes value of 1 if firm's total FX (SFX) is greater than sample's. I(Appreciation) refers to appreciation dummy that takes the value of 1 if exchange rate is appreciated in year t. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Independent variables are once-lagged, and are scaled by the lag of total firm assets. Standard errors are clustered by firm and are in parentheses.[*** p<0.01, ** p<0.05, * p<0.1]. Descriptions of the variables and details on data sources are in Appendix A.

Table 4.10: Controlling for Pre-Existing Differences in Firm Performances

Independent Variables	(1)	(2)	(3)	(4)	(5)
	Dependent Variables				
	Capital Investment				
FX debt x Δ log real exchange rate	-0.920**	-0.901**	-0.913**	-1.114***	-1.235***
	(0.419)	(0.386)	(0.387)	(0.354)	(0.391)
Lagged operating income x Δ log real exchange rate		-0.350			
		(0.630)			
Lagged operating income to asset		0.472***			
		(0.098)			
Lagged capital investment x Δ log real exchange rate			0.076		0.031
			(0.208)		(0.268)
Lagged inventory investment				0.047**	0.033*
				(0.021)	(0.018)
Lagged inventory investment x Δ log real exchange rate				0.135	0.053
				(0.254)	(0.224)
Observations	2638	2770	2770	2708	2708
R-squared	0.236	0.242	0.231	0.212	0.232

Each column displays the results of OLS fixed effect regression of equation 1 in the text. The dependent variable is fixed capital investment. Inventory investment is defined as the log change in the inventory. Estimates of the independent variables are listed in each row. Each regression also includes the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. Real exchange rate is from the current period, and hence it is contemporaneous with the dependent variable. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. All variables are author's calculation, and details of the variables and the data sources are in Appendix A.

Table 4.11: Effect of FX Debt, Expected Exchange Rate and Unexpected Component of Exchange Rate on Firm Investment

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variables					
	Capital Investment					
Panel A:Expected Exchange Rate and FX Debt						
FX debt x Δ log averaged expected real exchange rate	-0.284					
	(0.313)					
FX debt x Δ log current period-expected real exchange rate		-0.086				
		(0.238)				
FX debt x Δ log one year ahead-expected real exchange rate			-0.167			
			(0.383)			
FX debt x Δ log expected real exchange rate[75]				-0.046		
				(0.226)		
FX debt x Δ log one year ahead-expected real exchange rate[76]					-0.300	
					(0.448)	
FX debt x Δ log real exchange rate (CBRT)						0.134
						(2.663)
Δ averaged expected log real exchange rate	0.144					
	(0.325)					
Δ current period-expected log real exchange rate		0.418				
		(0.417)				
Δ one year ahead-expected log real exchange rate			-0.191			
			(0.252)			
Observations	2186	2186	2186	2770	2770	2770
R-squared	0.239	0.238	0.238	0.229	0.230	0.229

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. The expected real exchange rate is constructed as the end of year nominal USD/TRY rate multiplied by the ratio of US to expected domestic CPI. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. The source of the end of year expectation of USD/TRY and CPI is the survey data from Istanbul Chambers of Industry (ICI) and CBRT surveys. Average expected real exchange rate is calculated as the average of pre- and current period's expectations. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

[75] Manufacturing sector's current period expectation.
[76] Manufacturing sector's one-year ahead expectation.

Table 4.11: Effect of FX Debt, Expected Exchange Rate and Unexpected Component of Exchange Rate on Firm Investment, Continued

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variables					
	Capital Investment					
Panel B:Expected Exchange Rate and SFX Debt						
SFX debt x Δ log averaged expected real exchange rate	-0.455*					
	(0.269)					
SFX debt x Δ log current period-expected real exchange rate		-0.163				
		(0.245)				
SFX debt x Δ log one year ahead-expected real exchange rate			-0.312			
			(0.292)			
SFX debt x Δ log current period-expected real exchange rate[77]				-0.023		
				(0.221)		
SFX debt x Δ log one year ahead-expected real exchange rate[78]					-0.322	
					(0.422)	
SFX debt x Δ log real exchange rate (CBRT)						-0.703
						(2.253)
Δ log averaged expected real exchange rate	0.142					
	(0.326)					
Δ log current period-expected real exchange rate		0.433				
		(0.435)				
Δ log one year ahead-expected real exchange rate			-0.212			
			(0.247)			
Observations	2186	2186	2186	2770	2770	2770
R-squared	0.235	0.235	0.235	0.228	0.228	0.227

The expected real exchange rate is constructed as the end of year nominal USD/TRY rate multiplied by the ratio of US to expected domestic CPI. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Standard errors are clustered by firm and are in parentheses. The source of the end of year expectation of USD/TRY and CPI is the survey data from Istanbul Chambers of Industry (ICI) and CBRT surveys. Average expected real exchange rate is calculated as the average of pre- and current period's expectations. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

[77] Manufacturing sector's current period expectation.
[78] Manufacturing sector's one year ahead expectation.

Table 4.11: Effect of FX Debt, Expected Exchange Rate and Unexpected Component of Exchange Rate on Firm Investment, Continued

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variables						
	Capital Investment						
Panel C:Unexpected Component of Exchange Rate and FX Debt							
FX debt x Δ log real exchange rate	-1.248**	-1.330**	-1.434***	-1.031**	-0.993**	-0.528	-0.046
	(0.501)	(0.528)	(0.525)	(0.502)	(0.471)	(2.592)	(7.263)
FX debt x Δ log unexpected component of real exchange rate	-0.021						
(ex-post-one year ahead ex-ante)	(0.390)						
FX debt x Δ log unexpected component of real exchange rate		-0.102					
(ex-post-ex-ante)		(0.237)					
FX debt x Δ log unexpected component of real exchange rate			-0.196				
(ex-post-average of ex-ante and one year ahead ex-ante)			(0.305)				
FX debt x Δ log unexpected component of real exchange rate				-0.191			
(ex-post-manufacturing sector's one year ahead ex-ante)				(0.464)			
FX debt x Δ log unexpected component of real exchange rate					-0.063		
averaged (ex-post-manufacturing sector's ex-ante)					(0.222)		
FX debt x Δ log unexpected component of real exchange rate						0.39	
(ex-post-ex-ante-ex), CBRT						(2.641)	
FX debt x Δ log unexpected component of real exchange rate							0.873
(ex-post-one year ahead ex-ante), CBRT							(7.622)
Δ log unexpected component of real exchange rate	-0.125						
(ex-post-one year ahead ex-ante)	(0.259)						
Δ log unexpected component of real exchange rate		0.359					
(ex-post-ex-ante)		(0.384)					
Δ log unexpected component of real exchange rate			0.158				
(ex-post-average of ex-ante and one year ahead ex-ante)			(0.314)				
Observations	2186	2186	2186	2770	2770	2770	2244
R-squared	0.242	0.242	0.243	0.232	0.232	0.231	0.223

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. The expected real exchange rate is constructed as the end of year nominal USD/TRY rate multiplied by the ratio of US to expected domestic CPI. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. The source of the end of year expectation of USD/TRY and CPI is the survey data of Istanbul Chambers of Industry (ICI) and CBRT. Average expected real exchange rate is calculated as the average of pre- and current period's expectations. All variables are author's calculation, variable descriptions and data sources are in Appendix A.

Table 4.12: Instrumental Variable Estimator

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variables					
	Capital Investment					
FX debt x Δ log real exchange rate	-0.886**	-1.137*	-1.828**	-0.486	-1.609***	-2.160**
	(0.393)	(0.628)	(0.914)	(1.041)	(0.594)	(0.887)
FX debt	-0.090	-0.034	-0.001	-0.270*	-0.165*	-0.026
	(0.070)	(0.057)	(0.096)	(0.156)	(0.089)	(0.115)
Total debt x Δ log real exchange rate	0.637**	0.740	1.473*	0.289	1.272***	1.643**
	(0.311)	(0.475)	(0.767)	(0.741)	(0.403)	(0.657)
Total debt	0.031	-0.004	-0.049	0.155	0.063	-0.032
	(0.051)	(0.039)	(0.080)	(0.107)	(0.056)	(0.083)
Lagged capital investment	0.182***	0.878***	0.183***	0.177***	0.180***	0.852***
	(0.039)	(0.269)	(0.041)	(0.040)	(0.040)	(0.267)
Twice-lagged capital investment	0.087***					
	(0.030)					
Observations	2403	2403	2627	2627	2627	2403
R-squared	0.239	-0.125	0.220	0.219	0.221	
No IV	Yes					
IV for LDV		Yes				
IV for Total Debt			Yes			
IV for FX Debt				Yes		
IV for Total and FX Debt					Yes	
IV for LDV, Total and FX Debt						Yes

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. In columns 2, lagged dependent variable is instrumented for its twice-lagged values. In columns 3, total debt variables are instrumented for their twice-lagged values. In columns 4, FX debt variables are instrumented for their twice-lagged values. In columns 5, both total and FX debt variables are instrumented for their twice-lagged values. In columns 6, both lagged dependent variable, total and FX debt variables are instrumented for their twice-lagged values. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. Real exchange rate is contemporaneous with the lagged dependent variable. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. Standard errors are clustered by firm and are in parentheses. All accounting data is collected from Istanbul Stock Exchange, Public Disclosure Platform, and Capital Market Board as described in the text. Macro data are compiled from the Central Bank of Republic of Turkey's web page and OECD statistic. Variables descriptions and data sources are in Appendix A.

Table 4.13: Estimates of Baseline Specification with Different Fixed Effects

Independent Variables	(1)	(2)	(3)	(4)
	Dependent Variables			
	Capital Investment			
FX debt x Δ log real exchange rate	-0.749*	-0.749*	-0.545	-0.914**
	(0.413)	(0.413)	(0.365)	(0.387)
FX debt	-0.030	-0.030	-0.054	-0.094
	(0.108)	(0.108)	(0.043)	(0.062)
Total debt x Δ log real exchange rate	0.549*	0.549*	0.484	0.667**
	(0.328)	(0.328)	(0.301)	(0.307)
Total debt	0.018	0.018	-0.000	0.032
	(0.101)	(0.101)	(0.027)	(0.043)
Lagged capital investment			0.172***	0.180***
			(0.033)	(0.038)
Observations	3015	3014	2770	2770
R-squared	0.386	0.386	0.053	0.231
LDV	No	No	Yes	Yes
Firm FE	No	Yes	No	No
Industry-by-Year FE	Yes	Yes	No	Yes
Year FE	No	Yes	Yes	Yes

Each column displays the results of OLS fixed effect regression of equation 1 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Each column includes different fixed-effects as indicated. Column 4 is the baseline specification. Real exchange rate is from the current period, and contemporaneous with the lagged dependent variable. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1].All accounting data is collected from Istanbul Stock Exchange, Public Disclosure Platform, and Capital Market Board as described in the text. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Table 4.14: Competitiveness Effect of Exchange Rate

Independent Variables	(1)	(2)	(3)	(4)	(5)
	Dependent Variables				
	Capital Investment				
FX debt x Δ log real exchange rate	-0.925**	-0.942**	-0.887**	-0.842**	-1.344***
	(0.388)	(0.387)	(0.392)	(0.386)	(0.378)
Operating income x Δ log real exchange rate	0.208				
	(0.674)				
Operating income	0.296***				
	(0.091)				
I(Tradable) x Δ log real exchange rate		1.707**			
		(0.725)			
I(Tradable)		0.167			
		(0.195)			
I(Exporter) x Δ log real exchange rate			0.038		
			(0.244)		
I(Exporter)			0.073**		
			(0.035)		
Contemporaneous Sales				0.197***	0.395***
				(0.062)	(0.147)
Contemporaneous Sales cost				-0.140**	-0.343**
				(0.062)	(0.159)
Observations	2770	2770	2770	2770	2195
R-squared	0.237	0.233	0.234	0.248	0.277
IV for Sales and Sales cost					Yes

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. I (.) indicate a dummy variable as indicated. Estimates of the independent variables are listed in each row. Each regression also includes lagged dependent variable, the interaction of total debt with log change in real exchange rate, corresponding main effects and industry-by-year fixed effects. Real exchange rate is from the current period, and hence it is contemporaneous with the dependent variable. In columns 5, contemporaneous sales and costs are instrumented for the interaction of 3-digit ISIC-REV 2 code with the interaction of lagged export to sales with log change in real exchange rate. The main effects of export to sales and its interaction with real exchange rate are added as excluded instruments. Firm-level independent variables are once-lagged, except operating income, sales and cost of sales, and are scaled by the lag of total assets. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. All variables are author's calculation, details of the variables and data sources are in Appendix A.

Table 4.15: Effect of FX Debt and Exchange Rate on Firm Profitability

Independent Variables	(1) Operating Income	(2)	(3)	(4) Operating Income	(5)	(6)	(7)
	(t)			(t+1)			
	Panel A: Operating Income						
FX debt x Δ log real exchange rate	-0.009	-0.189	-0.058	-0.253	-0.204	-0.256	-0.266
	(0.101)	(0.122)	(0.136)	(0.196)	(0.129)	(0.196)	(0.193)
Total debt x Δ log real exchange rate	-0.016	0.046	-0.029	0.058	0.063	0.060	0.064
	(0.067)	(0.055)	(0.077)	(0.053)	(0.053)	(0.053)	(0.053)
Lagged operating income			0.533***				
			(0.030)				
Lagged capital investment				0.004	0.001		0.004
				(0.007)	(0.006)		(0.007)
Lagged inventory investment				-0.000		0.000	-0.001
				(0.004)		(0.004)	(0.004)
Lagged inventory investment x Δ log real exchange rate					-0.103		-0.125*
					(0.065)		(0.073)
Lagged inventory investment x Δ log real exchange rate						-0.011	0.002
						(0.045)	(0.044)
Observations	3015	3015	2768	2708	2770	2708	2708
R-squared	0.616	0.621	0.496	0.633	0.631	0.632	0.634
	Panel B: Sales						
Independent Variables	Sales	Sales Growth	Sales	Sales Growth			
	(t)	(t)	(t+1)	(t+1)			
FX debt x Δ log real exchange rate	-0.855*	0.146	0.317	0.828			
	(0.508)	(0.679)	(0.688)	(0.577)			
Total debt x Δ log real exchange rate	0.645	0.208	-0.151	-0.615			
	(0.391)	(0.497)	(0.416)	(0.418)			
Observations	3015	2740	3015	2740			
R-squared	0.823	0.357	0.821	0.349			

Each column displays the results of OLS fixed effect regression. The dependent variables are as indicated. Estimates of the independent variables are listed in each row. In panel A, in column1, real exchange rate is from the current period, and hence they are contemporaneous with the dependent variable; in columns 2-7 dependent variables is from the next period, and real exchange rate is contemporaneous with the lagged dependent variable. In panel B, in columns 1-2, real exchange rate is from the current period, and hence they are contemporaneous with the dependent variable, and in columns 3-4 dependent variables are from the next period, and real exchange rate is contemporaneous with the lagged dependent variable. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1].All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Table 4.16: Balance Sheet Effects of Exchange Rate

Independent Variables	(1)	(2)	(3)	(4)
	Dependent Variables			
	Net Worth	Δ Net Worth	Working Capital	Δ Working Capital
Panel A:The Level and Change in Net Worth and Working Capital				
FX debt x Δ log real exchange rate	-1.389*	-1.389*	-1.091	-1.101
	(0.768)	(0.768)	(1.046)	-1.242
FX debt	-1.100***	-0.100	-0.833***	-0.106
	(0.093)	(0.093)	(0.044)	(0.120)
Total debt x Δ log real exchange rate	0.773	0.773	0.705	1.335
	(0.744)	(0.744)	(0.931)	(1.174)
TRY debt	-0.623***	0.377***	-0.676***	0.243*
	(0.141)	(0.141)	(0.111)	(0.137)
Observations	3,015	3,015	3,015	3,015
R-squared	0.906	0.542	0.864	0.300
Panel B:The Level and Change in Debt Variables				
	Total Debt	Δ Debt	Financial Debt	Δ Financial Debt
FX debt x Δ log real exchange rate	1.311*	1.311*	1.555**	1.379*
	(0.767)	(0.781)	(0.681)	(0.761)
FX debt	1.080***	0.080	0.826***	0.068
	(0.107)	(0.109)	(0.101)	(0.092)
Total debt x Δ log real exchange rate	-0.714	-0.714	-1.057*	-0.870
	(0.766)	(0.780)	(0.639)	(0.752)
TRY debt	0.673***	-0.327*	0.323***	-0.283
	(0.172)	(0.175)	(0.110)	(0.173)
Observations	2,880	3,015	3,015	3,015
R-squared	0.884	0.394	0.889	0.345

Each column displays the results of OLS fixed effect regressions. The dependent variables are as indicated. Estimates of the independent variables are listed in each row. Each regression includes firm and industry-by-year fixed-effects without a LDV. Real exchange rate is from the current period, and hence they are contemporaneous with the dependent variable. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. Standard errors are clustered by firm, and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Table 4.17: Effect of FX Asset, FX Derivatives, Export, Import and Exchange Rate on Firm Investment

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variables					
	Capital Investment					
FX debt x Δ log real exchange rate	-0.914**	-1.021**	-1.408***	-1.152**	-1.035**	-1.041**
	(0.387)	(0.417)	(0.377)	(0.480)	(0.513)	(0.518)
FX debt	-0.094	-0.116*	-0.082	-0.007	-0.072	-0.072
	(0.062)	(0.070)	(0.075)	(0.055)	(0.065)	(0.066)
Total debt x Δ log real exchange rate	0.667**	0.726**	1.153***	0.841**	0.736	0.740
	(0.307)	(0.321)	(0.367)	(0.426)	(0.453)	(0.457)
Total debt	0.032	0.045	-0.002	-0.013	0.034	0.034
	(0.043)	(0.048)	(0.049)	(0.045)	(0.051)	(0.052)
FX asset x Δ log real exchange rate		0.515			0.184	0.182
		(0.570)			(0.562)	(0.564)
FX asset		0.103			0.104	0.104
		(0.073)			(0.066)	(0.066)
FX Derivatives x Δ log real exchange rate						0.294
						(1.112)
FX Derivatives						-0.006
						(0.120)
Export x Δ log real exchange rate			0.118		-0.700**	-0.700**
			(0.244)		(0.316)	(0.316)
Export			0.054*		0.088**	0.088**
			(0.032)		(0.041)	(0.041)
Lagged Import x Δ log real exchange rate				-0.518	-0.616	-0.613
				(0.479)	(0.476)	(0.479)
Lagged Import				0.023	0.008	0.008
				(0.067)	(0.064)	(0.064)
Lagged capital investment	0.180***	0.180***	0.113**	0.064	0.071	0.071
	(0.038)	(0.038)	(0.050)	(0.047)	(0.052)	(0.052)
Observations	2770	2770	2111	1242	1161	1161
R-squared	0.231	0.233	0.259	0.289	0.322	0.322
FX Derivatives>0 and FX Derivatives<0	Yes	Yes				

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. The real exchange rate is from current period, and hence contemporaneous to dependent variable. The number of observations varies because of the specifications and data availability. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Table 18: FX Matching with Foreign Curreny Asset, Derivatives and Export

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variables					
	Capital Investment					
FX debt x Δ log real exchange rate	-3.952	-4.344	-1.368***	-1.556***	-1.408***	-1.247***
	(3.430)	(3.463)	(0.373)	(0.403)	(0.377)	(0.464)
FX debt	0.122	0.141	-0.071	-0.102	-0.082	-0.017
	(0.193)	(0.206)	(0.072)	(0.080)	(0.075)	(0.054)
Total debt x Δ log real exchange rate	3.011	2.764	1.138***	1.236***	1.153***	0.919**
	(3.112)	(3.092)	(0.364)	(0.375)	(0.367)	(0.424)
Total debt	0.068	0.107	-0.009	0.010	-0.002	-0.005
	(0.176)	(0.186)	(0.049)	(0.052)	(0.049)	(0.044)
FX asset x Δ log real exchange rate				0.860		
				(0.663)		
FX asset				0.135*		
				(0.080)		
Export x Δ log real exchange rate					0.118	
					(0.244)	
Export					0.054*	
					(0.032)	
Lagged net export x Δ log real exchange rate						0.024***
						(0.003)
Lagged net export						-0.002***
						(0.000)
FX Derivatives x Δ log real exchange rate		2.851				
		(2.339)				
FX Derivatives		-0.144				
		(0.202)				
Observations	271	271	2111	2111	2111	1181
R-squared	0.804	0.808	0.257	0.261	0.259	0.301
FX Derivatives>0 and FX Derivatives<0	Yes	Yes				
Net Export>0,Net Export<0						Yes

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. The real exchange rate is from current period, and hence contemporaneous to dependent variable. The number of observations varies because of the specifications and data availability. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Table 19: Effect of Short Term FX Debt, FX Assets and Exchange Rate on Firm Investment

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variables					
	Capital Investment					
SFX debt x Δ log real exchange rate	-0.961**	-1.063**	-1.425***	-1.049**	-0.925*	-0.926*
	(0.374)	(0.415)	(0.513)	(0.485)	(0.480)	(0.482)
SFX debt	-0.075	-0.100	-0.083	-0.060	-0.106*	-0.106*
	(0.058)	(0.063)	(0.057)	(0.044)	(0.062)	(0.063)
Total debt x Δ log real exchange rate	0.498**	0.547**	0.928**	0.692	0.618	0.619
	(0.245)	(0.260)	(0.431)	(0.431)	(0.422)	(0.424)
Total debt	0.008	0.018	-0.005	0.013	0.042	0.042
	(0.025)	(0.025)	(0.034)	(0.031)	(0.041)	(0.041)
SFX asset x Δ log real exchange rate		0.367			0.066	0.065
		(0.755)			(0.594)	(0.597)
SFX asset		0.116			0.098	0.098
		(0.085)			(0.067)	(0.067)
FX Derivatives x Δ log real exchange rate						0.093
						(1.060)
FX Derivatives						-0.008
						(0.112)
Export x Δ log real exchange rate			0.108		-0.713**	-0.713**
			(0.246)		(0.318)	(0.319)
Export			0.052*		0.089**	0.089**
			(0.031)		(0.040)	(0.041)
Lagged Import x Δ log real exchange rate				-0.512	-0.595	-0.594
				(0.479)	(0.478)	(0.481)
Lagged Import				0.035	0.016	0.015
				(0.067)	(0.064)	(0.065)
Lagged capital investment	0.181***	0.180***	0.112**	0.063	0.066	0.066
	(0.039)	(0.039)	(0.050)	(0.047)	(0.053)	(0.053)
Observations	2770	2770	2111	1242	1161	1161
R-squared	0.230	0.231	0.258	0.290	0.322	0.322

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. The real exchange rate is from current period, and hence contemporaneous to dependent variable. The number of observations varies because of the specifications and data availability. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Table 20: Effect of Currency Mismatch and Exchange Rate on Firm Investment

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variables							
	Capital Investment							
FX mismatch x Δ log real exchange rate	-0.854**	-1.387***	-0.700	-0.766*				
	(0.383)	(0.390)	(0.450)	(0.443)				
FX mismatch	-0.108*	-0.104	-0.061	-0.079				
	(0.063)	(0.072)	(0.055)	(0.057)				
SFX mismatch x Δ log real exchange rate					-0.881**	-1.505***	-0.552	-0.679*
					(0.405)	(0.511)	(0.407)	(0.403)
SFX mismatch					-0.102*	-0.106**	-0.091*	-0.102*
					(0.059)	(0.052)	(0.052)	(0.054)
Total debt x Δ log real exchange rate	0.612**	1.110***	0.530	0.560	0.478*	0.982**	0.420	0.483
	(0.295)	(0.365)	(0.413)	(0.420)	(0.246)	(0.431)	(0.377)	(0.375)
Total debt	0.041	0.013	0.023	0.040	0.018	0.006	0.030	0.041
	(0.044)	(0.047)	(0.042)	(0.045)	(0.025)	(0.032)	(0.034)	(0.036)
Export x Δ log real exchange rate		-0.019		-0.756**		-0.031		-0.775**
		(0.244)		(0.315)		(0.242)		(0.313)
Export		0.045		0.088**		0.042		0.087**
		(0.031)		(0.041)		(0.031)		(0.040)
Lagged Import x Δ log real exchange rate			-0.686	-0.734			-0.693	-0.729
			(0.467)	(0.460)			(0.469)	(0.462)
Lagged Import			0.032	0.011			0.036	0.014
			(0.065)	(0.063)			(0.065)	(0.063)
Lagged capital investment	0.180***	0.120**	0.069	0.073	0.180***	0.118**	0.066	0.070
	(0.038)	(0.050)	(0.047)	(0.051)	(0.038)	(0.049)	(0.047)	(0.051)
Observations	2770	2111	1242	1161	2770	2111	1242	1161
R-squared	0.232	0.261	0.289	0.321	0.230	0.260	0.289	0.320

Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. Estimates of the independent variables are listed in each row. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. The real exchange rate is from current period and hence contemporaneous to dependent variable. Currency mismatch is the difference between FX asset and FX debt and FX derivatives. The number of observations varies because of the specifications and data availability. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Table 4.21: Estimates of the Sub-Sections of FCC Dataset

	(1)	(2)
Independent Variables	Dependent Variables	
FX debt x Δ log real exchange rate FX mismatch x Δ log real exchange rate	Capital Investment	
Panel A: Agricultural Sector		
FX exposure x Δ log real exchange rate	-3446.092	-1009.244***
	-3643.996	(85.939)
Observations	30	30
R-squared	0.595	0.957
Number of Firms	8	8
Panel B: Mining Sector		
FX exposure x Δ log real exchange rate	-21.303	-8.323
	(18.374)	(17.173)
Observations	28	28
R-squared	0.754	0.694
Number of Firms	6	6
Panel A: Manufacturing Sector		
FX exposure x Δ log real exchange rate	-0.710*	-0.751**
	(0.376)	(0.381)
Observations	2216	2216
R-squared	0.206	0.207
Number of Firms	269	269
Panel A: Non-Manufacturing Sector		
FX exposure x Δ log real exchange rate	-2.076	-1.526
	(1.744)	(1.785)
Observations	554	554
R-squared	0.300	0.304
Number of Firms	99	99
Panel A: Energy Sector		
FX exposure x Δ log real exchange rate	8.062	-3.390
	(6.269)	(1.940)
Observations	57	57
R-squared	0.427	0.409
Number of Firms	10	10

Panel A: Construction Sector		
FX exposure x Δ log real exchange rate	-2.856*	0.078
	(1.485)	(3.952)
Observations	34	34
R-squared	0.768	0.781
Number of Firms	12	12
Panel A: Retail and Wholesale Sector		
FX exposure x Δ log real exchange rate	-3.537	-5.248
	(2.297)	(3.814)
Observations	266	266
R-squared	0.235	0.266
Number of Firms	41	41
Panel A: Logistic and Communication Sector		
FX exposure x Δ log real exchange rate	0.706	2.235
	(3.532)	(3.491)
Observations	100	100
R-squared	0.518	0.523
Number of Firms	15	15
Panel A: Other Sectors		
FX exposure x Δ log real exchange rate	-20.806	-35.426
	(38.211)	(37.697)
Observations	30	30
R-squared	0.768	0.816
Number of Firms	6	6
Panel A: Tradable Sector		
FX exposure x Δ log real exchange rate	-0.760**	-0.904**
	(0.381)	(0.376)
Observations	2181	2181
R-squared	0.201	0.203
Number of Firms	271	271

Panel A: Non-Tradable Sector		
FX exposure x Δ log real exchange rate	-1.697	-0.735
	(1.383)	(1.485)
Observations	589	589
R-squared	0.339	0.345
Number of Firms	97	97
Panel A: Exporter Firms		
FX exposure x Δ log real exchange rate	-1.398***	-1.317***
	(0.371)	(0.368)
Observations	2209	2209
R-squared	0.253	0.254
Number of Firms	301	301
Panel A: Non-Exporter Firms		
FX exposure x Δ log real exchange rate	0.818	0.268
	(2.004)	(1.681)
Observations	561	561
R-squared	0.496	0.493
Number of Firms	144	144
Panel A: Foreign Firms		
FX exposure x Δ log real exchange rate	1.045	-0.087
	(0.750)	(0.824)
Observations	637	637
R-squared	0.368	0.369
Number of Firms	84	84
Panel A: Domestic Firms		
FX exposure x Δ log real exchange rate	-0.938**	-0.981**
	(0.458)	(0.444)
Observations	2133	2133
R-squared	0.267	0.269
Number of Firms	333	333

Panel A: Foreign Controlled Firms		
FX exposure x Δ log real exchange rate	0.739	0.544
	(0.746)	(0.823)
Observations	567	567
R-squared	0.383	0.386
Number of Firms	72	72
Panel A: Non-Foreign Controlled Firms		
FX exposure x Δ log real exchange rate	-0.862**	-1.005**
	(0.436)	(0.423)
Observations	2203	2203
R-squared	0.263	0.265
Number of Firms	345	345
Panel A: Bank and Parent Affiliated Firms		
FX exposure x Δ log real exchange rate	-0.876**	-0.787
	(0.434)	(0.478)
Observations	1328	1328
R-squared	0.343	0.344
Number of Firms	171	171
Panel A: Firms with No Affiliation		
FX exposure x Δ log real exchange rate	-2.143**	-2.528**
	(1.027)	(1.176)
Observations	904	904
R-squared	0.402	0.403
Number of Firms	174	174
Panel A: Mature Firms		
FX exposure x Δ log real exchange rate	-0.512	-0.582
	(0.542)	(0.588)
Observations	1243	1243
R-squared	0.317	0.320
Number of Firms	214	214

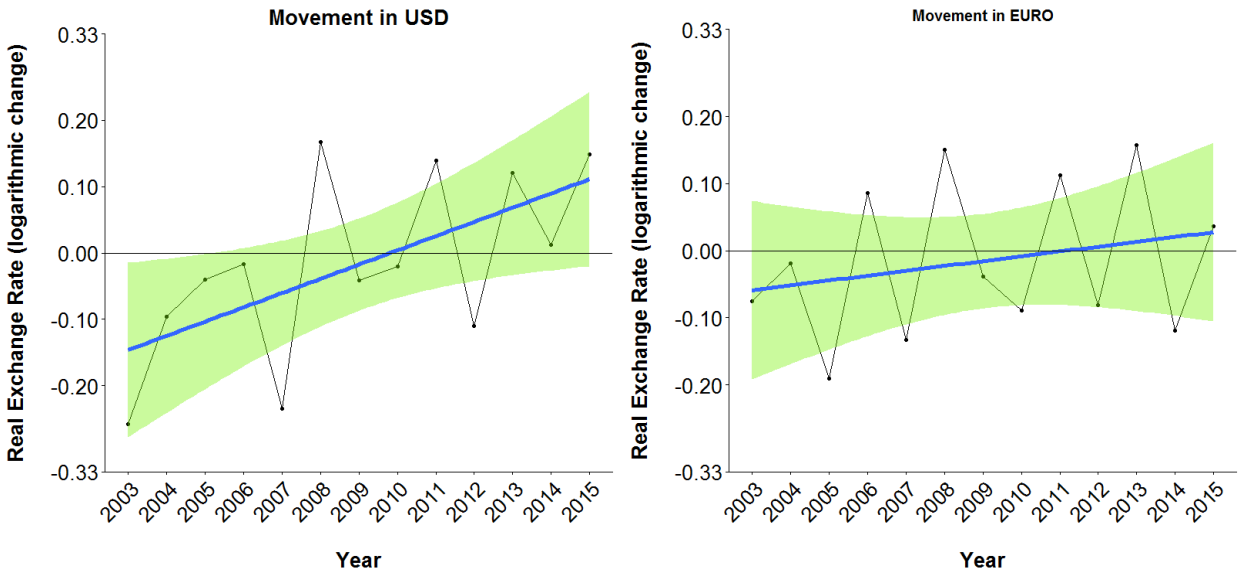
Panel A: Young Firms		
FX exposure x Δ log real exchange rate	-0.996	-0.818
	(0.668)	(0.503)
Observations	1527	1527
R-squared	0.307	0.307
Number of Firms	184	184
Panel A: Large Firms		
FX exposure x Δ log real exchange rate	-1.374**	-1.030*
	(0.599)	(0.620)
Observations	1735	1735
R-squared	0.322	0.320
Number of Firms	237	237
Panel A: Small and Medium Firms		
FX exposure x Δ log real exchange rate	0.008	-0.365
	(0.870)	(0.743)
Observations	1035	1035
R-squared	0.339	0.343
Number of Firms	201	201
Panel A: FX Matching Firms		
FX exposure x Δ log real exchange rate	-1.082**	-1.000**
	(0.471)	(0.447)
Observations	1852	1852
R-squared	0.293	0.295
Number of Firms	319	319
Panel A: FX Mismatching Firms		
FX exposure x Δ log real exchange rate	0.208	0.371
	(1.134)	(1.056)
Observations	918	918
R-squared	0.394	0.393
Number of Firms	231	231

Panel A: Net Exporting Firms		
FX exposure x Δ log real exchange rate	-0.919	-0.948
	(0.582)	(0.578)
Observations	713	713
R-squared	0.408	0.407
Number of Firms	157	157
Panel A: Net Importing Firms		
FX exposure x Δ log real exchange rate	-1.670	-2.024*
	(1.213)	(1.026)
Observations	564	564
R-squared	0.488	0.494
Number of Firms	124	124
Panel A: All Firms After 2009		
FX exposure x Δ log real exchange rate	-0.664	-0.386
	(0.529)	(0.484)
Observations	1828	1828
R-squared	0.212	0.214
Number of Firms	343	343
Panel A: All Firms Before 2009		
FX exposure x Δ log real exchange rate	-0.982	-1.212
	(0.686)	(0.759)
Observations	942	942
R-squared	0.284	0.286
Number of Firms	223	223
Panel A: Manufacturing Sector After 2009		
FX exposure x Δ log real exchange rate	-0.215	-0.182
	(0.526)	(0.483)
Observations	1409	1409
R-squared	0.201	0.203
Number of Firms	250	250

Panel A: Non-Manufacturing Sector After 2009		
FX exposure x Δ log real exchange rate	-2.796	-1.255
	(2.336)	(1.786)
Observations	419	419
R-squared	0.260	0.255
Number of Firms	94	94
Panel A: Manufacturing Sector Before 2009		
FX exposure x Δ log real exchange rate	-1.148	-1.139
	(0.721)	(0.800)
Observations	807	807
R-squared	0.220	0.221
Number of Firms	187	187
Panel A: Non-Manufacturing Sector Before 2009		
FX exposure x Δ log real exchange rate	-0.340	-2.351
	(2.067)	(3.750)
Observations	135	135
R-squared	0.435	0.447
Number of Firms	36	36

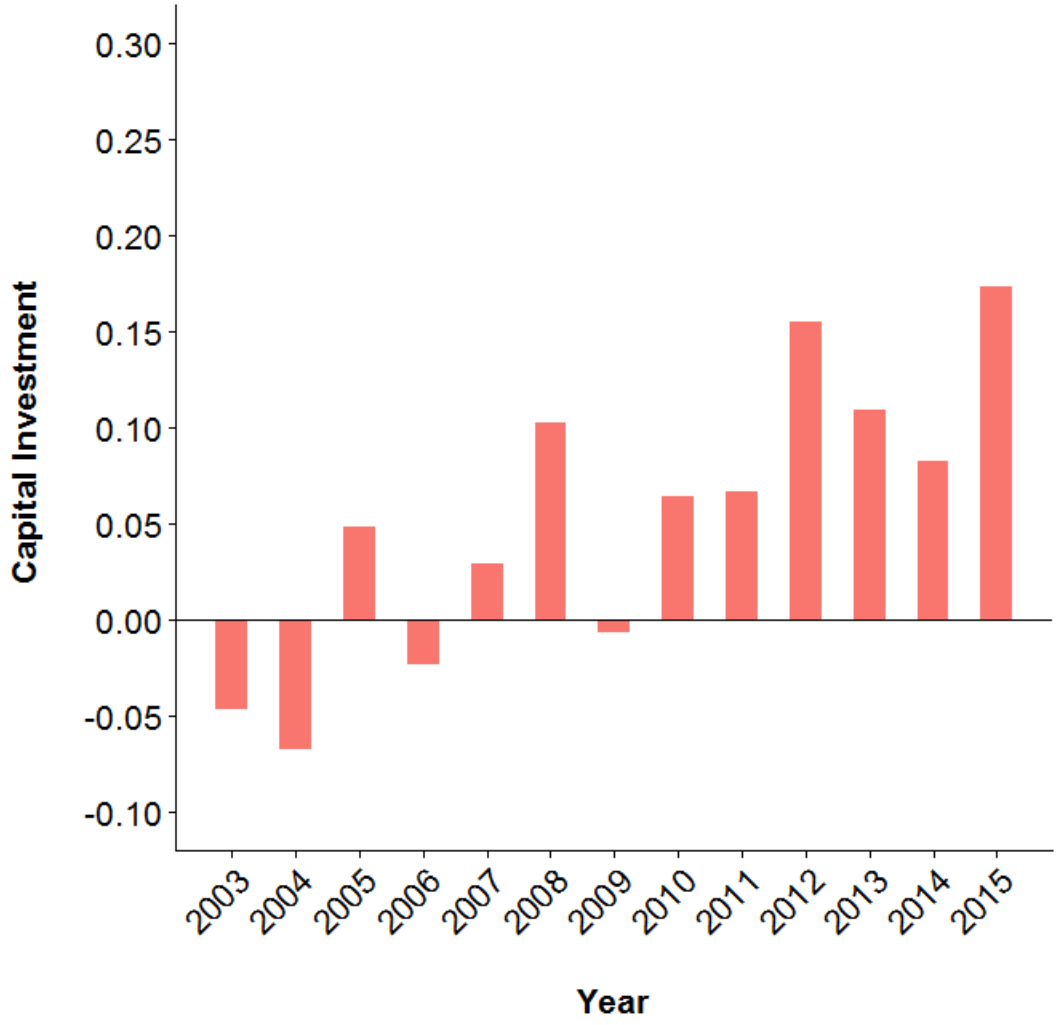
Each column displays the results of OLS fixed effect regression of equation 2 in the text. The dependent variable is fixed capital investment. In column 1, FX exposure is FX debt, and in column 2 it is FX mismatch. Estimates of the independent variables are listed in each row. Firm-level independent variables are once-lagged, and are scaled by the lag of total firm assets. The real exchange rate is from current period and hence contemporaneous to dependent variable. Currency mismatch is the difference between FX asset and FX debt and FX derivatives. The number of observations varies because of the specifications and data availability. Standard errors are clustered by firm and are in parentheses. [*** p<0.01, ** p<0.05, * p<0.1]. The number of firms equals the number of the clusters in the regressions. Whenever the numbers of firms are less than 40, regressions should be interpreted in caution. All variables are author's calculation, and details of the variables and data sources are in Appendix A.

Figure4.1: Movements in the Real Exchange Rate



Note: This figure displays the movements in real exchange rates. The real exchange rate is constructed as end of year nominal Turkish Lira value of one US Dollar (Euro) multiplied by the ratio of end of the year US (Euro Area) to Turkish consumer price index (CPI).An increase in the index implies depreciation in the domestic currency.

Figure 4.2: Growth Rate of Capital Expenditures



Note: This figure displays the change in the growth rate of investment. Investment is calculated as the change in the tangible fixed assets, net of depreciation.

Figure 4.3: Bracketing the Lagged Dependent Variable

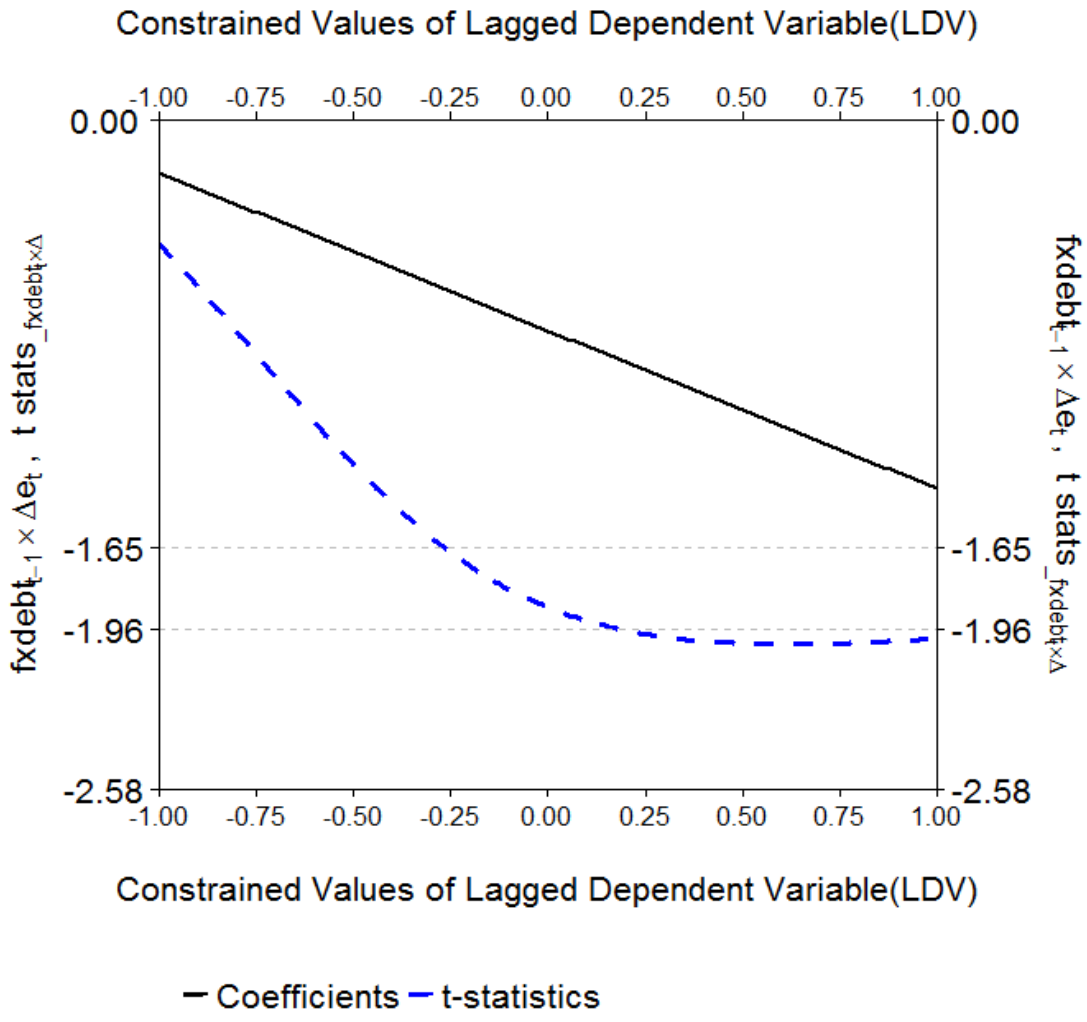


Figure3: This figure presents the coefficients of $\left(fxdebt_{i,t-1} \times \Delta e_t\right)$ along with their corresponding t-statistics when lagged dependent variable (horizontal axis) ranges by 0.01 in (-1,1), which satisfies the stability condition of the system. The coefficient of interest is always negative. This exercise proves that we do not need GMM. Specifically, I estimate the following regression in which α, the value of the LDV ranges within (-1,1) by 0.01: $y^{new}_{i,t} = y_{i,t} - \alpha\, y_{i,t-1} = \beta_{BS}\left(fxdebt_{i,t-1} \times \Delta e_t\right) + \beta_X X_{i,t-1} + \eta_i + \tau + \varepsilon_{i,t}$,where η is firm and τ is year fixed-effects.

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