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Exports, real exchange rates and external exposures: empirical evidence from Turkish manufacturing firms[1]

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[1] This paper was prepared for the meeting. The views expressed are those of the authors and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

Exports, Real Exchange Rates and External Exposures: Empirical Evidence from Turkish Manufacturing Firms

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Abstract

Turkish manufacturing firms are highly exposed to foreign currency (FX) denominated costs in the forms of liability dollarization and high imported input content in domestic production. This might limit the competitiveness effects of currency depreciation on exports. We attempt to uncover the relationship between the real exchange rates and exports of manufacturing firms in Turkey by taking into account FX exposures and various firm characteristics. We use a large panel of manufacturing firms to carry out an empirical analysis for the period 2002-2010. We document that a real depreciation of the Turkish lira has a positive impact on export volumes and its impact is muted for firms operating in sectors that use imported inputs intensively. That is, the cost of production channel seems to be effective in export performance of firms. In addition, we estimate that exports are less sensitive to real exchange rates for firms having moderate or low FX debt-to-export ratios (naturally hedged) and those are large and mature. Contrary to macro evidence, firm level findings suggest that a depreciation of the lira seems to favour the external competitiveness of firms in general while for naturally hedged, large, mature, and high import intensity firms, the sensitivity is estimated to be smaller.

Contents

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1. Introduction

Recent empirical trade literature has extensively studied the role of accessing to finance in promoting exports while it has so far paid little attention to the possible effects of foreign currency (FX) exposures (including imported inputs and FX denominated debt as form of finance) on financial positions of firms in examining the impact of exchange rates on exporting behaviour. A depreciation of the real exchange rate results in cheaper exported goods and services, but also makes the imported input expensive creating a cost disadvantage (for example, see Campa and Goldberg, 1997, Hummels et al., 2001, Greenaway et al. 2010). Ahmed et al. (2015) find evidence that the elasticity of exports to the real exchange rate has been declining mainly due to the vertical integration in global value chains which increase the usage of imported inputs all around the world. Similarly, a depreciation of the local currency reduces the net worth of firms that experience severe currency mismatch, restricting the availability of export financing and causing a loss of competitive advantage. In other words, for firms with large foreign exchange denominated debt (a type of external finance), a shock to capital inflows or sudden stops may lead to a rise in exchange rate volatility and have strong implications for their financial positions thus their real activities (Calvo and Reinhart, 2002; Calvo et al., 2004). In this context, an empirical analysis on Turkish firms would represent an ideal natural experiment for testing the muting effects of currency depreciations on exports due to high imported input content of domestic production, extensive currency mismatch with limited hedging instruments and volatile exchange rates.

This paper builds on the literature focusing on the effects of exchange rate variations on firms' exports' by taking into account the role of financial constraints and FX exposures. We particularly incorporate FX denominated costs into the analysis. The analysis done, referencing the related literature, involves empirical tests that use firm specific variables such as the liability dollarization ratio, labour productivity, real sales, leverage ratio, collateral ratio; industry based variables such as industry-specific real exchange rates and imported input intensity as well as macro variables that reflect domestic and foreign demand and macro volatility. In this context, we intent to control how exchange rate elasticity of exports react to firms heterogeneity in terms of imported inputs intensity, the degree of currency mismatch, size, and age.

Our findings suggest that a real depreciation of the Turkish lira has a positive impact on exports of firms. This positive impact is muted for firms operating in sectors that use imported inputs intensively. Similarly, exports of firms with moderate or low FX debt-exports ratios, so called "naturally-hedged", are less sensitive to real exchange rates as expected. In addition, estimations show that the exports of mature and large firms are estimated to be less sensitive to the variations in real exchange rates.

The rest of the paper is organized as follows. Section II presents economic developments and FX exposure structure in Turkey. Section III describes the firm-level data and variables. Section IV contains the empirical analysis of the links between

[1] This version of the paper is largely adapted from CBRT Working Papers No: 24/16.

export patterns and exchange rates considering various firms characteristics. Section V concludes.

2. A Short Evaluation on Foreign Exchange Exposures in Turkey

High current account deficit (or low domestic savings) has been a major obstacle for achieving high and sustainable growth in Turkey. Heavy dependence on imported inputs and foreign savings raises the sensitivity of the economic activity and prices to fluctuations in capital flows and international commodity prices. In this environment, exchange rates appear to be one of the key variables reflecting the conditions of the economy. In addition to unfavourable external position of the economy mentioned above, relatively high and unstable inflation rates were one of the underlying factors behind volatile exchange rates putting economic agents in a position where their pricing and investment decisions are more complicated.

To overcome the uncertainty due to unstable macro environment and volatility in exchange rates and international risk appetite, economic agents in Turkey tend to hold large amounts of FX liabilities and assets and they adopted a widespread FX indexed domestic pricing behaviour especially during 1990s. In other words, economic transactions were highly dollarized. Although there has been a decline in both liability and asset dollarization in 2000s as a consequence of improvement in underlying fundamentals, dollarization and FX indexed pricing have gained momentum again in recent years.

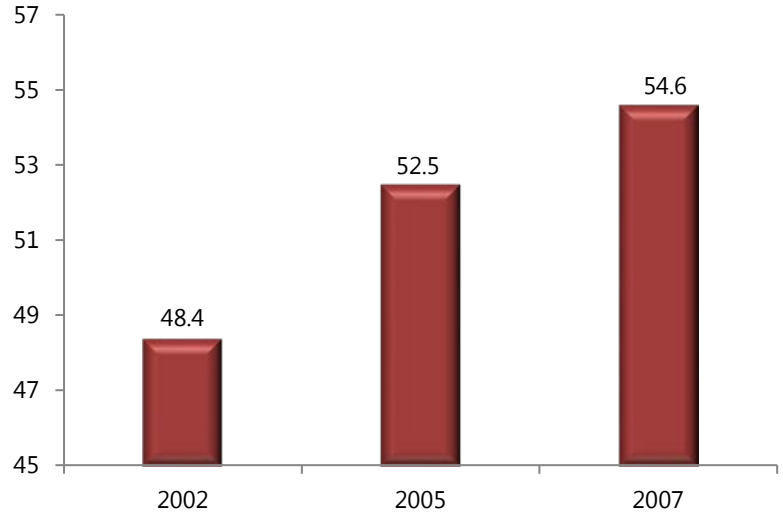
Before going into details of the empirical model, we will present several factors, which have affected the sensitivity of the Turkish economy to the exchange rates through increasing its FX exposure. Firstly, Turkish economy was transformed in a way that it has started to use more imported inputs in the production activity especially in 2000s. Secondly, in addition to growing import bill, fixed investments were largely financed by growing capital inflows which was not only supported Turkish lira especially before the great recession in 2008, but also increased the fragility of the economy to external shocks. Lastly, although there has been a decline in the extent of liability dollarization, the FX indexed pricing in the domestic economy has not lost its importance (Hülagü and Yalçın, 2014). We provide brief discussions on the first two factors below, respectively.

Turkish economy is characterized by a large trade deficit. Although various initiations were taken to encourage exports and reduce the reliance on imported inputs in the production, they failed to stop the widening the external deficit. In fact, trade deficit has deteriorated further in recent years resulting from increasing trend in imports also due to the increasing imported input content of domestic production especially after 2001 (Chart 1). Intermediate goods imports which has been always larger than exports of goods, reached as much as 22 percent of GDP in 2014. Insufficient domestic production in parallel to the strong economic performance during post-2001 crisis period was one of the major reasons of this increasing trend (Saygılı et al., 2010).

During this period, the finance costs and the price of capital goods went down, capital inflows accelerated and the Turkish lira appreciated significantly. Firms tended to allocate more resources to capital intensive production activities such as automotive, machinery and equipment, basic metal, metal products etc. which relied relatively more on imported intermediate and capital (machinery and equipment) inputs. Unavailability of domestic production, the need for high quality and

uninterrupted supply to ensure technology transfer, and the possibility of cheaper supply due to domestic currency appreciation and competitive prices in the trading partners (e.g. China) were other major factors contributing to the increasing trend in imported inputs.

Chart 1. The Share of Imported Intermediate Inputs in Total Cost of Production (%)



Source: Saygılı, Cihan, Yalçın and Hamsici (2010)

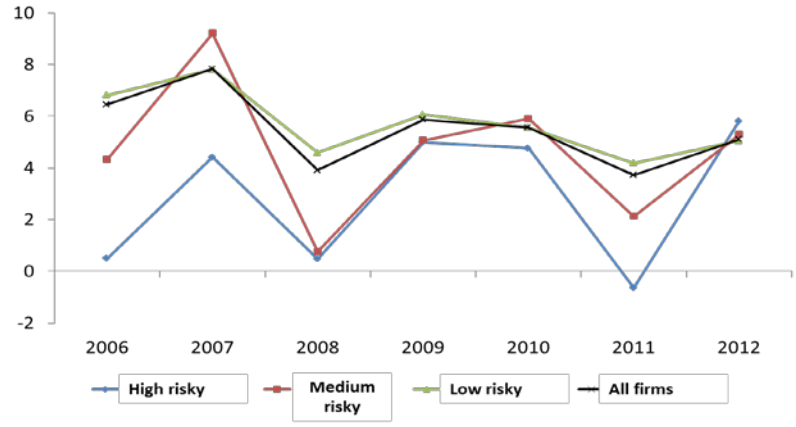
Turkish financial system do not produce sufficient Turkish lira denominated resources with reasonably long maturity to finance financially constrained domestic agents. The most important reasons for this are the relatively low domestic financial savings mostly characterized by short maturity structure. Banks are the primary financial institutions and have to borrow from abroad in order to extend credits with longer maturity. These credits are provided mostly in terms of FX in order to avoid the currency risk. Non-financial firms also borrow heavily from abroad directly. In other words, the growing imports bill and investments are largely financed by FX denominated debt. As a result, the FX liabilities of non-financial firms reached to 35 percent of GDP in 2014 from 14 percent in 2002 and short net FX position of these firms have increased from 3 percent of GDP to 22 percent in the same period.

The liability dollarization ratio, calculated as the share of FX debt in total debt, of non-financial firms in Turkey can be interpreted as high when compared internationally as well (Özmen and Yalçın, 2007). According to IMF (2015), Turkey has the third highest FX-denominated debt to GDP ratio as of 2014 after Chile and Poland. Firm level data show that liability dollarization ratio decreased from 85 percent in 2001 to 65 percent in 2010 in parallel to the declining inflation, structural reforms, and the newly adopted flexible exchange rate system (Alp and Yalçın, 2015). Short-term liability dollarization ratio has been on a declining trend as well. From 76 percent in 1996, it decreased to 50 percent in 2001, and with the positive impact of the reduced uncertainty during the post-2001 period it further shrank to 25 percent in 2010. This situation may increase the fragility of non-financial companies to external shocks such that in the case of a sudden stop foreign funding remains limited and credit to the real sector freezes. However, in spite of risk involved in FX debt, they undermine the extent of financial constraints and contribute to the enhancement of

domestic economic activity in an environment where domestic financial system fail to produce enough domestic currency denominated funds mainly due to low domestic savings and short maturity of financial savings.[2]

In addition to imported inputs, it is also important to note that financial expenditures in terms of FX is an important cost item for non-financial firms particularly in times of currency depreciations as FX denominated debt in terms of the domestic currency increases. Chart 2 shows that net profit margins of firms with poor natural hedging (risky firms) melt down significantly when Turkish lira depreciated sharply during the post-2008 financial crisis period. On the other hand, firms that are able to match the currency composition of their debt with their income streams, so called low-risk firms, seem to be affected from currency depreciations to a lesser extent. Any change in the pace of capital inflows and the price of international commodity prices has strong implications for the real exchange rates and thus domestic economy. The Turkish lira has usually exhibited a very volatile pattern over the time given heavy reliance on foreign capital and imported inputs. Given the volatility in the exchange rate and economy's strong reliance on imported inputs, empirical evidence for Turkey documents very strong exchange rate and import price pass through to domestic prices in international standards. Consequently, the export performance has been also affected by strong exchange rate and import price pass-through to domestic prices prevailing in the Turkish economy, which deteriorates firms' relative competitiveness in external markets.

Chart 2. Profit Margins of Non-financial Firms (Percent)



Source: Hülagü and Yalçın (2014)

3. Data and Variables

The firm level data used in this study is based on two sources: i) The Central Bank of the Republic of Turkey (CBRT) Company Accounts and ii) Risk Center Database of Banks' Association of Turkey. The CBRT Company Accounts Database is the most comprehensive database regarding financial data of non-financial firms in Turkey. It

[2] Note that although there has been a decline in the extent of liability dollarization, the FX indexed pricing in the domestic economy has not lost its importance. FX-indexed pricing behaviour prevailing in the domestic sector in some sectors has a positive impact on lowering currency risk (Hülagü and Yalçın, 2014).

includes information on balance sheet and income statement items, economic activity classified according to industry or sector, establishment date, number of employees, provinces operated in, and the legal status. Risk Center Database provides information on firm-level foreign and local currency denominated debts and their maturities. We merge two datasets by using firm identifiers, which enables us to incorporate information from balance sheet, income statements, and FX denominated debts items into the same analysis.

One of the drawbacks of the CBRT data is that it does not meet sampling standards as it covers mainly large firms. The database also covers only the participating firms those submit their financial statements regularly to the commercial banks. Any firm whose data of last three years is not available is kept out of the analysis. However, firms included in the dataset are of great weight in total activities, which renders the representative power of this analysis high. The dataset also includes substantial portion of small and medium-sized enterprises in addition to large firms (about two third of the sample) operating in Turkey. About half of the firms in the dataset operate in the manufacturing industry and these firms cover a significant portion of aggregate economic activity. Based on 2010 data, these firms hold about 77 percent of manufacturing sales, over 95 percent of manufacturing exports and about half of manufacturing FX-denominated debts. Firms in the database account for 35 percent of total manufacturing employment.

We use various firm specific, sectoral and macro variables in our analysis. As often used in the literature we utilize logarithms of real sales and logarithms of labour productivity (the ratio real sales to employment) to control for firms' size and productivity, respectively. To control financial conditions, following variables are used in the analysis: (i) leverage ratio, defined as the firm's ratio of total liabilities to total assets, (ii) collateral ratio, defined as real tangible assets over total assets to control capital intensity of firms and (iii) liability dollarization ratio, defined as the ratio of FX liabilities to total liabilities. The first two indicators have been extensively used in the literature dealing with financial constraints and all these variables reveal the degree of the firms' financial health (Greenaway et al., 2007).

FX liabilities is a central variable when examining the impact of exchange rate variations on firm-level exports particularly in the context of developing countries as most of them suffer from high liability dollarization (IMF, 2015). This situation is often referred as "original sin", following Eichengreen et al. (2005) measuring the inability of an economy to borrow internationally in its own currency. In this situation, "currency mismatch" creates a potential source of vulnerability if firm's debt is in the form of FX while the income and assets are mostly denominated in domestic currency. Therefore when evaluating the risks associated with liability dollarization of companies, FX revenues (if any FX denominated revenue exists) should also be considered. Since there is no available data that reflecting the overall FX exposure of Turkish companies' balance sheets, liability dollarization is analysed by taking into account the export revenues of companies. In other words, export revenues are considered as a "natural hedge" for companies that has FX denominated cash loans. If the liability dollarization of a company is high whereas its export revenue is low (or no export revenue), then the financial fragility of those kinds of companies are considered as high due to currency mismatch. In order to measure the degree of currency mismatch, we adopt Echeverry et al. (2003) methodology. Accordingly, we identify each firm as belonging to one of the three zones in the foreign debt-exports space: hell, heaven, and hedge. Firms are classified as hedged if the magnitude of their exports is similar to the magnitude of their foreign denominated liabilities. We

construct our measure for currency mismatch by taking the ratio of foreign exchange denominated debt to exports and set upper and lower bound as FX Debt =0.15 Exports and FX Debt =3.2 Exports, representing the upper and lower 25th percentile of the distribution, respectively.

At sectoral level, we construct export-weighted real effective exchange rates. The trade weights of each industry are constructed using the methodology described in Goldberg (2004). The trade shares are averaged (within an industry) across the pre-sample time period (1996-2000), therefore the variation in exchange rate over time comes only from changes in the real exchange rate changes and not from fluctuations in partners' trade shares. A rise in this index represents an appreciation of the domestic currency.

At macro level, we use domestic GDP with constant prices to reflect domestic demand that may be considered a substitute for external markets. For the external demand, we used the weighted average of OECD countries' GDPs (constant prices), where bilateral trade flows as shares in total trade of Turkey are used as weights and data are from IMF. In addition, we use Chicago Board of Exchange (CBOE) Volatility Index (VIX index) as measure of macro volatility.

To mitigate the impact of outliers on the regression results, we drop 0.1 percentile of firms both ends of the distributions of labour productivity, leverage ratio and collateral ratio. We also excluded companies that have missing values and that possess inconsistent values. Subsequently, we end up with about 24 thousand firm-year observations consisting of 4227 firms belonging to 22 manufacturing industries over the period 2002-2010. We deflate all the nominal values using the sectoral-level producer price indices (PPI) obtained from the Turkish Statistical Institute.

We categorize firms into small, medium, and large according to their employment levels. Firms below 50 average employees during the period are grouped as small firms, firms between 50 and 250 average employees are labelled as medium-sized firms and the rest of firms with more than 250 employees are considered as large firms. We also define young firms as belonging to the lowest 25 percentile of the age distribution, and mature firms as those belonging to the highest 25th percentile.

Basic statistics shows that larger and mature firms tend to be more productive and have higher sales. With regard to currency mismatch categorization, firms under the hell category tend have lower export shares, higher real sales, and liability dollarization and leverage ratios. They also hold higher tangible assets. These firms are highly dollarized and are mostly selling in the domestic market evidenced by considerable lower export shares. Firms in the heaven region are relatively smaller in terms of both employment and real sales, have lower dollarization and leverage ratios. In terms of exporting, they in general export more than firms in the hell region but still considerable lower than firms in the hedged area. Firms in the hedged region have high export shares and they are slightly older than their counterparts in the heaven and hell regions.

Consistent with the empirical literature exporters on average have higher employment and labour productivity than non-exporters (see, for example, Bernard and Jensen, 1999, for the US; and Greenaway and Kneller, 2004, for the UK). Firms operating in sectors that use lower imported inputs have higher dollarization rate, export shares, employment, and lower productivity. On the other hand, there is no significant variation in collateral ratios, leverage ratios, real sales, and real export

values between firms operating in sectors which have low and high-imported input intensities.

4. Model and Estimation Results

In our empirical specifications described below, we test the relative importance of different above-mentioned channels through which exchange rate variations may affect exports. These channels are often classified as competitiveness, the cost of production and the balance sheets. We start empirical tests with baseline specification and then extent the empirical model by introducing interaction terms representing firm characteristics.

4.1. Baseline Specification

We construct an econometric model to investigate the determinants of export volume of manufacturing firms (intensive margin). Our baseline model is standard where the logarithm of firm level export volumes are explained by sectoral logarithm (log) of real exchange rates (both level and change), VIX index as a measure of macro volatility, domestic output and foreign demand as well as firm specific variables. That is, we utilize variables that allow us to control for macro, sectoral, and firm level dynamics. More specifically, we use the following baseline specification to quantify the impact of exchange rate movements on firm level exports.

$$ln(X_{it}) = \alpha_1 \ln(X_{it-1}) + \alpha_2 \ln(RER_{jt}) + \alpha_3 VOL_t + \alpha_4 Z_{it} + \alpha_5 ln(GDP_t^D) + \alpha_6 ln(GDP_t^F) + \tau\mu_i \quad (1)$$

where i indexes firms, t shows time (years), j is the industry to which firm i belongs to, X_{it} is firm level real exports, $ln(RER_{jt})$ stands for log of industry-specific pre-period trade weighted real exchange rates (a rise in this index represents a real appreciation of the domestic currency); VOL_t is time varying VIX index; Z_{it} is a vector of firm-specific variables including labour productivity, log of real sales, liability dollarization ratio, collateral ratio, leverage ratio; $ln(GDP_t^D)$ and $ln(GDP_t^F)$ are logs of domestic income and export weighted foreign income, respectively; μ_i shows non-time-varying firm-specific idiosyncrasies and ε_{it} is the error term of the regression.

In order to cope with potential endogeneity problem and controlling dynamic aspect of exports, we use a dynamic panel framework where difference GMM estimations are carried out. The difference GMM estimation introduces the lag(s) of dependent variable to control for potential dynamic effects and uses the lags of dependent and explanatory variables as instruments to tackle potential endogeneity problem. Estimation results for the baseline specification are presented in Table 1.

We use the first lag of dependent variable as a regressor to control for the inertia in real exports and use its third lag as instrument variable in all GMM regressions. In addition, we treat liability dollarization ratio, labour productivity (change and its level), and log of real sales as predetermined variables given their endogenous relationships with employment and real sales and we use their up to three lagged values as the GMM-type instruments. Similarly, depending on specification used macro variables and sectoral real exchange rates (change and its level) are employed as standard differenced instruments. We report the Sargan test of over-identification to test for the validity of our instruments. Estimations results are from the one-step GMM procedure while the Sargan and autocorrelation tests, which are obtained from the

two-step procedure. Second order autocorrelation tests (*arm2*) do not reject the hypothesis of no serial correlation in the error terms for almost all regressions. Similarly, the Sargan tests do not reject the hypothesis of the validity of over-identifying restrictions almost in all regressions suggesting that instruments are valid.

The GMM estimation enables us to test the inertia in exports or its dynamic aspect. The coefficients of lag dependent variable are estimated to be positive and statistically significant across all specifications suggesting that real export variable has an inertia and its coefficient is estimated around 0.25, i.e. a ten percent rise in the previous year's exports adds about 2.5 percent to current real exports.

For the sake of robustness, we report alternative specifications using the levels and changes in logs of real exchange rates and labour productivity. Estimation results suggest that real appreciation of domestic currency has a negative impact on exports as expected. The real exchange rate elasticity of exports is estimated to be around 3 percent in all specifications of the baseline model. The, the coefficients of the real exchange rate do not change significantly when change in the log of real exchange rate ($\Delta ln(RER_{jt})$) is used instead of the level

We estimate that firm size ($ln(lrsale_{it})$) has positive impact on exports. The coefficients of size variable are significant and larger than unity in specifications where the log of labour productivity is used as regressors. This finding is consistent with literature (Bernard and Jensen, 1999; Wagner, 2001; Greenaway and Kneller; 2004), exporting activity incurs a sunk-cost and this cost is less important for larger firms thus they are expected to enter the export markets more easily. We also use the log of labour productivity, $ln(LP_{it})$, as explanatory variable. The coefficients of this variable are estimated to be positive and significant in the specification without size variable. When size variable is introduced coefficients turns to be insignificant. In order to address the potential multi-collinearity between size and labour productivity, we report the findings with both level and change in log of labour productivity. We estimate positive and significant coefficients for change in log of labour productivity ($\Delta ln(LP_{it})$) suggesting that a ten percentage point rise in labour productivity lead to a rise in export around 3-5 percent. These results are in line with the empirical evidence and theoretical predictions documenting that more productive firms tend to export more than less productive firms (Melitz, 2003).

Liability dollarization ratio ($Dolratio_{it}$) is used to control for several factors: (i) access to foreign finance which is evidently to be cheap and mutes financial constraints, (ii) an instrument of hedging mechanism (iii) the extent of FX-denominated liability exposure or currency mismatch. The first two channels may suggest a positive coefficient for this variable while the last channel suggests a negative coefficient especially when domestic currency depreciates to a large extent. Cheap FX-denominated debt with better terms compared to domestic currency denominated debt is apparently supportive for exports. The estimation results usually suggest a positive and significant association between liability dollarization ratio and export volume. The last channel as an element of production cost and balance sheet effects, suggests that large share of FX debt may not be supportive for exports in case of currency depreciation. We will test these channels in the next section.

We use the leverage ratio ($Leverage_{it}$) and collateral ratio ($Collateral_{it}$) as explanatory variables in order to control the financial health or capital of firms. Estimations suggest no statistically significant link between leverage ratio and exports. We estimate often insignificant coefficients for collateral ratio except in one specification (Table 1 in column 3) where we have negative and significant coefficient,

implying that as the share of tangible assets rises, firm's exports declines. Data shows that exports of firms in the lowest 25 percentile in terms of collateral ratio grew faster than exports of firms in the 75 percentile. Contrary to this findings, empirical literature document that industries with more tangible assets enjoy easier access to outside capital because firms can pledge more collateral (Braun, 2003; Claessens and Laeven, 2003; Manova,2015). Literature also documents that export starters have a significant ex-ante financial advantage, compared to non-exporters (Bellone et al. 2010; Muuls, 2012). That is, firm capital is more vital for the new exporter starters. However, even though better financial health has been associated with increasing export market participation (the extensive margin of trade) it does not necessarily increases intensive margin (Berman and Hericourt, 2010; Muuls, 2008) which is in line with the existence of large sunk costs which have to be paid to access the export market for the first time. Manova (2013) and Hur et al. (2006) find that in economies with higher levels of financial development, exports of vulnerable industries with fewer tangible assets grow faster. Therefore our finding on the impact of tangibility on intensive margin do not contradict fully with the empirical findings given the fact that recent improvement in conditions of accessing to credits by Turkish exporters and new incentives supporting exports might have increased the export performance of firms with lower collateral ratios.

For the macro variables, we use time varying VIX index as a regressor. In line with expectation and contrary to findings in fixed effect estimations, coefficients of this variable are estimated to be negative and significant in specifications where the log change of labour productivity while they are mostly negative and significant in the extended model estimations. In addition, we use $ln(GDP_t^F)$ to control for foreign demand and we estimate positive as expected but not always significant coefficients for this variable. We also use domestic demand, $ln(GDP_t^D)$ to control for potential substitution between domestic sales and exports. We estimate negative and significant coefficients for this variable, implying a substitution between domestic sales and exports. Anecdotal evidence for Turkish manufacturing suggests that firms substitute exports for domestic sales in the periods of weak domestic activity. This evidence is supported by Şahinbeyoğlu and Ulaşan (1999) that estimate a negative association between exports and domestic income. Parallel with our findings, empirical studies carried out for EU countries suggest a strong substitution between domestic sales and exports in the short run especially when domestic demand is weak (Bobeica, Esteves, Rua and Staehr, 2015), and economies are highly diversified in exporting or activities are less concentrated (Esteves and Prades, 2016).

Baseline Specification: Estimations with Difference GMM Model Table 1

	(1)	(2)	(3)	(4)
$lrexp_{i,t-1}$	0.198***	0.254***	0.230***	0.254***
	(0.0328)	(0.0387)	(0.0346)	(0.0374)
$ln(RER_{jt})$	-0.319**	-0.276*	-	-
	(0.154)	(0.164)		
$\Delta(ln(RER_{jt}))$	-	-	-0.340***	-0.230***
			(0.0714)	(0.0733)
$ln(LP_{it})$	0.160	-	-0.202	-
	(0.163)		(0.186)	
$\Delta(ln(LP_{it}))$	-	0.530***	-	0.338**
		(0.135)		(0.152)
$ln(lrsale_{it})$	1.088***	0.824***	1.117***	0.878***
	(0.127)	(0.148)	(0.130)	(0.142)
$Dolratio_{it}$	0.424**	0.323	0.525***	0.412**
	(0.189)	(0.215)	(0.193)	(0.208)
$Collateral_{it}$	-1.026	0.361	-2.155**	-0.501
	(0.973)	(1.251)	(1.021)	(1.219)
$Leverage_{it}$	0.218	0.739	0.260	0.584
	(0.502)	(0.650)	(0.517)	(0.630)
$ln(GDP_t^F)$	1.489	3.735***	0.501	2.360
	(1.160)	(1.414)	(1.222)	(1.450)
$ln(GDP_t^D)$	-1.488**	-2.620***	-1.294**	-2.173***
	(0.608)	(0.722)	(0.607)	(0.710)
VIX_t	-0.004	-0.007**	-0.003	-0.006**
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	2.918	9.579***	7.618***	9.304***
	(2.701)	(2.853)	(2.887)	(2.700)
Observations	20,969	20,908	20,969	20,908
Number of firms	3,855	3,847	3,855	3,847
Sargan (P-value)	0.0172	0.553	0.399	0.670
arm2 (p-value)	0.0704	0.954	0.313	0.672
arm1 (p-value)	0	0	0	0

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4.2. The Extended Specification

We extend the baseline specification by introducing dummy variables interacted with industry-specific real exchange rate (both level and change) to examine the sensitivity of exports to sectoral real exchange rates across various firm characteristics. We construct dummy variables reflecting the imported input intensity, the degree of currency mismatch, the firm size, and the firm age. We interact these dummy variables with the real exchange rate to test how the sensitivity of real exports to the real exchange rate alters across these characteristics. The model that includes the interaction terms mentioned above (the extended specification) is given in equation (2) below and is estimated by using the difference GMM estimation technique.

$$\ln(X_{it}) = \alpha_1 \ln(X_{it-1}) + \alpha_2 \Delta\ln(RER_{jt}) + \alpha_3 VOL_t + \alpha_4 Z_{it} + \alpha_5 \ln(GDP_t^D) + \alpha_6 \ln(GDP_t^F) + \alpha_7 (FCD \times \Delta\ln(RER_{jt})) + \tau\mu_i + \varepsilon_{it} \quad (2)$$

where *FCD* is a dummy variable reflecting firm characteristics and sets equal to "1" for firms that have specific characteristics mentioned above and "0" otherwise. We report and discuss findings concerning these interaction terms and provide details on

how these dummies are constructed under the relevant sub-sections below, respectively.

4.2.1. Imported Inputs

Campa and Goldberg (1997) and Greenaway, Kneller and Zhang (2010) find evidence that the impact of real exchange rate on exports is muted to some extent by the usage of imported intermediate inputs in the domestic production. We follow similar path to test the impact of real exchange rate on firm level export volume in Turkey. Evidence suggests that domestic manufacturing production is highly exposed to imported inputs in Turkey. Saygılı et al (2010) estimated that about 55 percent of total intermediate inputs are made up of imported inputs and it has been rising over the period of our study. In addition, there is widespread foreign exchange denominated pricing in domestic economy including in housing, manufacturing, tourism sectors and especially commodities, leading to high exchange rate pass through to CPI inflation. Based on this background, the competitive impact of currency depreciation on export volume in Turkey might be muted by the degree of foreign exchange exposures through the cost of production channel.

We construct a dummy variable based on sectoral imported inputs intensity following Saygılı et al. (2010) which reports sectoral imported input intensity ratio based on 2002 Input-Output Table. We define the sector in which firms are classified as high imported input intensity if this ratio is larger than 0.29 (IM_j is equal to "1", otherwise it is "0") which is the median ratio of the imported input intensities for two digit manufacturing industries in our analysis. We test the cost of production channel by using the interaction term between the real exchange rate variable and imported intensity dummy (IM_j) as regressor. We expect the coefficient of interaction terms between the sectoral exchange rate variable and the imported input intensity dummy to be positive. That is, the exports of manufacturing firms with high imported inputs in their production are expected to be less sensitive to real exchange rate (the sum of interaction term and the log real exchange rate is smaller in absolute term). In other words, a depreciation of the domestic currency is expected to raise production costs of companies that rely on imported inputs and thus reduces the sensitivity of exports to the real exchange rate.

Table 2 provides the estimation results in which interaction terms of the level and change in the log of real exchange rate with IM_j are used as explanatory variable, respectively. In line with expectations, estimations show that the coefficients of these interaction terms are positive but it is statistically significant only for the interaction term with the log of real exchange rate. This suggests that exports of firms belonging to sectors with high imported inputs intensity are less sensitive to level real exchange rate. That is, imported inputs as an item of production cost may mute the impact of the competitiveness channel of the real exchange rate, i.e. the sums of coefficients of interaction terms and real exchange rate variables are smaller in absolute value.

4.2.2. Currency Mismatch: Firms in Hell, Heaven or Hedged Regions

We extend our analysis by introducing a better firm-level proxy for currency mismatch, calculated by taking the period averages of the ratio of FX-denominated debt to exports ($MISMATCH_i$). The numerator represents liabilities while the denominator represents revenues thus larger $MISMATCH_i$ implies higher degree of currency mismatch. Although the ideal way of calculating a proxy for the currency mismatch is to consider also FX-denominated assets and FX indexed domestic sales,

due to lack of data we use only exports in the denominator of the ratio. We think this proxy is biased upward as the denominator may be larger than the actual export figures. We use the period average of $MISMATCH_i$ and classify firms into three groups and named them "heaven", "hedged" and "hell" inspired by Echeverry et al. (2003). The first group is reflected by a dummy that represents firms in the lower 25 percentile of average $MISMATCH_i$, "heaven". The second group is made up of firms in the upper 25 percentile of average $MISMATCH_i$, "hell". The last group represents the rest of the firms, "hedged". We use interaction terms of these three dummies with levels and change in log real exchange rate and run regression for the model given in equation (2).

Extended Specification with Imported Inputs: Estimations with Difference GMM Model

Table 2

	(1)	(2)
$lrexp_{i,t-1}$	0.252***	0.253***
	(0.0386)	(0.0375)
$ln(RER_{jt})$	-0.392**	-
	(0.185)	
$\Delta(ln(RER_{jt}))$	-	-0.270***
		(0.104)
$ln(RER_{jt})*IM_j$	0.344*	-
	(0.202)	
$\Delta(ln(RER_{jt}))*IM_j$	-	0.0989
		(0.147)
$\Delta(ln(LP_{it}))$	0.531***	0.330**
	(0.135)	(0.158)
$ln(lrsale_{it})$	0.829***	0.882***
	(0.147)	(0.143)
$Dolratio_{it}$	0.297	0.410**
	(0.215)	(0.208)
$Collateral_{it}$	0.317	-0.530
	(1.245)	(1.218)
$Leverage_{it}$	0.717	0.577
	(0.648)	(0.628)
$ln(GDP_t^F)$	3.664***	2.305
	(1.406)	(1.457)
$ln(GDP_t^D)$	-2.598***	-2.145***
	(0.720)	(0.714)
VIX_t	-0.007**	-0.006**
	(0.003)	(0.003)
Constant	9.571***	9.204***
	(2.854)	(2.722)
Observations	20,908	20,908
Number of firms	3,847	3,847
Sargan (P-value)	0.534	0.666
arm2 (p-value)	0.955	0.670
arm1 (p-value)	0	0

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

We expect the export sensitivity of hedged firms to the real exchange rate be small i.e. the coefficient of the interaction term of hedged firms is expected to be positive. We expect an insignificant coefficient for the interaction term for the firms belonging to the heaven region as the mismatch is not a problem for these firms and thus the impact through cost of production and balance sheets channels are muted. However, it is not straightforward to guess the expected sign of the coefficient for interaction term for the firms belonging to the hell region. Counteracting channels

may determine the sign of this coefficient. A depreciation of the domestic currency may hit the firms' overall economic activity negatively including exports through cost of production and balance sheet channels when currency mismatch exists to a great extent. Therefore, we may expect a positive sign for the coefficient of the interaction term. On the contrary, we may expect a negative sign for the coefficient of the interaction term when the competitiveness channel dominates.

Findings from estimations are often in line with these expectations (Table 3). We estimate insignificant coefficients for the interaction terms with heaven firms dummy. That is, the exports of these firms are unlikely to be sensitive to real exchange rates. On the other side of the distribution, however, we estimate significant and negative signs for the interaction terms of firms in the hell region. In this case, firms seem to be more sensitive to the real exchange rate fluctuations. This finding is interesting as it suggests that exports of firms with high currency mismatch are more sensitive to real exchange rates thus a depreciation of domestic currency is favourable for the exports of these firms. Contrary to our expectation, the cost of production and the balance sheets channels seem to be not binding when domestic currency depreciates implying that competitiveness channel dominates. This finding supports the idea that firms with high FX debt relative to their exports are somehow able to sustain their export performance with a depreciation of the domestic currency. We discover that these firms seem to be largely domestic oriented (14 percent export share, compared to 40 and 26 percent for firms in the hedged and heaven regions, respectively) and they have relatively lower imported inputs which may be a potential explanation for the strong sensitivity of their exports to the real exchange rates.

We estimate a positive and significant coefficient for the interaction terms with hedged firms dummy. These firms, by definition, may be treated as candidates for naturally hedged ones whose activities including exports are expected to be less sensitive to the variations in the real exchange rate. This suggests that the sensitivity of the exports to real exchange rate is muted, i.e. the cost of production channel limits the impact of competitiveness channel to some extent. These results are in line with findings in Bleakley and Cowan (2008), and confirm that firms tend to match the currency composition of their liabilities with their ex-ante sensitivity of revenues to the real exchange rate.

4.2.3. Size and Age

We interact firm size and age dummy variables with the change and level of log of real exchange rate and report regression results in Table 4 and Table 5, respectively. We expect to estimate a positive signs for the coefficients of interaction terms with large and old dummies and negative signs for small, medium, and young dummies. The latter group of firms is expected to be financially constrained and is not mature enough both in terms of size and age to manage the currency mismatch which makes their exports sensitive to the real exchange rate fluctuations. Estimations results are generally in line with expectations. We estimate generally positive and only significant coefficients for the interaction terms with log of real exchange rate for large and old dummies while generally negative and only significant coefficients for the interaction term with log of real exchange rate for medium and young dummies. The coefficient of interaction terms with small dummy is estimated to be generally insignificant. In short, estimations show that the exports of large and old groups are generally less sensitive to the real exchange rate.

Extended Specification with Natural Hedge Position: Estimations with Difference GMM Model

Table 3

	(1)	(2)	(3)	(4)	(5)	(6)
$lrexp_{i,t-1}$	0.256***	0.253***	0.273***	0.260***	0.272***	0.261***
	(0.0392)	(0.0374)	(0.0386)	(0.0380)	(0.0381)	(0.0374)
$ln(RER_{jt})$	-0.274	-	-0.680***		-0.0747	-
	(0.167)		(0.201)		(0.173)	
$\Delta(ln(RER_{jt}))$	-	-0.245***	-	-0.450***	-	-0.107
		(0.0799)		(0.101)		(0.0846)
$ln(RER_{jt})*HEAVEN_i$	0.00248	-	-	-	-	-
	(0.231)					
$\Delta ln(RER_{jt})*HEAVEN_i$	-	0.0742	-	-	-	-
		(0.164)				
$ln(RER_{jt})*HEDGED_i$	-	-	0.639***	-	-	-
			(0.185)			
$\Delta ln(RER_{jt})*HEDGED_i$	-	-	-	0.384***	-	-
				(0.132)		
$ln(RER_{jt})*HELL_i$	-	-	-	-	-0.845***	-
					(0.234)	
$\Delta ln(RER_{jt})*HELL_i$	-	-	-	-	-	-0.552***
						(0.156)
$\Delta(ln(LP_{it}))$	0.526***	0.326**	0.556***	0.417***	0.518***	0.345**
	(0.135)	(0.153)	(0.136)	(0.161)	(0.136)	(0.153)
$ln(lrsale_{it})$	0.824***	0.883***	0.812***	0.854***	0.837***	0.872***
	(0.149)	(0.143)	(0.149)	(0.144)	(0.150)	(0.143)
$Dolratio_{it}$	0.297	0.415**	0.386*	0.446**	0.209	0.408**
	(0.209)	(0.204)	(0.221)	(0.211)	(0.210)	(0.208)
$Collateral_{it}$	0.468	-0.548	0.353	-0.523	0.548	-0.528
	(1.258)	(1.214)	(1.269)	(1.236)	(1.273)	(1.221)
$Leverage_{it}$	0.803	0.557	0.779	0.546	0.841	0.558
	(0.659)	(0.624)	(0.656)	(0.639)	(0.663)	(0.631)
$ln(GDP_t^F)$	3.765***	2.313	3.872***	2.579*	3.793***	2.418*
	(1.422)	(1.452)	(1.427)	(1.471)	(1.428)	(1.453)
$ln(GDP_t^D)$	-2.632***	-2.152***	-2.692***	-2.290***	-2.675***	-2.211***
	(0.725)	(0.710)	(0.729)	(0.721)	(0.726)	(0.711)
VIX_t	-0.007**	-0.007**	-0.008**	-0.006**	-0.008**	-0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	9.493***	9.252***	9.751***	9.908***	9.380***	9.476***
	(2.850)	(2.688)	(2.890)	(2.750)	(2.863)	(2.710)
Observations	20,908	20,908	20,908	20,908	20,908	20,908
Number of firms	3,847	3,847	3,847	3,847	3,847	3,847
Sargan (P-value)	0.538	0.670	0.575	0.676	0.362	0.679
arm2 (p-value)	0.969	0.645	0.846	0.752	0.988	0.592
arm1 (p-value)	0	0	0	0	0	0

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Extended Specification with Size: Estimations with Difference GMM Model

Table 4

	(1)	(2)	(3)	(4)	(5)	(6)
$lrexp_{i,t-1}$	0.265***	0.254***	0.255***	0.253***	0.259***	0.254***
	(0.0398)	(0.0376)	(0.0388)	(0.0375)	(0.0392)	(0.0373)
$ln(RER_{jt})$	-0.449**	-	-0.127	-	-0.219	-
	(0.179)		(0.183)		(0.170)	
$\Delta(ln(RER_{jt}))$	-	-0.260***	-	-0.132	-	-0.268***
		(0.0825)		(0.0968)		(0.0802)
$ln(RER_{jt})*LARGE_i$	0.576***	-	-	-	-	-
	(0.203)					
$\Delta(ln(RER_{jt}))*LARGE_i$	-	0.111	-	-	-	-
		(0.139)				
$ln(RER_{jt})*MED_i$	-	-	-0.300*	-	-	-
			(0.175)			
$\Delta(ln(RER_{jt}))*MED_i$	-	-	-	-0.194	-	-
				(0.123)		
$ln(RER_{jt})*SMALL_i$	-	-	-	-	-0.281	-
					(0.226)	
$\Delta(ln(RER_{jt}))*SMALL_i$	-	-	-	-	-	0.170
						(0.155)
$\Delta(ln(LP_{it}))$	0.558***	0.354**	0.530***	0.340**	0.545***	0.315**
	(0.138)	(0.154)	(0.135)	(0.152)	(0.137)	(0.153)
$ln(lrsale_{it})$	0.824***	0.877***	0.826***	0.880***	0.820***	0.882***
	(0.149)	(0.143)	(0.148)	(0.143)	(0.149)	(0.142)
$Dolratio_{it}$	0.321	0.417**	0.322	0.425**	0.323	0.403*
	(0.217)	(0.211)	(0.215)	(0.209)	(0.216)	(0.208)
$Collateral_{it}$	0.541	-0.522	0.385	-0.574	0.444	-0.460
	(1.278)	(1.238)	(1.252)	(1.227)	(1.264)	(1.216)
$Leverage_{it}$	0.840	0.560	0.752	0.547	0.785	0.613
	(0.666)	(0.640)	(0.652)	(0.634)	(0.658)	(0.627)
$ln(GDP_t^F)$	3.862***	2.392*	3.735***	2.322	3.814***	2.310
	(1.437)	(1.452)	(1.415)	(1.451)	(1.428)	(1.447)
$ln(GDP_t^D)$	-2.689***	-2.194***	-2.619***	-2.157***	-2.662***	-2.143***
	(0.734)	(0.710)	(0.723)	(0.710)	(0.729)	(0.708)
VIX_t	-0.007**	-0.006**	-0.007**	-0.006**	-0.007**	-0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	9.546***	9.410***	9.527***	9.327***	9.648***	9.107***
	(2.882)	(2.719)	(2.855)	(2.701)	(2.870)	(2.702)
Observations	20,908	20,908	20,908	20,908	20,908	20,908
Number of firms	3,847	3,847	3,847	3,847	3,847	3,847
Sargan (P-value)	0.609	0.657	0.563	0.665	0.579	0.676
arm2 (p-value)	0.821	0.705	0.947	0.668	0.900	0.624
arm1 (p-value)	0	0	0	0	0	0

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Extended Specification with Age: Estimations with Difference GMM Model

Table 5

	(1)	(2)	(3)	(4)
$lrexp_{i,t-1}$	0.257***	0.253***	0.257***	0.251***
	(0.0389)	(0.0375)	(0.0387)	(0.0373)
$ln(RER_{jt})$	-0.407**	-	-0.191	-
	(0.177)		(0.169)	
$D(ln(RER_{jt}))$	-	-0.272***	-	-0.189**
		(0.0876)		(0.0808)
$ln(RER_{jt})*OLD_i$	0.411**	-	-	-
	(0.189)			
$Dln(RER_{jt})*OLD_i$		0.144	-	-
	-	(0.133)		
$ln(RER_{jt})*YOUNG_i$		-	-0.449*	-
	-		(0.217)	
$Dln(RER_{jt})*YOUNG_i$		-	-	-0.202
				(0.153)
$D(ln(LP_{it}))$	0.533***	0.344**	0.531***	0.341**
	(0.135)	(0.152)	(0.135)	(0.153)
$ln(lrsale_{it})$	0.823***	0.878***	0.831***	0.876***
	(0.148)	(0.143)	(0.148)	(0.143)
$Dolratio_{it}$	0.310	0.417**	0.314	0.435**
	(0.215)	(0.209)	(0.215)	(0.207)
$Collateral_{it}$	0.414	-0.549	0.365	-0.646
	(1.255)	(1.228)	(1.251)	(1.209)
$Leverage_{it}$	0.802	0.563	0.795	0.531
	(0.655)	(0.632)	(0.650)	(0.626)
log_GDP_Partners	3.758***	2.369	3.722***	2.377
	(1.418)	(1.450)	(1.417)	(1.453)
log_GDP	-2.618***	-2.181***	-2.602***	-2.190***
	(0.724)	(0.710)	(0.724)	(0.712)
VIX_t	-0.007**	-0.006**	-0.007**	-0.006**
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	9.487***	9.390***	9.422***	9.553***
	(2.857)	(2.702)	(2.864)	(2.714)
Observations	20,908	20,908	20,908	20,908
Number of id	3,847	3,847	3,847	3,847
Sargan (P-value)	0.575	0.664	0.578	0.651
arm2 (p-value)	0.946	0.675	0.950	0.646
arm1 (p-value)	0	0	0	0

*Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

5. Conclusions and Assessments

Empirical studies that use macro data often fail to find a relationship between real exchange rate and manufacturing exports in Turkey. This finding may be justified with a large content of costs in the forms of foreign exchange including extensive imported inputs and high liability dollarization. In other words, foreign exchange denominated cost items are made up of a significant portion of manufacturing production. Given the cost structure of domestic manufacturing production, the competitive impact of the exchange rate depreciation may be balanced or muted by the cost of production and the balance sheets channels. In this study we use large panel of manufacturing firms to investigate the impact of the variations in exchange rate on exports for the period 2002-2010. We attempt to uncover the relationship between the real exchange rates and exports of manufacturing firms in Turkey by taking account FX exposures and various firm characteristics. Our main contribution

is to strike attention to the role of FX exposures and currency mismatch in examining export performance of firms operating in manufacturing industry.

We document that a real depreciation of the Turkish lira has a positive impact on exports and this impact is muted for manufacturing firms operating in sectors that use imported inputs intensively. That is, the cost of production channel seems to be effective in export performance of firms. We also find that exports of firms with moderate FX debt-to-export ratios, so called "naturally hedged firms", are less sensitive to real exchange rates as expected. That is, our findings suggest that degree of currency mismatch appears an important determinant for firm level exports in addition to other commonly used firm specific financial health measures in the literature. Our estimations also show that the exports of medium, small, and young firm groups are generally more sensitive to the real exchange rates while the exports of mature and large firms are estimated to be less sensitive. Contrary to macro evidence, firm level findings suggest that a depreciation of Turkish lira seems to favour the external competitiveness of firms in general while for naturally hedged, large, mature and high import intensity firms, the sensitivity is estimated to be smaller.

These findings are consistent with fact that small and medium sized-young firms in Turkey are more concerned with the level of the exchange rate than large-mature firms which are somehow naturally hedged and hold a large amount of FX debt with longer maturity. The latter group of firms expects lower volatility rather than the level for the exchange rate. Similarly, the former group of firms that uses Turkish lira denominated financing intensively is concerned with high domestic interest rate which creates a financing burden for them.

Liability dollarization in itself is an anomaly for an economy, which may threaten the financial stability. Turkish manufacturing firms are highly dollarized in terms of their liabilities, which may lead to a currency mismatch and thus potentially deteriorate their financial positions in case of large depreciations. However, as also documented by Alp and Yalçın (2015), having access to foreign exchange funds with longer maturity undermines the extent of financial constraints and thus support firms' activity. That is, a strong association is estimated among liability dollarization ratio, and sales, employment and exports of firms. In addition, we estimate that the competitiveness channel dominates the negative outcomes of balance sheet and the cost of production channels in case of currency depreciation for firms, which experience currency mismatch. This finding suggests that the corporate sector has potential to deal with the negative impact of depreciation of the domestic currency.

The data used in this study is confined with balance sheets and income statements of firms. There is extensive foreign exchange indexed pricing in Turkey, which has important implications for the impact of real exchange rate depreciation on firms activity and their financial positions. To better measure the extent of currency mismatch and assess the impact of exchange rate on export, foreign exchange indexed pricing and foreign exchange denominated assets of firms should be incorporated into the analysis. This is a starting point for future research.

References

Ahmed. S., M. Appendino and M. Ruta (2015) "Global Value Chains and the Exchange Rate Elasticity of Exports" IMF Working Paper No: WP/15/252.

Alp, H. B., and C.Yalçın (2015) "Türkiye'de Şirketlerin Borç Dolarizasyonu ve Büyüme Performansı (Liability Dollarization and Growth Performance of Non-Financial Firms in Turkey)" in Turkish, The Central Bank of Turkey Working Paper No. 1501.

Arellano, M., and S. Bond (1991) "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations" The Review of Economic Studies, 58(2), 277-297.Aldan, A. and M. Günay (2008) "Entry to export markets and productivity: Analysis of matched firms in Turkey," The Central Bank of the Turkey Working Papers No.0805

Aydın, M. F., U.Çıplak and M. E. Yücel (2004) "Export supply and import demand models for the Turkish economy" The Central Bank of the Turkey Working Paper No. 04/09.

Aydın, F., H. Saygılı, and M. Saygılı (2007) "Empirical analysis of structural change in Turkish exports" The Central Bank of the Turkey Working Paper No.07/08.

Bellone, F., P.Musso, L.Nesta and S. Schiavo (2010) "Financial constraints and firm export behaviour" The World Economy, 33(3), 347-373.

Berman, N., and J. Héricourt (2010) "Financial factors and the margins of trade: Evidence from cross-country firm-level data" Journal of Development Economics, 93(2), 206-217.

Bernard, Andrew B. and J. B. Jensen (1999) "Exceptional exporter performance: cause, effect, or both?" Journal of International Economics, 47, 1-25.

Berument, M. H., N. N. Dincer, and Z.Mustafaoglu, (2014) "External income shocks and Turkish exports: A sectoral analysis" Economic Modelling, 37, 476-484.

Bleakley, H., and K.Cowan (2008) "Corporate dollar debt and depreciations: much ado about nothing?" The Review of Economics and Statistics, 90(4), 612-626.

Bobeica, E., P. S. Esteves, A. Rua and K. Staehr (2015) "Exports and domestic demand pressure: a dynamic panel data model for the euro area countries" ECB Working Paper Series No: 1777.

Braun, M. (2003). "Financial Contractibility and Asset Hardness" University of California - Los Angeles mimeo.

Calvo, Guillermo A. and Carmen M. Reinhart (2002) "Fear Of Floating," Quarterly Journal of Economics, 107(2), 379-408.

Calvo, G. A., Izquierdo, A., ve Mejia, L. (2004) "On the Empirics of Sudden Stops: The Relevance of Balance-Sheet Effects" NBER Working Paper No: 10520.

Campa, J., and L. S.Goldberg (1997). "The evolving external orientation of manufacturing industries: evidence from four countries" NBER Working Paper No.5919).

Carranza, L. J., J. M.Cayo , and J. E. Galdón-Sánchez (2003) "Exchange rate volatility and economic performance in Peru: a firm level analysis" Emerging Markets Review, 4(4), 472-496.

Claessens, S. and L. Laeven (2003) "Financial development, property rights, and growth" The Journal of Finance, 58(6), 2401-2436.

Echeverry, J. C., L.Fergusson, R.Steiner and C. Aguilar (2003) " Dollar debt in Colombian firms: Are sinners punished during devaluations?" Emerging Markets Review, 4(4), 417-449.

Eichengreen, B., R.Hausmann and U. Panizza (2005) The mystery of original sin. Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies, 233-65.

Esteves, P.S. and E.Prades (2016) "On domestic demand and export performance in the euro area countries: does export concentration matter?" ECB Working Paper Series No: 1909.

Goldberg, L. S. (2004) "Industry-specific exchange rates for the United States" Federal Reserve Bank of New York Economic Policy Review, 10(1).

Greenaway, D. and R.Kneller (2004) "Exporting and productivity in the United Kingdom" Oxford Review of Economic Policy, 20(3), 358-371.

Greenaway, D., A.Guariglia and R.Kneller (2007) "Financial factors and exporting decisions" Journal of international economics, 73(2), 377-395.

Greenaway, D., R.Kneller and X.Zhang (2010) "The effect of exchange rates on firm exports: The role of imported intermediate inputs" The World Economy, 33(8), 961-986.

Hur, Jung, Manoj Raj, and Yohanes E. Riyanto. "Finance and trade: A cross-country empirical analysis on the impact of financial development and asset tangibility on international trade." World Development 34.10 (2006): 1728-1741.

Hummels, D., J. Ishii and K. Yi (2001) "The Nature and Growth of Vertical Specialization in World Trade", Journal of International Economics, 54, 75–96

Hülagü, T., and C.Yalçın (2014) "Turkiye'de Firmalarin Yabanci Para Borclulugu ve Kur Riskine Iliskin Mikro Degerlendirmeler" Central Bank of the of Turkey Research Notes in Economics No. 1413.

IMF (2015) Global Financial Stability Report, Chapter 3.

Melitz, M. J. (2003) "The impact of trade on intra-industry reallocations and aggregate industry productivity" Econometrica, 71(6), 1695-1725.

Manova, K., Wei, S. J., & Zhang, Z. (2015). Firm exports and multinational activity under credit constraints. Review of Economics and Statistics, 97(3), 574-588.

Manova, K. (2013) "Credit constraints, heterogeneous firms, and international trade" The Review of Economic Studies, 80, 711–744.

Muûls, M. (2008). Exporters and credit constraints: A firm-level approach (No. 139). Brussels: National Bank of Belgium.

Muûls, M. (2015) "Exporters, importers and credit constraints" Journal of International Economics, 95(2), 333-343.

Özmen, E. and C. Yalçın (2007) "Küresel finansal riskler karşısında Türkiye'de reel sektörün finansal yapısı ve borç dolarizasyonu" Iktisat Isletme ve Finans, 22(258), 5-39.

Saygılı, S., C.Cihan, C.Yalçın and T. Hamsici (2010) "Türkiye İmalat Sanayiin İthalat Yapısı"The Central Bank of Turkey Working Paper No. 1002.

Wagner, J. (2001) "A note on the firm size–export relationship" Small Business Economics, 17(4), 229-237.

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IFC-ECCBSO-CBRT Conference on *"Uses of Central Balance Sheet Data Offices' information"*

Co-organised by the IFC, the European Committee of Central Balance Sheet Data Offices (ECCBSO) and the Central Bank of the Republic of Turkey (CBRT)

Özdere-İzmir, Turkey, 26 September 2016

Exports, real exchange rates and external exposures: empirical evidence from Turkish manufacturing firms[1]

Nazlı Karamollaoğlu, MEF University, and Cihan Yalçın, CBRT

[1] This presentation was prepared for the meeting. The views expressed are those of the authors and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

TÜRKİYE CUMHURİYET MERKEZ BANKASI

Exports, Real Exchange Rates and External Exposures: Empirical Evidence from Turkish Manufacturing Firms

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MEF University

Cihan Yalçın
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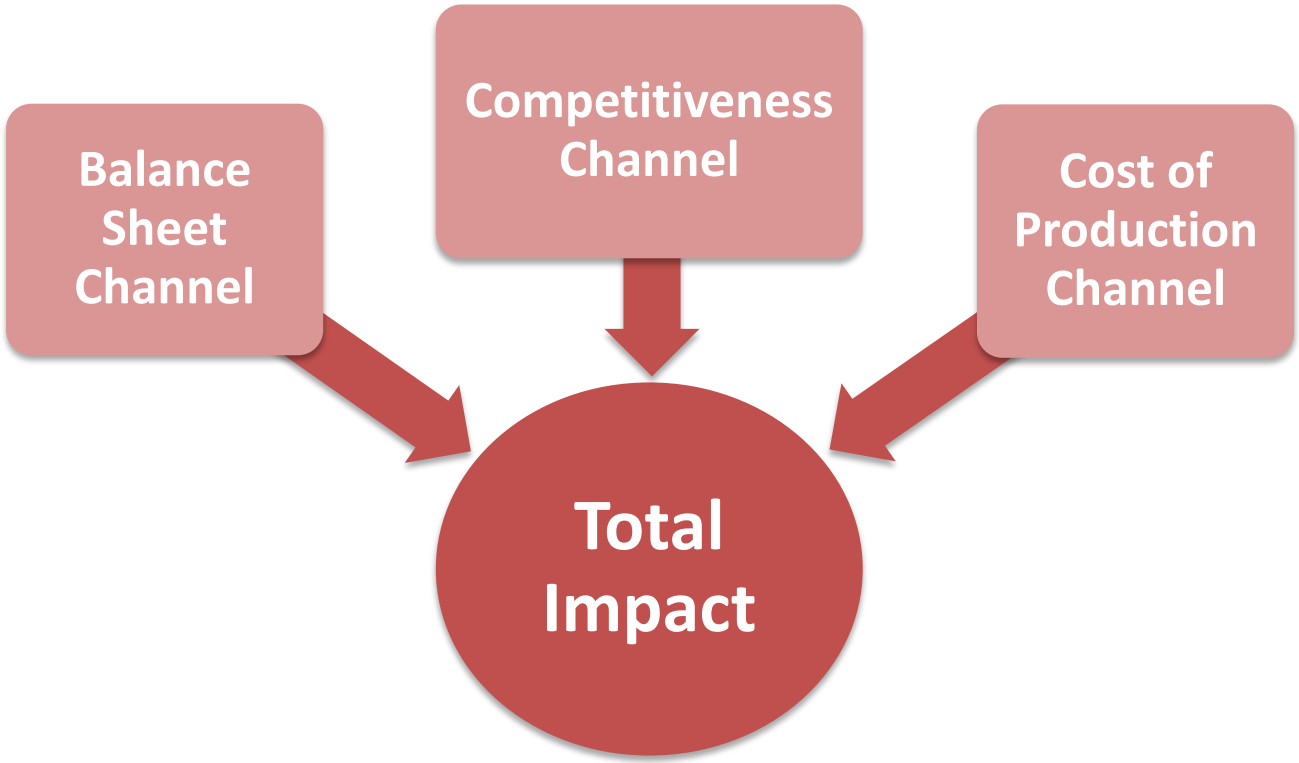
IFC / ECCBSO / CBRT Conference on
"Uses of Central Balance Sheet Data Offices' information", İzmir, September 26th, 2016

Motivation

- A policy question: Do exports respond to real exchange rate changes?
- Studies using macro data report insignificant results (Exchange rate disconnect puzzle) Dekle et al. 2008
- Firm level evidence suggests a significant response. Fitzgerald and Haller (2008), Dekle and Ryoo (2007), Tybout and Roberts (1997)
- The empirical trade literature has so far paid little attention to the possible effects of foreign exchange exposures, except few studies such as Campa and Goldberg (1997) and Greenaway et al. (2010) and recently Ahmed et al. (2015)
- Turkish manufacturaing firms that are highly exposed to FX denominated costs provides an opportunity to test the role of FX exposures in the response of exports to real exchange rates

Exchange rates and exports



	Balance Sheet	Competitiveness	Cost of Production
Depreciation	(-)	(+)	(-)

Contribution of the paper

- Adds to the literature on the impact of currency variations on firms' exports in the context of a developing country.
- Investigate the impact of exchange rates on firms' exports controlling for
  - Foreign exchange exposures in the forms of imported inputs (sectoral), liability dollarization or FX debt-exports ratio
  - Productivity
  - Firm-level financial ratios including collateral and leverage
  - Macro variables: volatility, domestic and external demand

Main findings

- A real depreciation of TRY has a positive impact on the intensive margins of exports.
- This impact is lower for firms operating in sectors that use imported inputs intensively
- For “naturally hedged" firms, the sensitivity of exports to exchange rate variations is estimated to be weaker.
- The exports of SMEs and young firms seem to be more sensitive to the exchange rate variations

Literature

New-new trade theory (Melitz, 2003) suggests significant barriers to engaging in exporting activity (sunk costs).

Sunk costs "form of investment that need to be financed".

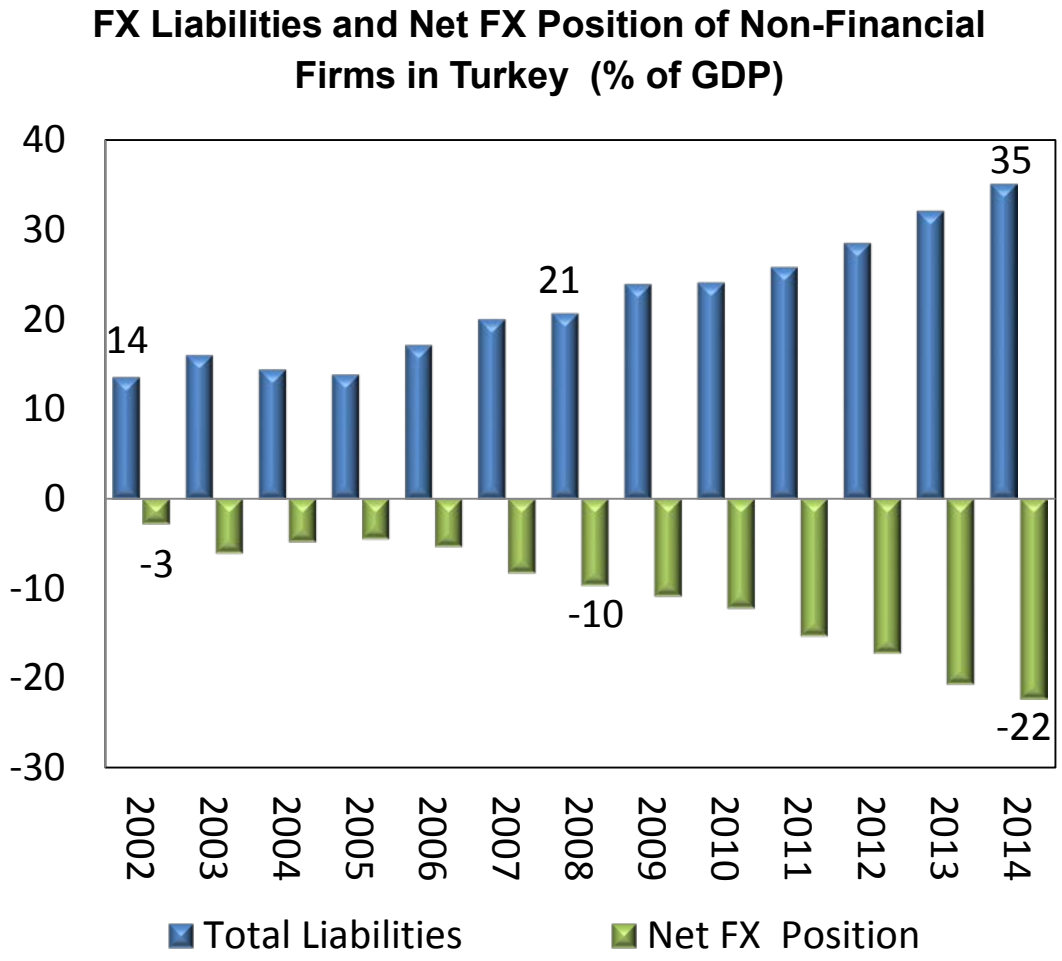
- Financial constraints is an important determinant of exporting decision at firm-level (Greenaway, 2007; Minetti and Zhu,2011; Muuls; 2015)
- Disconnection between productivity and exporting when financial constraints dominate (Berman and Hericourt, 2010; Liu and Li, 2015)

Few studies incorporating the exchange rates and FX exposure dimensions in the analysis of financial constraints and exports.

FX exposures of non-financial firms in Turkey

- Low domestic savings
- Limited local currency denominated funds and the need for FX denominated funds
- High FX denominated debt of non-financial firms: more than half of total debts in their balance sheets
- Large currency mismatches of non-financial firms. The net foreign exchange position of non-financial firms in Turkey reached to 187 billion USD as of February 2016, representing roughly 25% of GDP.

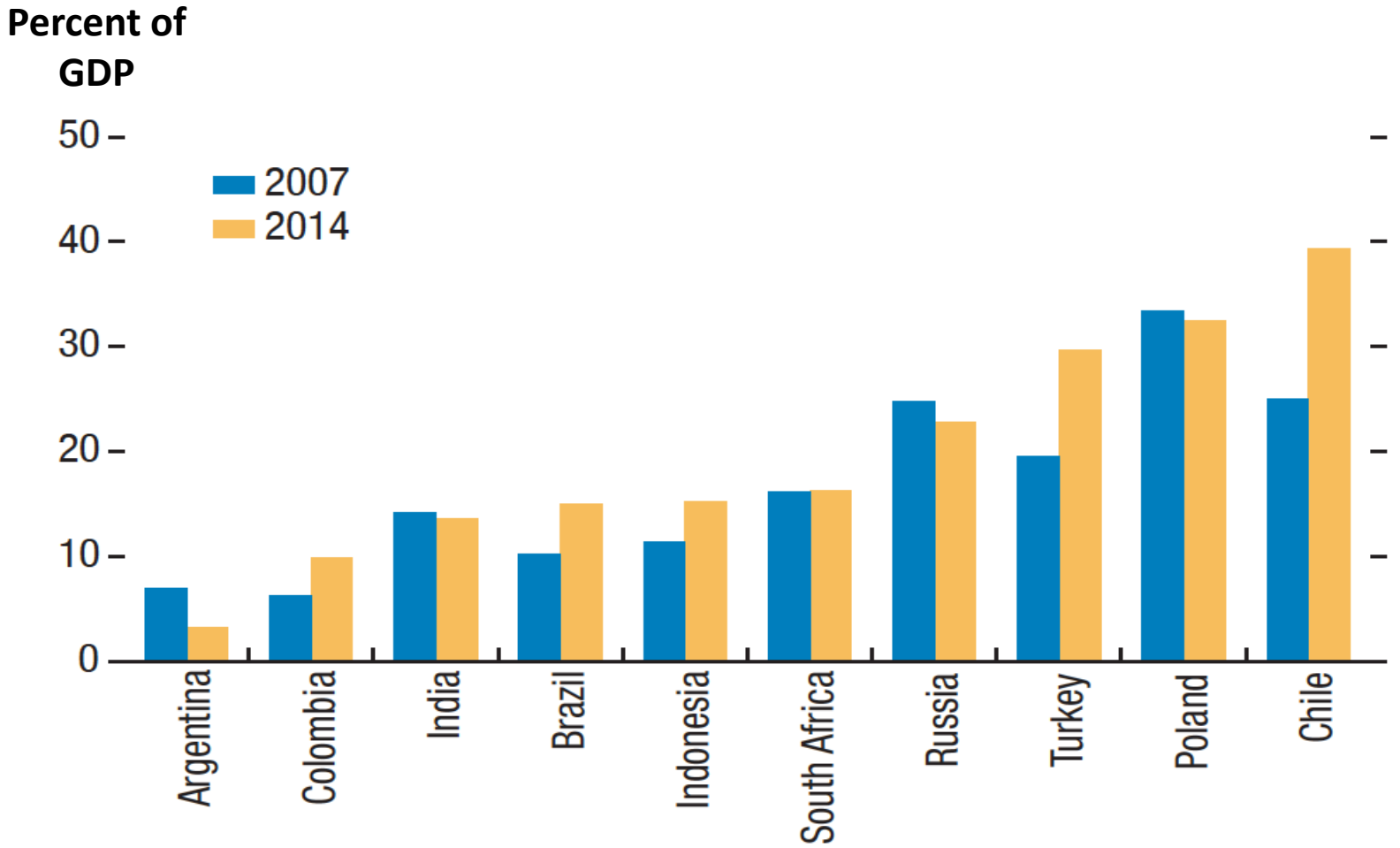
FX exposures of non-financial firms in Turkey



Source: Central Bank of Turkey

- FX liabilities of non-financial firms reached to 35 percent of GDP in 2014 from 14 percent in 2002 and short net foreign exchange (FX) position of these firms have increased from 3 percent of GDP to 22 percent in the same period.

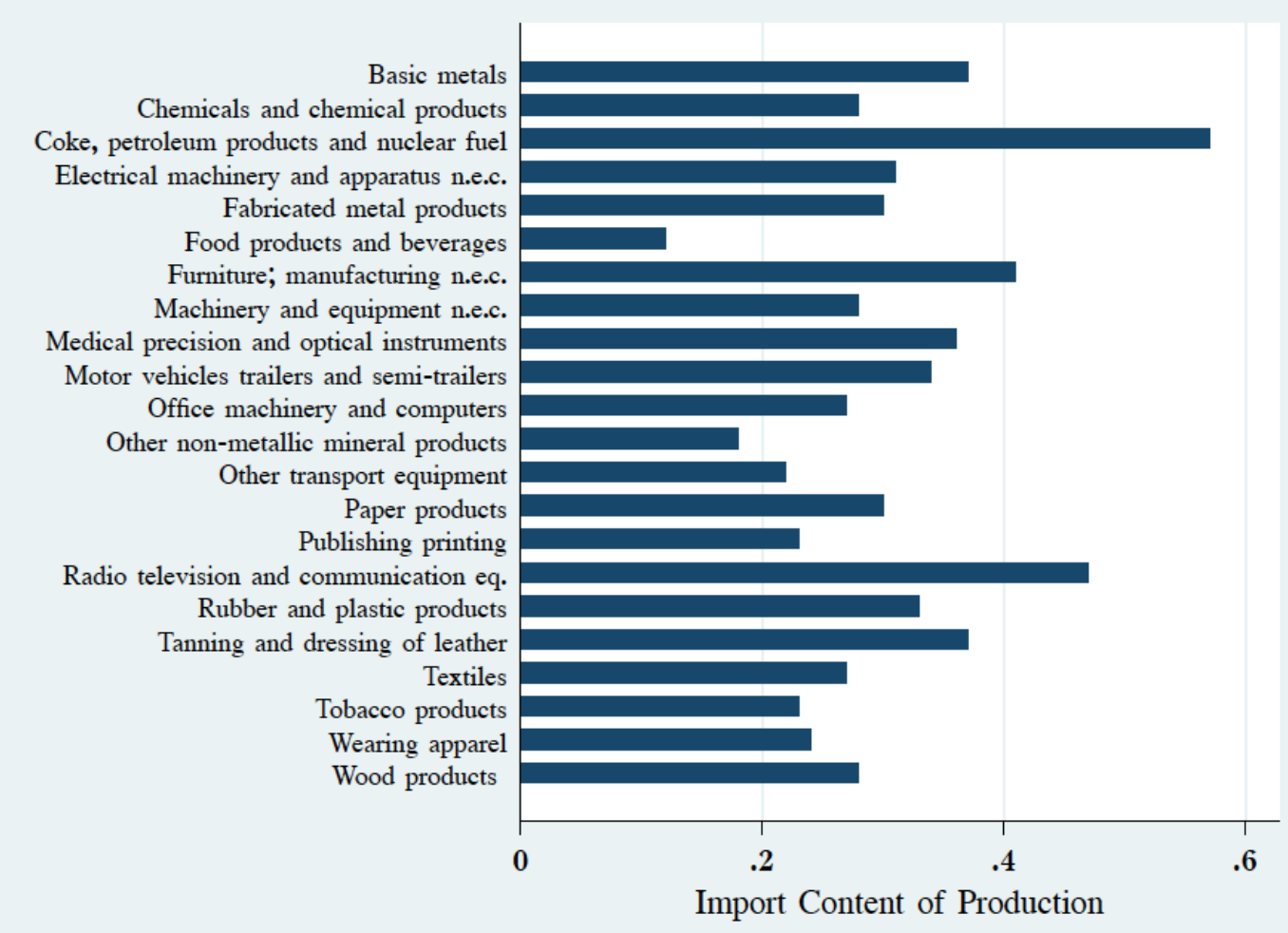
Foreign currency debt of non-financial firms and households



Sources: IMG Global Financial Stability Report. Note: Foreign Currency Debt comprises domestic loans, international loans and international bonds.

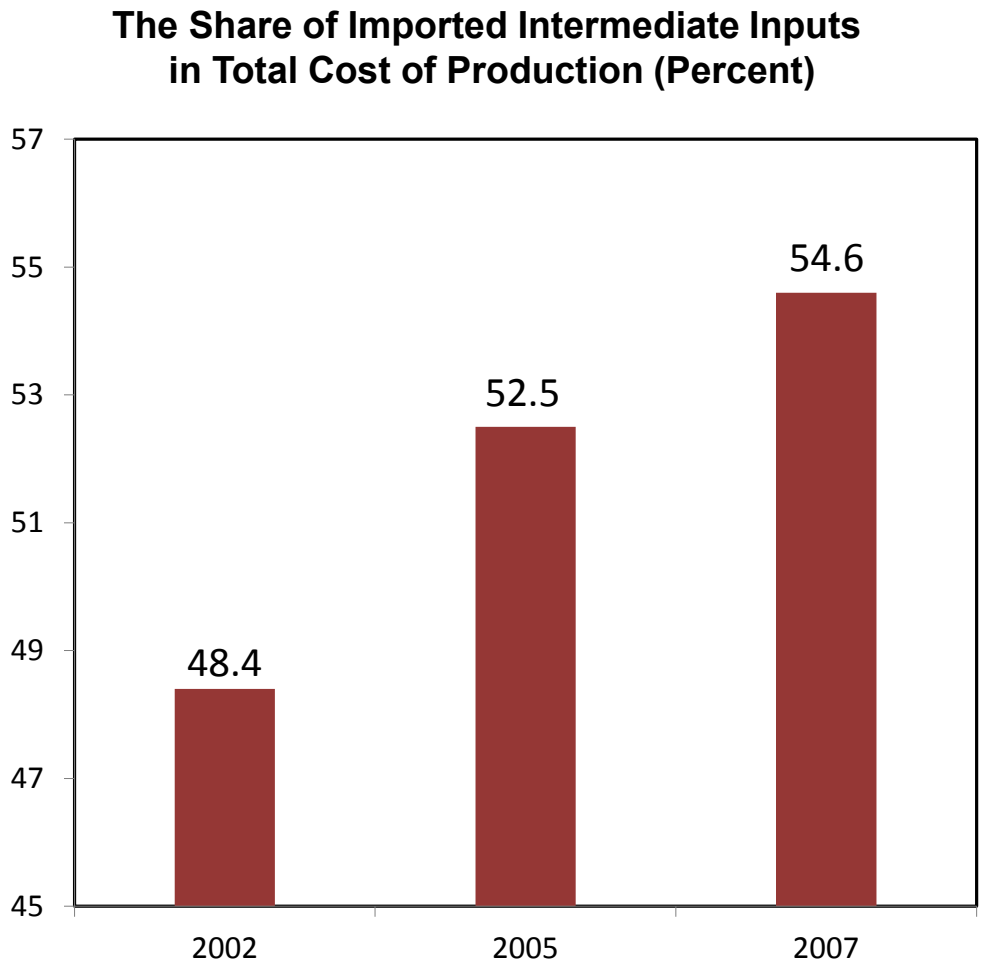
Imported input content of production

Shares of import in the production value based on 2002 input output tables



Source: Saygili et al. (2010)

Import content of production

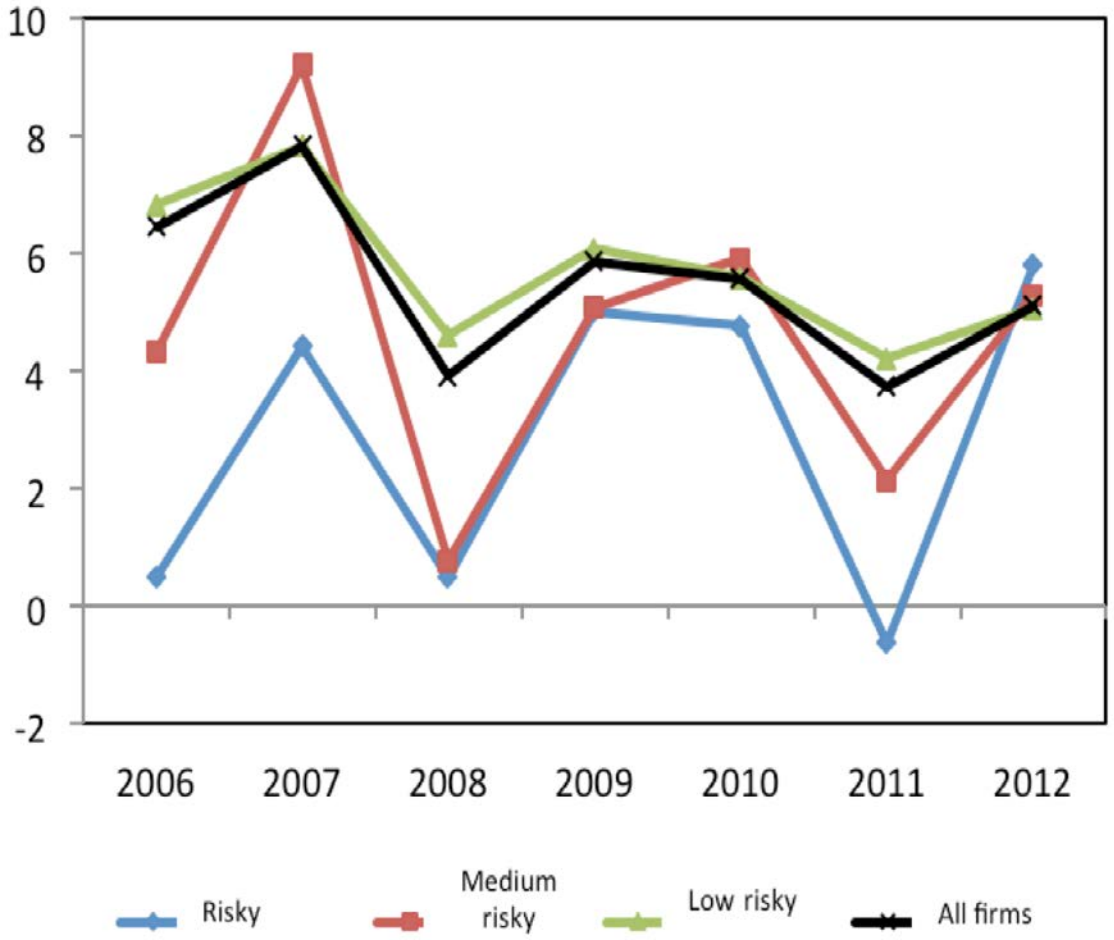


Source: Saygılı, Cihan, Yalçın and Hamsici (2010)

- Turkish economy is characterized by a large trade deficit.
- Trade deficit has deteriorated further in recent years resulting from increasing trend in imports which have grown rapidly due to the increasing imported input content of domestic production especially after 2001
- Intermediate goods imports which has been always larger than exports of goods, reached 22 percent of GDP in 2014.

Foreign exchange exposures and profit margins

Profit margins of non-financial firms (%)



- Net profit margins of firms with poor natural hedging (risky firms) melt down significantly when Turkish lira depreciated sharply during the post-2008 financial crisis period.
- Firms that are able to match the currency composition of their debt with their income streams, so called low-risk firms, seem to be affected from currency depreciations to a lesser extent.

Source: Hülagü and Yalçın (2014)

The data

- Central Bank of Turkey - Company Sector Database
- Banks's Association of Turkey - Risk Center Database
- Annual data for the period 2002-2010
- 3860 firms belonging to 21 industries (over 90% of total manufacturing exports)
- All the real values are deflated using the sectoral-level PPI
- Industry specific exchange rates
- Weighted average of OECD countries's GDPs (constant prices)
- Domestic GDP
- We classify firms according to sectoral imported input intensity, dollarization ratio, currency mismatch (FX-denominated debt-exports ratio) size, age

Descriptive statistics - Size and Age

	N	Mean	Min	Max
Log of Labour Productivity				
Small	5755	11.60	5.00	17.00
Medium	12126	11.63	7.00	18.60
Large	6164	11.74	7.00	19.30
Log of Real sales				
Small	5755	15.12	8.00	19.60
Medium	12126	16.50	11.00	23.60
Large	6164	18.19	12.00	23.80
Log of Real Exports				
Small	5755	12.78	0.00	18.60
Medium	12126	14.31	1.00	23.20
Large	6164	16.27	3.00	22.00
Export Share (Exports/ Total sales)				
Small	5755	0.27	0.00	1
Medium	12126	0.30	0.00	1
Large	6164	0.35	0.00	1
Employment				
Small	5755	32	3	50
Medium	12126	125	50	249
Large	6164	751	249	17482

	N	Mean	Min	Max
Log of Labour Productivity				
Young	6979	11.58	4.74	19.00
Medium age	11144	11.60	7.93	17.00
Mature	5824	11.83	6.94	19.00
Log of Real sales				
Young	6979	16.22	8.18	21.00
Medium age	11144	16.52	8.35	24.00
Mature	5824	17.23	10.25	24.00
Log of Real Exports				
Young	6979	13.93	0.22	20.00
Medium age	11144	14.43	1.10	22.00
Mature	5824	15.11	1.47	23.00
Export Share (Exports/ Total sales)				
Young	6979	0.30	0.00	1
Medium age	11144	0.33	0.00	1
Mature	5824	0.28	0.00	1
Employment				
Young	6979	169	3	4105
Medium age	11144	223	4	4527
Mature	5824	455	5	17482

- Labor productivities increase with size and age. Sales increase with age.
- Exports shares incrase with size. Mature firms have lower export shares.

Descriptive statistics - Size and Age

	N	Mean	Min	Max
Age				
Small	5733	21.11	3	110
Medium	12068	24.16	3	134
Large	6146	28.27	4	122
Dollarization Ratio				
Small	5755	0.38	0	1
Medium	12126	0.52	0	1
Large	6164	0.61	0	1
Leverage Ratio				
Small	5755	0.6	0	3.20
Medium	12126	0.58	0	5.10
Large	6164	0.54	0	3.40
Collateral Ratio				
Small	5755	0.25	0	1
Medium	12126	0.28	0	1
Large	6164	0.32	0	1

	N	Mean	Min	Max
Age				
Young	6979	13.65	3	17
Medium age	11144	23.27	17	30
Mature	5824	39.79	30	134
Dollarization Ratio				
Young	6979	0.51	0	1
Medium age	11144	0.52	0	1
Mature	5824	0.50	0	1
Leverage Ratio				
Young	6979	0.61	0	5.00
Medium age	11144	0.57	0	5.00
Mature	5824	0.54	0	4.00
Collateral Ratio				
Young	6979	0.28	0	1
Medium age	11144	0.28	0	1
Mature	5824	0.3	0	1

- On average, larger firms are older, highly dollarized and have low leverage and high collaterial ratios.
- Young firms are more leveraged and dollarized compared to mature firms.

Descriptive statistics - Export status

	N	Mean	Min	Max
Log of Labour Productivity				
Non-exporter	2934	11.46	5.03	16.86
Low - Exporter	2014	11.78	7.75	16.64
Med. - Exporter	14236	11.68	4.74	16.93
High - Exporter	7795	11.56	6.84	19.29
Log of Real sales				
Non-exporter	2934	14.96	5.25	20.46
Low - Exporter	2014	16.45	12.19	22.41
Med. - Exporter	14236	16.6	8.18	23.82
High - Exporter	7795	16.64	10.2	23.6
Employment				
Non-exporter	2934	64	1	1852
Low - Exporter	2014	221	3	10726
Med. - Exporter	14236	250	3	17482
High - Exporter	7795	299	5	5245
Age				
Non-exporter	2906	21	5	77
Low - Exporter	2002	23	4	134
Med. - Exporter	14173	25	3	122
High - Exporter	7772	24	3	110

	N	Mean	Min	Max
Dollarization Ratio				
Non-exporter	2934	0.09	0	1
Low - Exporter	2014	0.28	0	1
Med. - Exporter	14236	0.46	0	1
High - Exporter	7795	0.66	0	1
Leverage Ratio				
Non-exporter	2934	0.59	0	3.81
Low - Exporter	2014	0.54	0	1.92
Med. - Exporter	14236	0.57	0	4.67
High - Exporter	7795	0.59	0	5.13
Collateral Ratio				
Non-exporter	2934	0.28	0	0.99
Low - Exporter	2014	0.3	0	0.97
Med. - Exporter	14236	0.28	0	0.97
High - Exporter	7795	0.28	0	0.99

- Exporters on average have higher employment, labor productivity and real sales than non-exporters.
- Exporters have higher dollarization rate than non-exporters.

Descriptive statistics – Imported inputs intensity

	N	Mean	Median	Sd	Min	Max
Log of Labour Productivity						
High III	9485	11.74	11.64	0.96	6.94	19.29
Low III	14560	11.59	11.5	0.93	4.74	16.34
Log of Real sales						
High III	9485	16.64	16.54	1.66	8.35	23.82
Low III	14560	16.58	16.56	1.46	8.18	22.41
Employment						
High III	9485	247.58	109.43	551.77	3	6796
Low III	14560	273.35	125	657.14	3	17482
Age						
High III	9464	25.42	24	11.04	3	110
Low III	14483	23.87	22	11.07	3	134
Dollarization Ratio						
High III	9485	0.46	0.49	0.4	0	1
Low III	14560	0.54	0.72	0.41	0	1
Leverage Ratio						
High III	9485	0.56	0.57	0.25	0	3.5
Low III	14560	0.58	0.58	0.27	0	5.13
Collateral Ratio						
High III	9485	0.28	0.26	0.18	0	0.97
Low III	14560	0.28	0.26	0.19	0	0.99

- Firms operating in sectors that use higher imported inputs have higher productivity and lower dollarization rate, export shares and employment,
- Significant variations in collateral ratios, leverage ratios, real sales, and real export values between low and high-imported input intensities sectors

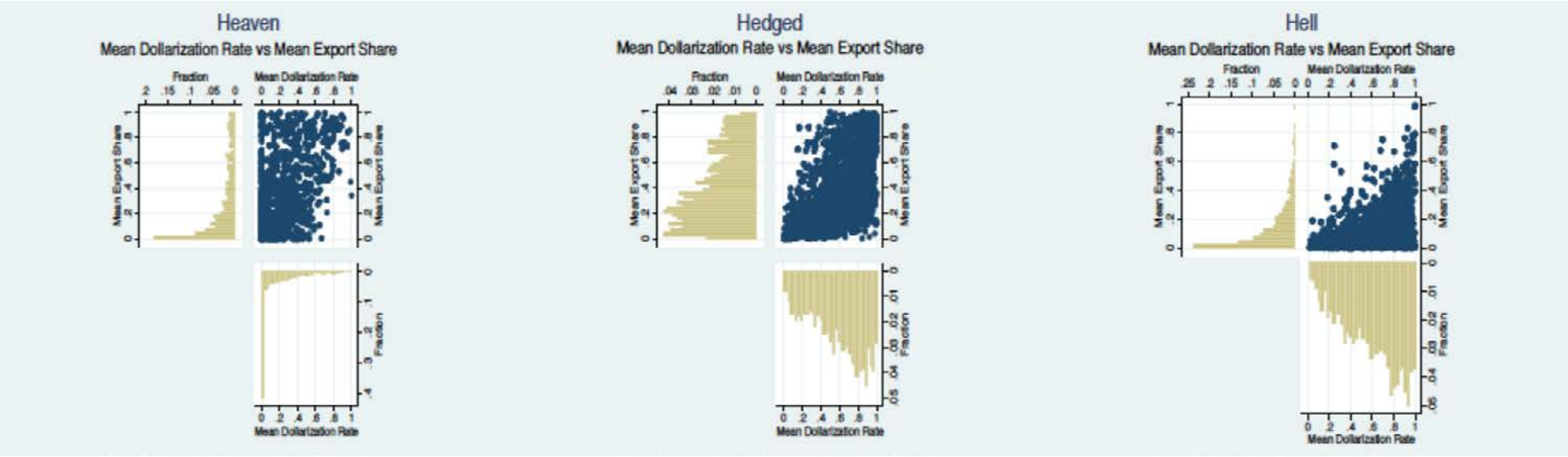
Descriptive statistics – Currency mismatch

	N	Mean	Min	Max
Log of Labour Productivity				
Hell	5863	11.71	4.74	16.93
Hedged	13561	11.69	7.06	19.29
Heaven	4621	11.47	8.21	16.17
Log of Real sales				
Hell	5863	16.79	8.18	22.62
Hedged	13561	16.74	10.63	23.6
Heaven	4621	15.97	8.35	23.82
Employment				
Hell	5863	252	5	5556
Hedged	13561	284	3	7967
Heaven	4621	217	3	17482
Age				
Hell	5830	23.67	3	122
Hedged	13521	24.96	4	93
Heaven	4596	24.12	3	134

	N	Mean	Min	Max
Dollarization Ratio				
Hell	5863	0.63	0	1
Hedged	13561	0.6	0	1
Heaven	4621	0.09	0	1
Leverage Ratio				
Hell	5863	0.61	0	3.39
Hedged	13561	0.58	0	5.13
Heaven	4621	0.51	0	3.83
Collateral Ratio				
Hell	5863	0.33	0	1
Hedged	13561	0.27	0	1
Heaven	4621	0.26	0	1
Log of Real Exports				
Hell	5863	13.37	1.1	21.88
Hedged	13561	15.24	1.32	23.24
Heaven	4621	13.48	0.22	22.00
Export Share (Exports/ Total sales)				
Hell	5863	0.14	0	1
Hedged	13561	0.4	0	1
Heaven	4621	0.26	0	1

- Firms under the hell category tend have lower export shares, higher tangible assets, and liability dollarization and leverage ratios.
- Firms in the heaven region, are relatively smaller in terms of both employment and real sales, have lower dollarization and leverage ratios. In terms of exporting, they in general export more than firms in the hell region but still considerable lower than firms in the hedged area.
- Firms in the hedged region have high export shares and they are slightly older than their counterparts in the heaven and hell regions.

FX denominated debt-export ratios



- Firms in heaven have an export share distribution skewed to the left ranging between 0 and 1
- The distribution of the dollarization ratio suggest that they tend to not carry foreign exchange denominated debt
- Firms belonging to the hedge region carry out both export and substantial amount of foreign currency debt.
- Firms in hedged region possess both high export share and liability dollarization ratio.
- Firms in the hell region are characterized by low export shares and high dollarization rates.

Statistics summary

- Labor productivities increase with size and age. Sales increase with age.
- Exports shares incrase with size. Mature firms have lower export shares.
- Larger firms are older, highly dollarized and have low leverage and high collateral ratios.
- Young firms are more leveraged and dollarized compared to mature firms.
- Exporters on average have higher labor productivity, real sales than non-exporters.
- Exporters have higher dollarization rate than non-exporters.
- Firms operating in sectors that use higher imported inputs have higher productivity and lower dollarization ratio, export shares and employment
- Firms under the hell category tend have lower export shares, higher tangible assets, and liability dollarization and leverage ratios.
- Firms in the heaven region, are relatively smaller in terms of both employment and real sales, have lower dollarization and leverage ratios.
- Firms in the hedged region have high export shares and they are slightly older than their counterparts in the heaven and hell regions.

Empirical model

➢ The baseline specification

$$\ln(X_{it}) = \alpha_1 \ln(RER_{jt}) + \alpha_2 VOL_t + \alpha_3 Z_{it} + \alpha_7 ln(GDP_t^D) + \alpha_8 ln(GDP_t^F) + \tau\mu_i + \varepsilon_{it}$$

➢ The extended specification

$$\ln(X_{it}) = \alpha_1 \ln(RER_{jt}) + \alpha_2 VOL_t + \alpha_3 Z_{it} + \alpha_7 GDP_t^D + \alpha_8 GDP_t^F + \boldsymbol{\alpha_9(FCD \times ln\,(RER_{jt}))} + \tau\mu_i + \varepsilon_{it}$$

- ***Z*** consists of firm specific variables: the log of labor productivity, log of real sales, liability dollarization ratio, leverage ratio, collateral ratio.
- We use levels and changes of log of exchange rates and labor productivity alternatively
- ***FCD*** are firm-specific dummies and interacted with real exchange rate to control for;
  - Sectoral import intensity
  - Liability dollarization
  - Natural hedging position
  - Size and age age

Estimation method

- Differenced GMM to consider dynamic aspects and control for potential endogeniety
- Liability dollarization ratio, log of labor productivity (change and its level), and log of real sales are treated as endogenous variables
- Using up to three lagged values of these variables and dependent variable (log of real exports) as the GMM-type instruments
- Macro variables and sectoral real exchange rates (change and its level) are employed as standard differenced instruments
- Second order autocorrelation tests (arm2) do not reject the hypothesis of no serial correlation in the error terms for almost all regressions.
- The Sargan tests do not reject the hypothesis of the validity of over-identifying restrictions almost in all regressions suggesting that instruments are valid
- Estimation period of 2002-2010 when flexible exhange rate regime was effective

Findings-1

- Real exports has an inertia and the coefficient of its lag is estimated in the range of 0.20-0.25 in all specifications.
- ***The exhange rate elasticity of exports*** is estimated around 3 percent, a ten percent depreciation of the exhange rate is estimated to increase exports about 3 percent.
- The coefficient of the change in labor productivity is estimated to be positive and significant
- Sales seem to affect exports positively.

	(1)	(2)	(3)	(4)
$lrexp_{i,t-1}$	0.198***	0.254***	0.230***	0.254***
$ln(RER_{jt})$	-0.319**	-0.276*		
$\Delta(ln(RER_{jt}))$			-0.340***	-0.230***
$ln(LP_{it})$	0.160		-0.202	
$\Delta(ln(LP_{it}))$		0.530***		0.338**
$ln(lrsale_{it})$	1.088***	0.824***	1.117***	0.878***

Findings-2

- Liability dollarization is estimated to support exports significantly, probably due to its role of undermining financial constraints.
- Firms with low tangible total assets ratios are estimated to have high export performance in general while the coeffcient of leverage ratio is insignificant in all specifications.
- Exchange rate volatility seem to curb export even though its coefficents is not significant in most cases.
- External demand seems to not support firm exports.

	(1)	(2)	(3)	(4)
$Dolratio_{it}$	0.424**	0.323	0.525***	0.412**
$Collateral_{it}$	-1.026	0.361	-2.155**	-0.501
$Leverage_{it}$	0.218	0.739	0.260	0.584
$\ln(GDP_t^F)$	1.489	3.735***	0.501	2.360
$\ln(GDP_t^D)$	-1.488**	-2.620***	-1.294**	-2.173***
VOL_t	-0.004	-0.007**	-0.003	-0.006**

Findings-3

- The exports of firms operating in sectors with high import intensitiy is estimated to be less sensitive to the change in real exchange rates
- The exports of firms with high FX debt-export ratio (hell) are more sensitive to real exchange rates.
- The exports of firms with moderate FX debt-export ratio (hedged) are less sensitive to real exchange rate.

	Import Intensity		Heaven		Naturally Hedged		Hell	
$\ln(RER_{jt})$	-0.392**		-0.274		-0.680***		-0.075	
$\Delta(\ln(RER_{jt}))$		-0.270***		-0.245***		-0.450***		-0.107
$ln(RER_{jt})*IM_j$	0.344*							
$D(ln(RER_{jt}))*IM_j$		0.099						
$\ln(RER_{jt})*HEAVEN_i$			0.003					
$\Delta\ln(RER_{jt})*HEAVEN_i$				0.074				
$\ln(RER_{jt})*HEDGED_i$					0.639***			
$\Delta\ln(RER_{jt})*HEDGED_i$						0.384***		
$\ln(RER_{jt})*HELLi$							-0.845***	
$\Delta\ln(RER_{jt})*HELL_i$								-0.552***

Findings-4

- Exports of medium, small and young firm groups are generally more sensitive to the real exchange rates.
- Large and mature firms are generally hedged against exchange rate fluactuations.
- Political economy outcome: unlike SMEs and young firms, they did not react to persistent currency appreciations in 2000s.

	Large		SMEs		Old		Young	
$\ln(RER_{jt})$	-0.449**		-0.127		-0.407**		-0.191	
$\Delta(\ln(RER_{jt}))$		-0.260***		-0.132		-0.272***		-0.189**
$\ln(RER_{jt})*LARGE_i$	0.576***							
$\Delta\ln(RER_{jt})*LARGE_i$		0.111						
$\ln(RER_{jt})*SMEs_i$			-0.300*					
$\Delta\ln(RER_{jt})*SMEs_i$				-0.194				
$\ln(RER_{jt})*OLD_i$					0.411**			
$\Delta\ln(RER_{jt})*OLD_i$						0.144		
$\ln(RER_{jt})*YOUNG_i$							-0.449*	
$\Delta\ln(RER_{jt})*YOUNG_i$								-0.202

Concluding remarks

- Contrary to macro evidence, analysis based on firms data suggests that exports of Turkish manufacturing firms are sensitive to real exchange rates.
- This sensitivity is smaller for firms operating in sectors with high import content, and those are naturally hedged, large and mature.
- The exports of firms with high currency mismatch are more sensitive to the change in real exchange rates. It seems competitiveness channel dominates the cost of production and the balance sheets channels.
- Evidence implies that liability dollarization undermines financial constraints and thus supports exports even though it might have negative impact on firms' profitibility in cases of large depreciation due to currency mismatch.

Thank you for listening..