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ABSTRACT

This paper investigates the causes and balance sheet effect consequences of the liability dollarisation of non-financial sectors in Turkey using the Company Accounts database compiled by the Central Bank of Turkey. The results from the panel EGLS and GMM procedures suggest that both sector-specific (tangibility, leverage ratio, export share) and macroeconomic condition variables (inflation, real exchange rate change, budget deficits and confidence) are significant in explaining the corporate sector liability dollarisation. Firms are found to match only partially the currency composition of their debt with their income streams making them potentially vulnerable to negative balance sheet affects of real exchange rate depreciation shocks. Consistent with this argument, real exchange rate depreciations are found to be contractionary, in terms of investments and profits, for sectors with higher liability dollarisation. Macroeconomic instability, as proxied by budget deficits and inflation, appears to have a significant negative affect on the performance of the firms in the non-financial sectors, in terms of their investments, sales and profits. Our results also stress the importance of strong macroeconomic policy stance and price stability for an endogenous dedollarisation process along with regulatory measures to limit vulnerabilities caused by dollarisation.

Keywords: Balance sheet effects**,** Capital structure, Corporate sector, Debt composition, Liability dollarisation, Turkey

JEL Classification: E22, F31, G32

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I. Introduction

The currency composition of debt and balance sheets of the main sectors in an economy are now at the centre of international macroeconomics literature with the recent financial crises experiences of a number of developing countries including East Asia, Latin America and Turkey. One strand of the literature focuses on the countrywide balance sheet currency mismatches caused by the fact that most countries cannot borrow internationally in their own currencies which is referred to as "original sin" by Eichengreen, Hausmann and Panizza (2004). The inability of many countries to borrow in domestic currency at long maturities and fixed rates even at home constitutes the domestic dimension of the original sin[2]. Given the persistence and often invariance of international original sin to prevailing policy regimes, another related strand of the literature now focuses also on the domestic dimension of the original sin which can potentially be solved by sound macroeconomic polices. In this paper, we consider an important part of the domestic original sin, liability dollarisation of the corporate sector in Turkey.

In Turkey, corporate sector firms appear to rely heavily on foreign currency (FX) and short-term debt instruments making them vulnerable to both exchange rate and interest rate shocks through currency and maturity mismatches. Interest rate increases can lead to a rollover risk and a decline in the net worth of the firms with higher short term debt magnifying the conventional interest rate channel as postulated by the financial accelerator mechanism (Bernanke, Gertler, and Gilchrist, 1999). The presence of liability dollarisation can make corporate sector firms' balance sheets and hence their net worth vulnerable to exchange rate shocks through currency and maturity mismatches. Real exchange rate depreciations, whilst can potentially make exporting firms more competitive, negatively affect balance sheets of unhedged nontradable firms and strain the firm's ability to service and/or rollover its debt. The consequent deterioration of borrowing capacity leads to a decrease in the firm's investment and production as suggested by the "balance sheet channel" literature (Aghion, Bacchetta

[2] Original sin has important theory and policy implications. It can be a source of financial fragility and limited ability to implement an independent monetary policy (Eichengreen *et al*., 2004), harsher macroeconomic adjustment process (Obstfeld, 2004) and greater vulnerability to sudden stops (Calvo *et al*., 2004). An important consequence of the original sin is neatly summarized by IMF (2005, p. 116): "an emerging market firm that is unable to obtain long term funding locally faces a trade-off between financing long-term investments with short term local currency liabilities, which creates a *maturity mismatch*, or borrowing long-term in foreign currency, which creates a *currency mismatch*". The results by Özmen and Arınsoy (2005, p. 599) suggest that "flexible exchange rates and strong macroeconomic policy stance with sound institutions are necessary but not sufficient for redemption from original sin".

and Banerjee, 2001). Furthermore, as noted by IMF (2005, p. 116) "both currency and maturity mismatches can exacerbate the impact of exogenous shocks in emerging markets, increase the severity of crises, and slow down the post crisis adjustment". All these may explain the crucial role of the currency composition of balance sheets of the main sectors especially of a developing country economy in the so called third generation crisis models[3].

Under perfect frictionless capital markets, nominal changes may be assumed to have no real effects on the firms' financial positions and consequently real decisions (Modigliani and Miller, 1958). Capital market imperfections, on the other hand, create a wedge between internal and external finance and lead firms' real decisions to depend crucially on their financial positions (Bernanke *et al*., 1999 and Gertler *et al*., 2003). Financial positions of firms, in turn, may not be invariant to their balance sheets currency composition and elasticity of their income and expenditures to real exchange rate changes. In the conventional open economy macroeconomics literature, following the Mundell-Flemming tradition, real exchange rate depreciations are expansionary as they increase the competitiveness of tradable sector firms in export markets. Thus the *competitiveness effect* can improve financial positions and net worth of tradable sector firms leading them to invest more in the case of a real depreciation. Firms with unhedged foreign currency debt, on the other hand, face an increase in their liabilities in domestic goods when the currency depreciates. The resulting decrease in the net worth and financial position will have a contractionary effect as firms invest less[4]. The overall impact of real exchange rate depreciations is thus an empirical issue and critically depends on the firm/industry characteristics and balance sheet currency compositions along with some macroeconomic factors such as the macroeconomic stability and the prevailing exchange rate regime.

[3] See Aghion *et al.* (2004), Calvo *et al*., 2004, Céspedes *et al*. (2004), Obstfeld (2004) Roubini and Setser (2004) and references therein for the recent accounts. It is worth noting that the IMF now puts a special emphasis on the role of balance sheet vulnerabilities in the genesis and evolution of financial crises and expands the set of surveillance instruments to contain also the balance sheet approach (Allen *et al*., 2002).

[4] As noted by Obstfeld (2004, p. 42) the possibility of contractionary devaluations was already discussed as early as 1960s. According to Díaz Alejandro (1965, p. 31), "Devaluation may produce another type of wealth effect when some groups of the country have debts to foreigners expressed in terms of foreign currencies. A devaluation will then increase the value of the debt expressed in domestic currencies and will exert a depressing influence on the expenditures of these groups, especially when the domestic prices they receive for the sale of their products or services do not increase proportionally with the devaluation. When a country has a net foreign debt, this effect will make more likely an improvement in the trade balance and a drop in output following a devaluation, especially when the debt is held by the private sector and is concentrated in short-term maturities".

There is a wide theoretical literature on the causes and consequences of liability dollarisation and currency mismatches. Compared with the theoretical contributions and empirical literature based on cross-country macroeconomic data, empirical studies on the determinants and the balance sheet consequences of liability dollarisation at the micro level have been much more limited basically due to data availability[5]. The recent exceptions mainly include studies on the Asian crisis of the late 1990s and Latin American countries. Harvey and Roper (1999) provide an earlier empirical account of the Asian crisis and find that balance sheet effects played a significant role in propagating the crisis. Claessens *et al.* (2000) find that vulnerabilities in corporate financial structures including currency and maturity mismatches in East Asia were significant even before the crisis. Luengnaruemitchai (2004), on the other hand, finds that the negative balance sheet effect of currency depreciation on non-financial firms with foreign currency (FX) debt was not very strong in the Asian crisis as these firms tended match their FX debt with their FX income.

Bleakley and Cowan (2002) consider a sample of publicly traded firms in five Latin American countries (Argentina, Brazil, Chile, Colombia and Mexico) between 1991 and 1999 and find that firms tend to match currency compositions of their liabilities and income streams leading to the lack of a significant negative balance sheet effect. Galindo *et al.* (2003), on the other hand, convincingly warn that the results by Bleakley and Cowan (2002) should be interpreted with a caution as around the half of the observations are from a single country (Brazil) with a fairly limited level of dollarisation under a strict prudential regulation. The results of the firm level studies for six Latin American countries, as summarised by Galindo *et al.* (2003), suggest that although firms tend to partially match their debt and income currency compositions, the degree of liability dollarisation often reverses the conventional expansionary competitiveness effect of currency devaluations on investment. Among the six Latin American countries, a negative balance sheet effect on investment appears to be the case for Argentina (Galiani *et al*., 2003), Colombia (Echeverry *et al*., 2003a,b), México (Pratap *et al*., 2003), and Peru (Carranza *et al*., 2003) whilst the evidence on Brazil (Bonomo *et al*., 2003) and Chile (Benavente *et al*., 2003) is somewhat weaker. The

[5] For a theoretical exposition see, among others, Krugman (1999), Aghion *et al.* (2004), Calvo *et al.* (2004), Céspedes *et al.* (2004) and Schneider and Tornell (2004). Galindo, Panizza and Schiantarelli (2003), Luengnaruemitchai (2004) and Cowan, Hansen and Herrera (2005) provide the recent surveys of the empirical literature on the causes and consequences of liability dollarisation at firm/industry level.
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results by Aguiar (2005) support the presence of balance sheet effects in explaining the recessionary impact of devaluation in the wake of the Mexican crisis of 1994. Cowan, Hansen and Herrera (2005), on the other hand, find a significant balance-sheet effect for Chilean firms when their currency composition of assets and income are both taken into account. In the same vein, Galindo *et al.* (2005) consider industry level data for 9 Latin American countries and find that the overall impact of a real exchange rate depreciation can be negative in industries with high liability dollarisation.

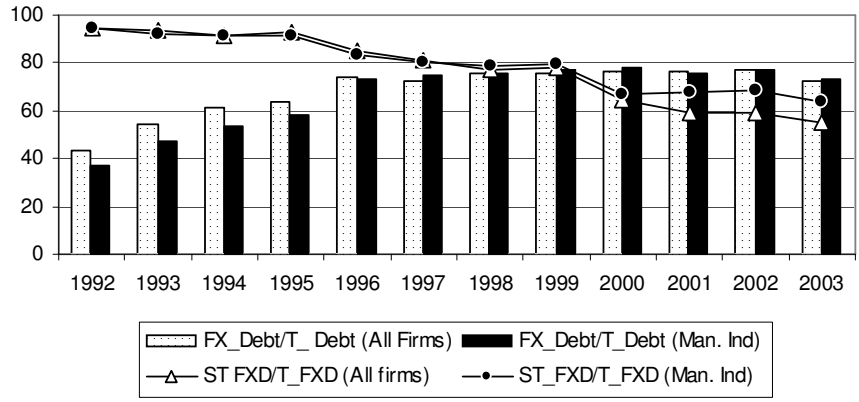
This paper attempts to contribute to this growing literature by investigating the causes and consequences of non-financial corporate sector liability dollarisation in Turkey using the sector level data compiled by the Central Bank of the Republic of Turkey (CBRT). The sector disaggregation in the database follows the NACE classification and our sample contains annual data for 26 main non-financial sectors (see Appendix Table A1) for the period of 1992-2003. We restrict our sample to non-financial sector as the behaviour and capital structure of the banks under financial regulation are not comparable with those of non-financial firms. The plan of the rest of the paper is as follows. In Section II, we briefly present the stylised facts of the corporate sector liability dollarisation in Turkey. Section III is devoted an empirical investigation of the determinants of the debt currency composition by taking into account both sector specific and macroeconomic variables. In Section IV we focus on the balance sheet effects of real exchange rates on investments, profits and sales. These two issues are interrelated as the balance sheet effect crucially depends on the currency denomination of debt. Finally, section V concludes.

II. Corporate Sector Liability Dollarisation in Turkey: Some Stylised Facts

To investigate the causes and balance sheet consequences of FX debt, we start by looking at some stylised facts of corporate liability dollarisation in Turkey during 1992-2003. Figure 1 plots the ratio of FX debt to total debt (FXD/TD) for all non-financial (NF) including manufacturing (Man.) sectors' firms as a measure of corporate sector liability dollarisation in Turkey. The figure also presents the ratio of short-term FX debt (maturity less than one year) to total FX debt (ST_FXD/T_FXD) as a proxy of foreign currency debt maturity mismatch. The corporate sector liability dollarisation, which was already high in 1992, sharply increased during 1992-1996 reaching a level of around 70% in 1996. After 1996, the dollarisation ratio fluctuated slightly around the severe level reaching local peaks with the implementation and collapse of the exchange rate based

stabilisation policy after 1999. The relative improvement of the macroeconomic conditions in 2003 appears to be effective in decreasing liability dollarisation around to a level of 1996, albeit which is still a very high one. The bulk of the FX debt (more than 80%) appears to be short-term until 2000. The relative improvement of the FX debt maturity with the stabilisation policy of 2000 seems not to be substantially distorted even with the financial crash of 2001 potentially due to the credibility of the post-crisis stabilisation programme. Although there have been some signs of improvements, the maturity structure and especially the level of corporate sector liability dollarisation can be interpreted still as a source of concern leading firms vulnerable to external shocks.

Figure 1. Corporate Sector Liability Dollarisation in Turkey (%)



The corporate sector liability dollarisation in Turkey can be interpreted as extremely high when compared internationally. According to IMF (2005, p. 118), the 1999-2003 averages of the corporate sector FX debt in percent of total debt are 33.6 for Latin America, 23.0 for Asia, 20.4 for Europe and 25.7 for all emerging market countries in the sample. The Latin American countries tend to have the highest liability dollarisation ratio. For an international comparison we consider the Inter-American Development Bank (IADB) database which provides firm-level information for approximately 2,000 non-financial firms from 10 Latin American countries for 1990–2002[6]. Figure 2 plots the liability dollarisation ratios (FX debt as a percent of total debt) for non-financial firms of Latin America and Turkey. Turkey (along with Uruguay) appears to be among the most dollarised countries whilst the liability dollarisation for Colombia, Chile and Brazil can be interpreted as relatively modest. As Cowan and Kamil (2004) warns, the case for Uruguay

[6] See Cowan and Kamil (2004) for a detailed information on the IADB database. The December (2003) issue of the Emerging Markets Review is entirely devoted to studies using the IADB database (see, Galindo *et al*., 2003 for a review).

should be interpreted with an extreme caution since the number of firms is too small to be clearly representative (less than 30 for most of the years). The small sample size problem is the case also for Venezuela and Costa Rica. The liability dollarisation tends to be relatively persistent for most of the countries. Consistent with an argument that fixed exchange rate regimes encourages dollarisation, the countries with hard pegs (Argentina) and *de facto* (Reinhart and Rogoff, 2004) crawling pegs (Bolivia, Costa Rica, Peru, Uruguay and Venezuela) are more dollarised than the countries with floating exchange rate regimes (Brazil, Chile, Colombia) during most of the sample period. It is worth noting that, the countries with lower dollarisation levels are also the countries enforced strict regulations on financial transactions in foreign currency[7] (Brazil, Chile, Colombia and to a certain extent Mexico). Therefore, the impact of exchange rate regime flexibility on dollarisation should better be interpreted with a caution as the lower dollarisation levels can be the result of also the strict regulations on FX transactions and currency mismatches to support a successful implementation of a flexible exchange rate regime. The Turkish experience, however, may be interpreted as somewhat exceptional as the level of the liability dollarisation remained the highest in spite of substantially differing degrees of exchange rate regime flexibility during the period. This may indeed show also the importance of strong macroeconomic policy stance and price stability for an endogenous dedollarisation process (Galindo and Leiderman, 2005) along with regulatory measures to limit vulnerabilities caused by dollarisation.

The financial fragility of firms with FX debt to real exchange rate depreciation shocks crucially depends on the mismatch between their currency composition of debt, assets and sources of income. The financial fragility can be expected more severe for low-exporting nontradable sectors which are highly leveraged in FX debt although their revenues are primarily in domestic currency. Figure 3 plots the ratios of FX debt (FXD) and short-term FX debt (ST_FXD) to exports (EXP) for all non-financial (NF) and manufacturing (Man.) sectors as broad measures of corporate sector exposure to debt-revenue currency mismatches[8]. The figure suggests a high level of liability dollarisation

[7] Singh *et al.* (2005, Chapter VI) provide a recent account of financial dollarisation and regulations in Latin America.

[8] This debt-revenue currency mismatch should better be defined to contain also import expenditures and hence to define FX revenue in terms of net exports. Furthermore, firms can be expected to hedge by holding FX assets. The omission of the former (latter) leads to an underestimation (overestimation) of the extend of the currency mismatch. Unfortunately, data for import expenditures and FX assets are not available.

with export earnings of the firms are covering almost only their FX debt during most of the period. Manufacturing sector firms appear to have generally relatively lower exposure to the debt-revenue currency mismatches. The mismatch tends to be the highest preceding the financial crisis years of 1994 and 2001. During the financial crises years of 1994 and 2001, the ratio of FX debt to exports substantially decreases potentially supporting both the competitiveness (increase in exports) and balance sheet (bankruptcies of firms with high liability dollarisation) effects of real exchange rate depreciations. The post-crisis adjustments, however, are not the same for the 1994 and 2001 crises. Firms tend to increase their mismatch exposure after the 1994 crisis whilst the post-crisis adjustment after 2001 contains gradually decreasing FX debt-exports ratios. These different adjustment mechanisms may plausibly related to the fact that the 1994 post-crisis stabilization efforts, different from the 2001 crisis, were not very successful in bringing price stability and in establishing a stronger macroeconomic policy stance. The credibility and the relative success of the post-2001 stabilization policy appear to be effective for firms to be more prudent on liability dollarisation and the consequent currency mismatches.

Figure 2. Liability Dollarisation in Latin America and Turkey

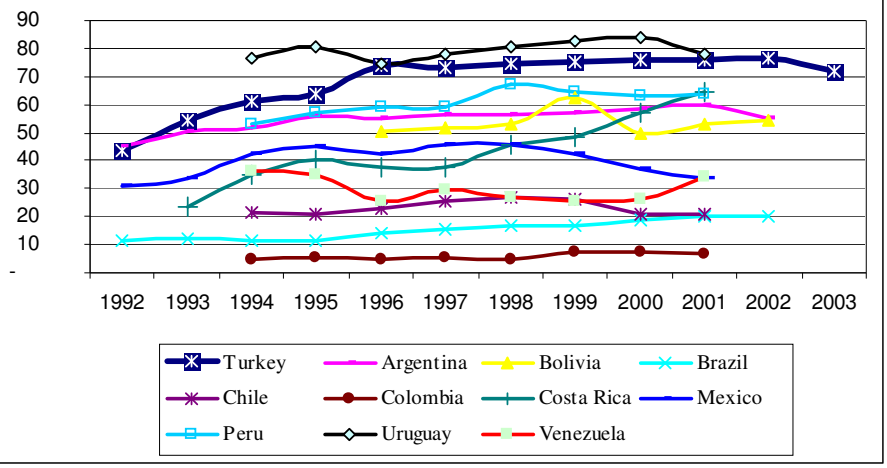


Figure 3. Foreign Currency Debt and Export Earnings (%)

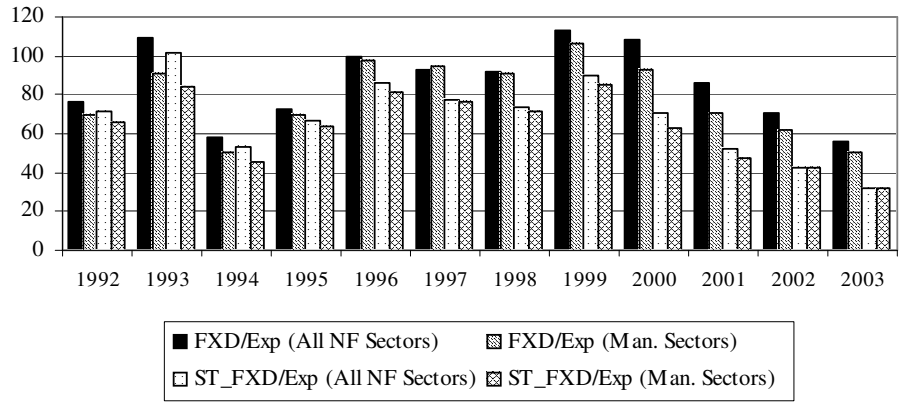


Figure 4 plots the liability dollarisation and export ratios of the sectors for the years 1992-2003. Following Echeverry *et al.* (2003b) we identify each sector as belonging to one of four zones[9]: *hell, heaven, hedge,* and *demand only*. Sectors with high dollarisation and low export levels are classified as being in hell. These sectors can be expected to be more vulnerable to the balance sheet effect of real exchange rate depreciations. In the opposite extreme, sectors in heaven export a large proportion of their output, yet have a low level of FX debt. Sectors hedging their high FX debt with higher export levels are classified in the hedge zone. The rest of the sectors with low levels of exports and FX indebtedness can be expected to face basically the demand channel of a real depreciation. It is worth noting that this arbitrary classification attempts to consider vulnerability to real depreciations and a sector in hell can actually be in heaven in the case of a real exchange rate appreciation. According to Figure 4, a majority of the sectors during the sample period belong to the hell zone. A considerable portion of the sample, on the other hand, belongs to "hedge" or "demand only" zones, with "heaven" zone containing only a negligible portion of observations.

[9] Note that our zone boundary for the horizontal axis (30% for the exports ratio) is less conservative than Echeverry *et al.* (2003b). When the Echeverry *et al.* (2003b) definition is considered (50%) almost all of the manufacturing sectors belong to the hell region.

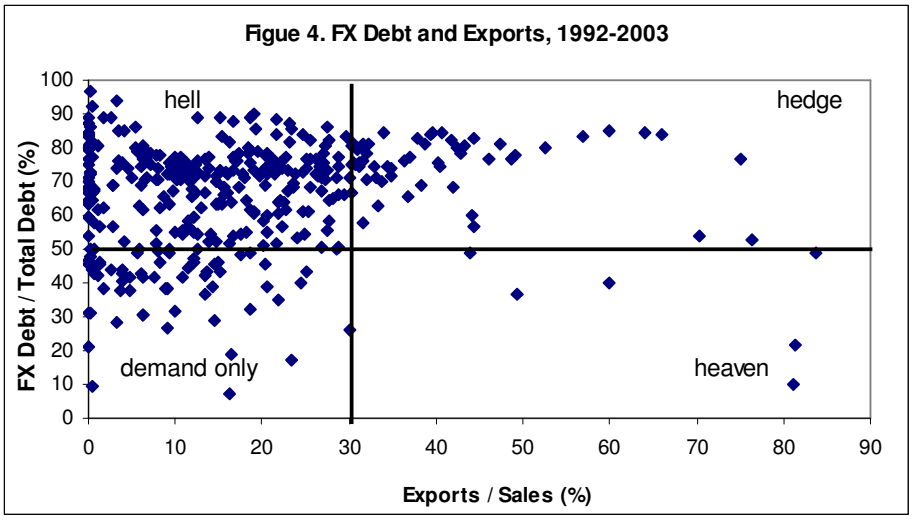
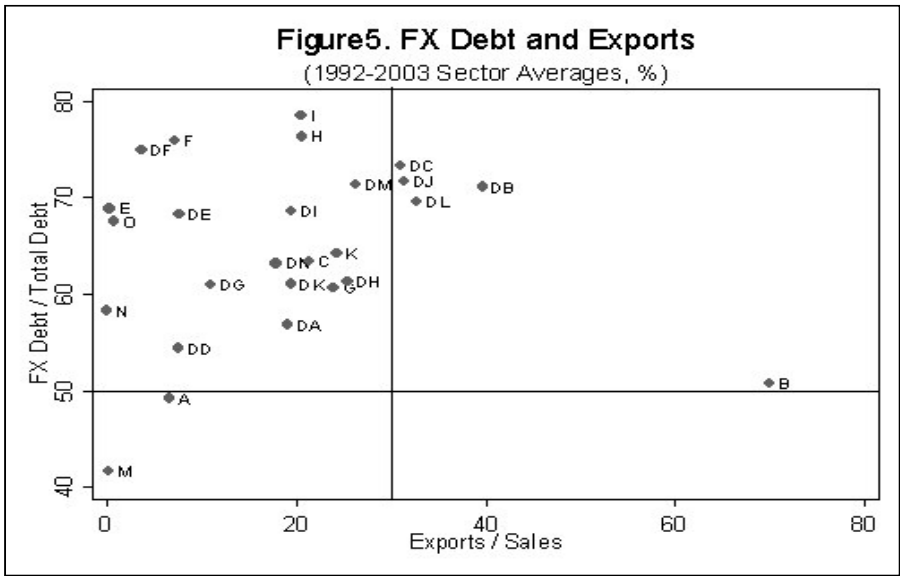


Figure 5 plots the 1992-2003 averages of the sectors' exports and FX debts. Supporting the evidence presented by Figure 4, the majority of the sectors appears to be in the hell zone. Sectors DC (manufacture of leather and leather products), DJ (manufacture of basic metals and fabricated metal products), DL (manufacture of electrical and optical equipment), DB (manufacture of textiles and textile products) and B (fishing) can be interpreted as hedging their FX debt with relatively higher levels of exports. Consistent with the fact that their export levels are very low, sector A (agriculture, hunting and forestry) and a conventional nontradable sector M (education) tend to be very prudent to liability dollarisation leading them to be affected basically through the demand affect of a currency depreciation. Some other sectors, specifically N (health and social work), O (other community, social and personal service activities), F (construction), E (electricity, gas and water supply) and DF (manufacture of coke, refined petroleum products and nuclear fuel), however, can be interpreted as largely ignoring the currency denomination of their income sources (domestic currency) when borrowing mainly in FX leading them to be potentially extremely vulnerable to negative balance sheet effect of real depreciations.



Note: See Appendix (Table A1) for the classification of the sectors and their codes.

II. The Determinants of Corporate Sector Liability Dollarisation

In this section we proceed with the investigation of the sector-specific and macroeconomic determinants of the corporate sector liability dollarisation in Turkey. To this end, we consider the following general form:

$$D^*_{it} = a_1 EXPS_{it} + \beta S_{it} + \gamma M_t + u_i + \upsilon_t + \eta_{it} \qquad (1)$$

where D* is the ratio of FX debt to total debt, EXPS is the share of exports to total sales, S and M contain other sector-specific and macroeconomic environment variables, respectively, with β and γ being the vectors of corresponding regression coefficients. In (1), υ_t and u_i are respectively time (t) and cross-section (n) specific effects and η_{it} is a disturbance term.

The significance of a negative balance sheet effect crucially depends on whether the FX debt is matched by the currency denomination of sector's revenues. In this context, Equation (1) contains EXPS to test whether the composition of the debt matches the international tradability of the sector's output. A positive coefficient on EXPS (a_1) implies that sectors tend to match their liabilities with the structure of their revenues. The results of the firm level studies for six Latin American countries suggest a significant positive relation between debt composition (the share of foreign currency debt in total debt) and

the international tradability of the firm's output in Colombia (Echeverry *et al*., 2003a,b), México (Pratap *et al*., 2003), Peru (Carranza *et al*., 2003) and Chile (Benavente *et al*., 2003 and Cowan *et al.* 2005). (Galiani *et al*., 2003) and (Bonomo *et al*., 2003), on the other hand, find a positive but statistically insignificant relationship between debt composition and tradability for Argentina and Brazil, respectively. In the same vein, Luengnaruemitchai (2004) considers the East Asian corporations and finds that firms tended match their FX debt with their FX income.

Following the studies reviewed by Galindo *et al.* (2003) we postulate also leverage ratio, LR (debt over total assets), asset tangibility TANG (net tangible fixed assets over total assets) and SIZE (proxied by the log of total sales deflated by sectoral price indices) as other potential sector-specific variables (S) explaining the debt decomposition. It is worth noting that, due to the lack of sector level data, S does not contain some other potentially important variables such as ownership, access to foreign capital markets and import shares (Cowan and Kamil, 2004). A greater degree of asset tangibility (TANG) mitigates asymmetric information problems and allows firms to be able to hold more debt. Higher asset tangibility can be expected to increase the share of domestic currency debt as it may be more difficult for a foreign creditor to liquidate tangible assets to recover a non-paid FX debt. However, this distinction between foreign and domestic creditors may not be very strong if the domestic financial system itself is severely dollarised. In such a case, the debt enhancing capacity of asset tangibility may be dominating leading a positive TANG coefficient. Therefore, the effect of the asset tangibility on the debt composition may not be unambiguous for a financially dollarised country. A similar argument may be applicable also for the LR and SIZE variables. Higher leverage ratios (LR) can severely limit the capacity of a firm to borrow both in domestic and foreign currencies. A negative (positive) LR coefficient, in this context, can be interpreted as firms finding it more difficult to borrow in foreign (domestic) currencies. An insignificant LR coefficient, in this context, is consistent with a case that both borrowing conditions are equivalently constrained by the debt level itself. Larger companies can be expected to hold more FX debt as they have a better access to international financial markets. However, the SIZE variable may be a poor proxy for the firm size distribution of the sectors and thus the coefficient of it should better be interpreted with a caution.

The conventional literature offers the set of macroeconomic conditions variables (M) explaining dollarisation to include basically real exchange rate change (ΔREER, an

increase in the REER denotes real appreciation) and inflation rate (INF). High and persistent inflation history, often reflecting the lack of credibility in domestic monetary policy, is conventionally taken as one of the basic driving forces of dollarisation (see, Levy-Yeyati, 2006 for a recent review). In this sense, in the absence of a readily available domestic currency indexed financial instruments, financial dollarisation may be a part of the optimal response of agents to a persistent high inflation. Consequently, firms' ability to borrow in domestic currency can be expected to decrease with higher inflation. Real exchange rate appreciations, on the other hand, decrease the real cost of FX debt in terms of domestic currency and thus can lead firms to prefer borrow from abroad. Real exchange rate appreciations under managed or fixed exchange rate regimes, for instance, can lead domestic financial system to borrow excessively from abroad as shown by the experience of the Asian countries before the crisis of the late 1990s. If the system is already dollarised, domestic financial intermediaries may prefer to lend in FX substituting a currency mismatch possibly with a maturity mismatch. Real exchange rate changes may be argued to have different effects on liability dollarisation and deposit dollarisation (currency substitution). Real depreciations, for instance, can be expected to discourage liability dollarisation especially in non-export oriented sectors whilst being an important determinant of currency substitution/deposit dollarisation.

High budget deficits sustained through the period can plausibly limit the available funds for the corporate sector by causing financial crowding out. Higher budget deficits can increase the debt default risk and thus concerns about debt repudiation via inflation can also severely limit the ability of firms to borrow in domestic currency. An increase in the perceived macroeconomic stability and more optimistic future expectations for economic activity, on the other hand, can strengthen confidence in the domestic currency. Therefore, we define the set of the macroeconomic condition variables (M) to include also budget deficits as a percent of GDP (BDEF) and the Real Sector Confidence Index of the Central Bank of Turkey based on business tendency surveys (CONF).

Table 1 reports the results of the models to explain the debt currency composition of the sectors. Equation (1.1) presents the results of the cross-section fixed effects Feasible Generalised Least Squares (GLS, with cross-section GLS weights) regression with coefficient standard errors that are robust to within cross-section residual correlation and heteroscedasticity (Arellano, 1987). The Hausman test strongly supports our choice of the fixed effects over the random effects specification. All the variables have the expected

coefficient signs and are statistically significant. The equation, however, may be misspecified as it does not consider the potential persistence of dollarisation which may be proxied by the lagged D*. The estimation of (1.1) augmented with the lagged D* employing the conventional panel data procedures, however, may be misleading under many cases as surveyed by Arellano and Honore (2001) and Bond (2002).

It may be plausibly argued that the sector specific variables are potentially endogenous for the evolution of the debt currency composition D*. This simultaneity issue along with the inclusion of the lagged D* is addressed by estimating the equation by employing Generalised Method of Moments (GMM) procedures developed for dynamic panel data models (DPD) by Arellano and Bond (1991) and Arellano and Bover (1995). We maintain that the macroeconomic condition variables BDEF, ΔREER, CONF and INF are strictly exogenous for the evolution of the sectors' debt composition over time. All the sector specific variables S (TANG, SIZE, LR, EXPS), on the other hand, are treated as being potentially endogenous. Equation 1.2 reports the results of the one-step GMM estimations with orthogonal transformation (Arellano and Bover, 1995) using all the available t-2 (and earlier) dynamic lags of D* and S. As noted by Bond (2002), the maintained endogenous variables should be treated symmetrically with the dependent variable, therefore we specify exactly the same dynamic lag structure for the instruments for D* and the variables in S. In equation (1.2) the instrument set contains also the current values of the maintained strictly exogenous variables M. The validity of the instrument set is strongly supported by the Sargan test of overidentification restrictions. The consistency of the GMM estimators crucially depends on the absence of serial correlation. If the disturbance in the original dynamic levels equation is not serially correlated, there should be evidence of significant negative AR(1) and no significant AR(2) in the difference equation (Arellano and Bond, 1991). The results for m1 and m2 for (1.2) therefore suggest the lack of serial correlation in the transformed GMM model. The results by the panel OLS and GMM are essentially the same supporting that the OLS coefficients are not significantly attenuated by a simultaneity bias.

The results presented in Table 1 strongly suggest that both sector-specific and macroeconomic condition variables are significant in explaining the corporate sector liability dollarisation in Turkey during the period. The significance of the positive EXPS coefficient supports the view that the sectors partially match the currency composition of their debt with that of their income streams. Given the fact that the sectors with low

export ratios are also heavily indebted in foreign currency, the evidence suggesting firms operating in export-oriented tend to hedge their exchange risk does not necessarily imply that the Turkish corporate sector is not exposed to a negative balance sheet affect. As will be discussed in the following section, the high level of exposure to exchange risk in the low-export sectors can dominate the partial hedge in the higher exporting sectors leading to an overall negative balance sheet effect. The leverage ratio (LR) and asset tangibility (TANG) are also found to be the significant determinants of the FX debt. Higher indebtedness appears to be limiting sectors' FX borrowing capacity as suggested by the significant negative LR coefficients. The positive and significant TANG coefficients, on the other hand, suggest that sectors with higher collateral levels can borrow more in FX. Considering the fact that the Turkish financial system is heavily dollarised, the positive TANG coefficient can be interpreted supporting also an argument that higher asset tangibility enhances the overall borrowing capacity of the sectors. The SIZE variable, which may indeed inappropriately proxying the sectors' firm size distribution, is found to be statistically insignificant in the determination of debt currency composition. According to the significant coefficient of the lagged dependent variable (D^*_{t-1}), sectors' debt exhibits some persistence in terms of currency denomination. As the bulk of the FX debt is short-term (less than one year), a considerable part of the persistence can be attributed to the inertia of the dollarisation process rather than the debt maturity structure itself.

The macroeconomic policy stance strongly matter for liability dollarisation as suggested by the significance of all the macroeconomic conditions variables INF, BDEF, ΔREER and CONF in the equations[10]. The severely high inflation rates sustained during the period until very recently have led a plausible confidence loss in the Turkish lira causing liability dollarisation in an environment lacking effective domestic currency indexed financial instruments. The substantially high budget deficits (BDEF) appear to be effective in limiting the ability of firms to borrow in domestic currency and causing an increase in the corporate sector liability dollarisation. An increase in the real exchange rate (real appreciation), on the other hand, encourages liability dollarisation potentially because it decreases the real cost of FX debt in terms of domestic currency. This affect can be expected to be stronger for the sectors with limited export earnings. The

[10] Most of the recent literature, including the studies reviewed by Galindo *et al.* (2003), prefer to use time dummies instead of the relevant macroeconomic variables themselves in estimating the debt composition equations. We prefer to consider the potentially relevant macroeconomic condition varaibles explicitly instead of proxying them with a set of time dummies.

significance of the negative CONF coefficient is in line with an interpretation that more optimistic future expectations for economic activity and an increase in the macroeconomic stability strengthens the confidence in domestic currency leading to a decrease in dollarisation.

Table 1. The Determinants of Liability Dollarisation

	Equation (1.1) GLS	**Equation (1.2) GMM**
Dependent Variable	$\mathbf{D_{it}^*}$	$\mathbf{D_{it}^*}$
Constant	-3.43 (12.50)	5.874** (0.982)
D^*_{it-1}		0.294** (0.009)
INF_t	0.211** (0.032)	0.107** (0.052)
$\Delta REER_t$	0.663** (0.089)	0.399** (0.131)
$BDEF_t$	1.370** (0.176)	0.894** (0.190)
$CONF_t$	-0.050 (0.042)	-0.066* (0.039)
$TANG_{it}$	0.282** (0.126)	0.665** (0.136)
$EXPS_{it}$	0.369** (0.065)	0.221** (0.098)
LR_{it}	-0.352** (0.083)	-0.274** (0.101)
$SIZE_{it}$	7.578** (2.085)	-4.561 (4.428)
N	285	225
Diagnostics	$R_w^2 = 0.93$, $R^2 = 0.53$, s.e = 11.24, DW = 1.29 $\chi^2_H(8) = 22.5[0.004]$	$\chi^2_{WALD}(9) = 242.2[0.000]$ P[SARGAN] = 0.88 m1 = -3.47 [0.001] m2 = -1.30 [0.19]

Notes: The values in parentheses are the coefficient standard errors (d.f adjusted) that are robust to within cross-section residual correlation and heteroscedasticity (Arellano, 1987). N is the effective number of observations. R_w^2 is the weighted R^2 from the GLS. * and ** denote the significance at the 10 and 5 %, respectively. m1 and m2 are the Arellano and Bond (1991) tests for first-order and second-order serial correlation, asymptotically N(0,1). χ^2_H and χ^2_{WALD} are respectively the Hausman test for comparing random and fixed effects models and the Wald test for the joint significance of the explanatory variables, with p-values given in [.]. P[SARGAN] reports the p–value of the SARGAN test for instrument validity and overidentification restrictions.

IV. The Balance Sheet Consequences of the Liability Dollarisation

Following Bleakley and Cowan (2002) and the literature reviewed by Galindo *et al.* (2003) and Cowan *et al.* (2005) we investigate the balance sheet consequences of corporate sector liability dollarisation by considering the following generic equation:

$$Z_{it} = b_1(\Delta REER_t \times D^*_{it}) + b_2 \Delta REER_t + b_3 D^*_{it} + \gamma M_t + u_i + \upsilon_t + \eta_{it} \qquad (2)$$

where Z_{it} is the sector-level outcome, typically taken as investment, profits, earnings and/or sales in the literature, and ΔREER is the annual real effective exchange rate change, with an increase of it representing real appreciation. M contains other macroeconomic condition variables postulated for the explanation of Z_{it}. As shown by Bleakley and Cowan (2002) the interaction of the FX debt (liability dollarisation level, D^*_{it}) with the real exchange rate change $\Delta REER_t$ is the key explanatory variable as the coefficient of it (b_1) represents the balance sheet effect of holding FX debt. A *positive* b_1 estimate suggests a *negative balance sheet effect* as real exchange rate depreciations lead to a lower Z_{it} for the sectors with higher liability dollarisation.

Investment appears to be the most commonly used performance measure in investigating the balance sheet effect (Cowan *et al*., 2005). Therefore, we first define Z_{it} as real investment rates INV measured as the annual change in real (deflated by WPI) fixed assets. Equations 2.1 and 2.2 of Table 2 report the estimation results of the cross-section fixed effects Feasible GLS (with cross-section GLS weights) and the two-step Arellano-Bond GMM estimation procedures, respectively. The instrument set of the GMM specification contains all the available (t-2 and earlier) dynamic lags of the potentially endogenous sector specific and interaction variables along with the levels of the macroeconomic variables which are treated as strictly exogenous. The results of the Sargan and Hausman tests support our choice of the instrument set and fixed effects model, respectively. The empirical validity of the GMM specification is not precluded by the presence of serial correlation as suggested by the results of the m1 and m2 tests.

The results of both GLS and GMM procedures strongly support the significance of our key balance sheet effect variable $\Delta REER_t \times D^*_{it}$. The coefficient of this interaction variable is positive suggesting that sectors with higher liability dollarisation invest more in the case of real exchange rate appreciations. In other words, real exchange rate depreciations are contractionary for sectors holding more FX Debt. The partial match of the currency

denomination of the sectors' revenues and liabilities suggested by the results of Table 1 earlier thus appears to be inadequate to avoid them from the negative balance sheet affect. Note that, it is basically neither the FX debt itself nor real exchange rate changes *per se*, but their interaction leads to the negative balance sheet affect. The direct effect of real depreciations on investment is positive as suggested by the significantly negative ΔREER coefficient. However, the negative net worth effect tends to dominating over this positive competitiveness affect leading real exchange rate depreciations to be contractionary in Turkey during the sample period. The results reveal also the negative effects of the substantially high budget deficits and the severe inflation rates on investment during the period. The contractionary effect of the budget deficits can be interpreted as being perfectly consistent with the "expansionary fiscal contractions" arguments in the literature (Giavazzi *et al*., 2000 and Özatay, 2005).

In addition to investment, we also consider the effects of liability dollarisation on net sales and profits. To this end, the sector performance variable Z_{it} is defined as period profits before interest and taxes as a percent of total assets (PROF) in equations (3.1) and (3.2) reported in Table 3. Equations (3.3) and (3.4), on the other hand, consider Z_{it} as the net sales as a percent of total assets (SALE). All the PROF and SALE equations are data-acceptable as suggested by the results of the diagnostic tests. Both profits and sales appear to be negatively affected by macroeconomic instability proxied by inflation (INF) and budget deficits (BDEF). The negative impact of budget deficits on the corporate sector performance may be taken as much less controversial if we consider the fact that deficit finance via domestic borrowing in a non-Ricardian economy can lead both a financial crowding-out and a decrease in domestic spending through higher interest rates. The impact of inflation especially on profits, however, is somewhat less significant consistent with an argument that firms tend to follow a mark-up based adaptive pricing strategy in an economy where the nominal contracts are often indexed to the substantially high inflation rates.

Table 2. Liability Dollarisation and Corporate Sector Investments

	(2.1) GLS	**(2.2) GMM**
Dependent Variable	**INV_{it}**	**INV_{it}**
Constant	35.51** (11.54)	52.35** (21.37)
INV_{it-1}	-0.203** (0.06)	-0.149** (0.005)
$\Delta REER_t \times D^*_{it}$.	3.602** (1.131)	2.815** (0.195)
$\Delta REER_t$	-1.325** (0.617)	-1.485** (0.507)
D^*_{it}.	-0.019 (0.155)	0.133 (0.206)
INF_t	-0.078 (0.050)	-0.275* (0.167)
$BDEF_t$	-1.124** (0.596)	-2.817* (0.906)
N	249	212
Diagnostics	$R_w^2 = 0.46$, $R^2 = 0.20$, s.e = 90.4, DW = 2.02 $\chi^2_H(6) = 38.9[0.00]$	$\chi^2_{WALD}(6) = 6055[0.00]$ P[SARGAN] = 1.00 m1 = -2.11 [0.035] m2 = -0.99 [0.32]

Notes: The values in parentheses are the coefficient standard errors (d.f adjusted) that are robust to within cross-section residual correlation and heteroscedasticity (Arellano, 1987). N is the effective number of observations. R_w^2 is the weighted R^2 from the GLS. * and ** denote the significance at the 10 and 5 %, respectively. m1 and m2 are the Arellano and Bond (1991) tests for first-order and second-order serial correlation, asymptotically N(0,1). χ^2_H and χ^2_{WALD} are the Hausman test for comparing random and fixed effects models and the Wald test for the joint significance of the explanatory variables, respectively, with p-values given in [.]. P[SARGAN] reports the p–value of the SARGAN test for instrument validity and overidentification restrictions.

The empirical literature often ignores the possibility that the impact of liability dollarisation on sales and profits may be quite different from each other. Liability dollarisation and the capital structure of the firms, *per se*, may not affect sales whilst basically determining profits and hence investments. The evidence from the Turkish data presented in Tables 2 and 3 strongly supports this hypothesis. The significant dollarisation variable D^*_{it} in the GLS equation becomes insignificant in the GMM specification when the potential endogeneity of it is also considered. This suggests that we have no strongly reliable evidence that the liability dollarisation itself affects net sales. Liability dollarisation, as being basically a cost item, on the other hand, negatively affects profits (equations 3.1 and 3.2). In the same vein, the profitability of the sectors with higher debt dollarisation are negatively affected from real exchange rate depreciations as suggested by

the significant positive coefficients of the interaction variable $\Delta REER_t \times D^*_{it}$ in (3.1) and (3.2). This is consistent with our earlier finding supporting the negative balance sheet effect of real depreciation on investment. The insignificance of the $\Delta REER_t \times D^*_{it}$ variable in (3.3) and (3.4) is consistent with a plausible argument that the sales of the sectors are invariant to their capital structure and levels of liability dollarisation. Real exchange rate appreciations decrease both sales and profits suggesting that the competitiveness affect is strong. This strong competitiveness affect, however, does not adequately offset the negative balance sheet impact of the FX debt and consequently real exchange rate depreciations tend to be contractionary in terms of both profits and investments.

Table 3. Corporate Sector Performance and Liability Dollarisation

	(3.1) GLS	**(3.2) GMM**	**(3.3) GLS**	**(3.4) GMM**
Dependent Variable	**$PROF_{it}$**	**$PROF_{it}$**	**$SALE_{it}$**	**$SALE_{it}$**
Constant	9.173** (1.365)	5.103** (1.336)	62.79** (7.986)	17.11** (2.554)
$PROF_{it-1}$	0.427** (0.101)	0.352** (0.054)		
$SALE_{it-1}$			0.575** (0.061)	0.354** (0.036)
$\Delta REER_t \times D^*_{it}$.	0.146* (0.079)	0.403** (0.038)	0.055 (0.188)	0.003 (0.057)
$\Delta REER_t$	-0.042 (0.055)	-0.375** (0.038)	-0.312** (0.127)	-0.576** (0.086)
D^*_{it}.	-0.038* (0.022)	-0.110** (0.024)	-0.096** (0.030)	-0.024 (0.050)
INF_t	-0.009 (0.016)	-0.037** (0.010)	-0.063* (0.035)	-0.166** (0.022)
$BDEF_t$	-0.311** (0.115)	-0.166** (0.060)	-0.432** (0.188)	-0.403** (0.109)
N	273	236	273	236
Diagnostics	R_w^2 = 0.68, R^2 = 0.63, s.e = 4.63, DW = 1.86 $\chi^2_H(6)$ = 41.2 [0.00]	$\chi^2_{WALD}(6)$=312[0.00] P[SARGAN] = 1.00 m1 = -3.58 [0.000] m2 = 1.18 [0.24]	R_w^2 = 0.97, R^2 = 0.89, s.e = 16.6, DW = 1.72 $\chi^2_H(6)$ = 81.5[0.00]	$\chi^2_{WALD}(6)$ = 542[0.00] P[SARGAN] = 1.00 m1 = -1.89 [0.07] m2 = -0.54 [0.59]

Notes: The values in parentheses are the coefficient standard errors (d.f adjusted) that are robust to within cross-section residual correlation and heteroscedasticity (Arellano, 1987). N is the effective number of observations. R_w^2 is the weighted R^2 from the GLS. * and ** denote the significance at the 10 and 5 %, respectively. m1 and m2 are the Arellano and Bond (1991) tests for first-order and second-order serial correlation, asymptotically N(0,1). χ^2_H and χ^2_{WALD} are the Hausman test for comparing random and fixed effects models and the Wald test for the joint significance of the explanatory variables, respectively, with p-values given in [.]. P[SARGAN] reports the p–value of the SARGAN test for instrument validity and overidentification restrictions.

V. Concluding Remarks

In this study we investigated the causes and balance sheet effect consequences of the currency composition of the non-financial sectors in Turkey. The level of the liability dollarisation of the Turkish corporate sector firms is extremely high when compared internationally making them potentially vulnerable to real exchange rate depreciation shocks. According to our results, both sector-specific (tangibility, leverage ratio, export share) and macroeconomic condition variables (inflation, real exchange rate change, budget deficits and confidence) are significant in explaining the corporate sector liability dollarisation. The result that dollarisation significantly decreases with macroeconomic stability can be interpreted as showing also the importance of strong macroeconomic policy stance and price stability for an endogenous dedollarisation process along with regulatory measures to limit vulnerabilities caused by dollarisation.

Sectors with higher export levels can be expected to be less vulnerable to a negative balance sheet effect of real domestic currency depreciations. We indeed find that the liability dollarisation and export levels of the sectors are positively correlated suggesting that firms tend to match, at least partially, the currency composition of their debt with their income stream. However, the fact that the sectors with low export ratios are also heavily dollarised, the evidence suggesting firms operating in export-oriented sectors tend to hedge their exchange risk does not preclude the Turkish corporate sector being exposed to a negative balance sheet affect. Consistent with this argument, real exchange rate depreciations are found to be contractionary, in terms of investments and profits, for sectors with higher FX debt. The high level of exposure to exchange risk in the low-export sectors thus dominates the partial hedge in the higher exporting sectors leading to an overall negative balance sheet effect which is not compensated by the direct expansionary competitiveness impact of real exchange rate depreciations. The performance of the firms in the non-financial sectors, in terms of their investments, sales and profits, are found to be significantly determined by also the variables proxying macroeconomic instability.

Our results strongly support that the structure and currency composition of balance sheets of the main sectors in an economy may substantially matter as suggested by wide and a growing body of the recent theoretical and empirical literature. The relevance of the balance sheets for the real impact of macroeconomic policies may become crucially important especially for a financially dollarised economy like Turkey. Our negative

balance sheet results for the non-financial corporate sectors can be interpreted to lend a support for the case for a “fear of floating”. The evidence that macroeconomic conditions matter, however, may be quite consistent with a view that a sustained strong macroeconomic policy stance and price stability can endogenously decrease the relevance of “fear of floating” in favour of a flexible exchange rate regime.

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APPENDIX

The Data

We consider the sector level unbalanced data compiled by the Central Bank of the Republic of Turkey (CBRT). The CBRT data are based on the annual financial accounts of a large number of companies and the sectors are classified according to NACE (*Nomenclature Generale des Activites Economique dans les Communautes Europeennes*), Rev.1. The CBRT website www.tcmb.gov.tr provides detailed information on the database and sector data for the years after 1997. Table A1 below presents the NACE classification of the non-financial sectors considered in this study along with their codes and the average number of firms (per year) in the CBRT database.

Table A1. Sector Classification

Sector code	Average annual number of firms	Sectors
A	102	Agriculture, hunting and forestry
B	12	Fishing
C	183	Mining and quarrying
E	36	Electricity, gas and water supply
F	1140	Construction
G	1980	Wholesale and retail trade
H	381	Hotels and restaurants
I	396	Transport, storage and communication
K	156	Real estate, renting and business activities
M	62	Education
N	50	Health and social work
O	41	Other community, social and personal service activities
DA	659	Manufacture of food products, beverages and tobacco
DB	979	Manufacture of textiles and textile products
DC	86	Manufacture of leather and leather products
DD	123	Manufacture of wood and wood products
DE	155	Manufacture of pulp, paper and paper products; publishing and printing
DF	8	Manufacture of coke, refined petroleum products and nuclear fuel
DG	274	Manufacture of chemicals, chemical products and man-made fibres
DH	192	Manufacture of rubber and plastic products
DI	246	Manufacture of other non-metallic mineral products
DJ	379	Manufacture of basic metals and fabricated metal products
DK	240	Manufacture of machinery and equipment n.e.c.
DL	184	Manufacture of electrical and optical equipment
DM	194	Manufacture of transport equipment
DN	91	Manufacture of furniture, manufacturing n.e.c.
D		Manufacturing sectors