Foreign currency borrowing and leverage adjustments

Abstract

This paper examines how the use of debt in foreign currency (DFC) affects firms' leverage adjustments using a novel dataset of firms' foreign currency borrowing across 37 countries. We show that the use of DFC substantially decreases the leverage adjustment speeds. This decrease is due to the higher marginal cost of implementing leverage changes due to variations in exchange rates. The adjustments toward target leverage vary with country and firm-level features that are related to the costs and benefits of using DFC. At the country level, the negative effect of DFC is more pronounced for firms in emerging economies than for those in advanced economies. At the firm level, this negative effect is less pronounced in export-oriented industries and firms that use derivatives, consistent with the idea that operational or financial hedging mitigates the effects of exchange rate variations on the deviations from the firms' optimal leverage.

Keywords: Foreign currency debt, Dynamic trade-off theory, Leverage Adjustments, Exchange rate exposure
JEL Codes: F15, F18, F31, F32, F34

1 Introduction

The use of DFC is widespread among large corporations. Firms may issue DFC for various reasons, such as hedging operational foreign exchange (FX) exposure (Alfaro et al., 2023) or accessing lower-cost financing (Bocola and Lorenzoni, 2020; Gutierrez et al., 2023; Öztekin and Flannery, 2013), particularly in jurisdictions with thin capital markets in local currency. In addition, macroeconomic features, such as interest rate differential (Hassan and Zhang, 2021), and uncovered interest rate parity deviations (Bruno and Shin, 2017; Opie and Riddiough, 2020) may create incentives for firms to time the debt market. Thus, firms dynamically respond to changes in the environment and adjust their financial policies to broader institutional and macroeconomic environments (Öztekin and Flannery, 2013). However, despite the importance of DFC usage, little is known about how firms adjust their leverages when they borrow in foreign currency.[1]

This paper investigates the effects of DFC on the speed of adjustment (SoA) of the firms' capital structure. We conjecture that the cost of adjusting leverage when firms borrow in foreign currency depends not only on explicit transaction costs, but also on country- and firm-specific features. At the country level, exchange rate volatility imposes larger deviations from the target leverage due to exchange rate variations. Lower capital market development may also affect the availability of hedging instruments and impair the firms' ability to manage the currency risks that affect leverage. Larger deviations imply a slower SoA. Firm-specific features, such as the existence or not of operational currency hedge, also affect how exchange rate variations affect deviations from the target and the SoA. If DFC partially or totally offsets the firm's transaction and economic exposure to exchange rate risk (as is the case of exporters, for example) its usage would imply smaller deviations from the desired capital structure. However, in most cases, DFC does not offset operational exposure to FX risk and may increase FX exposure (for importers or firms whose inputs are affected by the exchange

[1]These leverage adjustments are present in real-world corporate finance. Firms report having a target debt-equity ratio and are prepared to let it deviate from this target, and periodically adjust leverage to bring it back into line (Graham and Harvey, 2001; Graham, 2022) based on a satisficing behavior (Simon, 1956).

rate). Unhedged DFC may entail larger deviations from the target capital structure due to exchange rate presents large variations. These exposures may impose additional costs of adjustment, because decreasing the firm's leverage is more costly when the exchange rate varies in an unfavorable direction, therefore leading to a lower SoA.

Therefore, the choices of issuing DFC, and how much of it, reflect a tradeoff between DFC's marginal costs and benefits. DFC increases firms' currency risks and, consequently, reduce the firm's SoA. However, DFC may allow for larger and cheaper access to capital. Firms are more likely to bear the costs of currency risks in environments with thinner capital markets (typically emerging economies) than in jurisdictions with thicker markets (developed economies). In addition, assets denominated in a strong currency, like the USD, serve as a form of insurance for investors emerging economies because local currencies typically depreciate during adverse macroeconomic conditions (Brunnermeier et al., 2008; Mancini et al., 2013). The typically large interest rate differentials tend to turn emerging market currencies into "carry currencies" (Koijen et al., 2018). Consequently, the forward exchange rate, determined by covered interest rate parity (non-arbitrage), is a biased predictor of the future exchange rate, as it embeds a currency premium. As a result, borrowing in foreign currency typically results in a lower expected cost of debt compared to borrowing in local currency in emerging markets. At the firm level, high-productivity firms are more likely to use DFC than low-productivity firms, as they will benefit more from increased access to capital (Salomao and Varela, 2022), and firms in exporting sectors will tend to use more DFC as it functions as a currency hedge.

We use a cross-country panel sample of firms with more than 180,000 observations from firms in 37 countries, including advanced and emerging economies from 2002 to 2021. We extract novel data on DFC at the contract issuance level from Capital IQ, and match these with data from Compustat Global. The data show that, in advanced economies, approximately one in seven firms uses DFC. The proportion of DFC users is much larger (more than one in four firms) in emerging economies, consistent with our conjecture that the benefits

of using DFC are larger in jurisdictions with thinner capital markets. DFC as a proportion of total debt is also larger in emerging than in developed economies, suggesting that the benefits of using DFC are more pronounced in emerging economies, either due to a reduction in the cost of debt or because of limited access to capital in local currency. In addition, DFC users are larger, more levered and more profitable than non-users in both advanced and emerging economies, in line with the model of Salomao and Varela (2022) and their findings for Hungarian firms. Firms in exporting sectors are more likely to use DFC, as expected, but there is a great deal of DFC usage in firms from non-exporting sectors.

In our baseline analyses, We examine whether DFC imposes additional costs for firms and results in slower speed of capital structure adjustment. Because firms simultaneously decide on their target leverage, currency of debt and how fast they adjust to the target leverage, we start by estimating a selection model, in which we identify the firm- and country-level factors that affect the likelihood of a firm using DFC. Then, we use these likelihoods to estimate the firms' target leverage. Using the estimated likelihood of using DFC instead of observed usage of DFC mitigates self-selection concerns, as these likelihoods already embed the observable features associated with DFC usage. Finally, we adapt the classic speed of adjustment models of Flannery and Rangan (2006) by adding an interaction term to capture the additional effect of DFC on the speed of adjustment.

Our findings show that foreign currency borrowing significantly slows down the speed of adjustment towards the target leverage. For firms in developed economies, firms without DFC adjust approximately 44% of their market leverage gap in each year, whereas for DFC firms, the figure is approximately 42%. In emerging markets, non-DFC firms close 45% of the gap in each year, and DFC firms close only 41% of their gap.[2] We observe a similar pattern for book leverage SoA. The slower speed of adjustment for DFC firms compared to non-DFC firms strongly suggests that using DFC entails an additional cost in the firms' attempt to

[2]We also estimate the unconditional speed of adjustment (*i.e.*, the classic Flannery and Rangan (2006) model, without any interactions) for each country in our sample. Our estimates are close to those obtained by Öztekin and Flannery (2013) and with most of the literature on speeds of adjustment. These papers typically find that firms close 35-45% of their leverage gap in each year.

adjust their leverage ratio, consistent with the rationale that exchange rate variations create larger deviations from the target and an additional hurdle for firms to adjust their capital structure towards the target.

Furthermore, we find that adjustment speeds are heterogeneous across firms. First, we use exports data at the industry-country level to identify export oriented industries in each country. We find that the reduction in SoA due to DFC usage is less pronounced for firms in export-oriented industries. This result is consistent with the rationale that DFC and exports create a natural hedge, implying smaller deviations from the target leverage upon exchange rate variations than in non-exporting sectors, thus leading to faster adjustment towards the target leverage.

In an attempt to capture the effect of hedging on the speed of adjustment, we also identify firms that state having derivatives adjustments in their income statement, and use this information as a proxy for hedging. Our results show that the negative effect of DFC on the speed of adjustment is less pronounced among hedgers than among non-hedgers. This result suggests that hedging partially offsets the effects of exchange rate variations on deviations from the target leverage.

We submit our inferences to a series of robustness checks. To further identify the moderating role of country-level financial market development on the effects of DFC on SoA, we split our sample into countries with high, medium and low financial structure, based on the classifications of Beck et al. (2009) and Čihák et al. (2012). We find that, firms without DFC in high financial structure countries adjust their book (market) leverage 13 (5) percentage points faster than in low and medium structure countries. However, the marginal negative effect of DFC on the SoA is more pronounced in high financial structure countries. As a result, the SoA of firms with DFC in high financial structure is almost the same as in medium and low financial structure countries.

We also split our sample in terms of exchange rate volatility during our sample period, and find that the negative effect of DFC on the SoA is less pronounced in low-volatility countries

than in other countries. This is consistent with the idea that exchange rate volatility is at least one of the mechanisms that make firms with DFC adjust their capital structure more slowly than non-DFC firms.

Our paper contributes to the literature in several dimensions. First, we add to the literature on the balance sheet effects of currency fluctuations (e.g., Krugman (1999); Caballero and Krishnamurthy (2003); Céspedes et al. (2004)) by further understanding the balance sheet effects of corporate debt in foreign currency, and gauging how much firms deviate from their desired capital structure at which speed firms adjust their leverage according to their usage of DFC.

Second, we contribute to the literature on firm dynamics and leverage adjustments (e.g., Flannery and Rangan (2006) and Flannery and Hankins (2013)). Some papers (e.g. Öztekin and Flannery (2013)) look at the effect of institutions on leverage adjustments, and we add by further exploring the effects of country-level features (such as currency volatility) on leverage dynamics. Other studies found evidence of heterogeneity in leverage adjustments across firm-level features such as cash flow (Faulkender et al., 2012), credit conditions (Lockhart, 2014; Devos et al., 2017), and business transactions (Flannery et al., 2022). We contribute to this stream by documenting how DFC and operational and financial hedging heterogeneously affect these costs.

We also contribute to the literature on the drivers and effects of DFC usage (e.g., Salomao and Varela (2022)) by examining additional costs of DFC usage. More indirectly, we also contribute with the extensive literature on corporate hedging, as our paper aims at understanding how firms with different exposure to currency risks set their target leverage and adjust their capital structure towards this target. Finally, our paper also contributes to the recent policy debate on the importance of foreign currency debt for financial stability (e.g., Du and Schreger (2022)).

The remainder of this paper is organized as follows. Section 2 presents the theoretical framework for hypotheses statements. Section 3 describes data sources and explains how

we incorporate foreign exchange rate fluctuations into a model of target leverage and SoA to reflect the interaction between a firm's debt in foreign currency and its capital structure adjustments. In section 4, we illustrate some distinguishing features of modeling target leverage and SoA when firms borrow in foreign currency, explain how it affects a firm's cost of making leverage adjustments, and extend the model to deal with potential endogeneity problems. In Section 5, we test whether the level of currency volatility and depreciation shocks affect adjustment speeds. The final section summarizes results and discusses their implications for balance sheet effects of currency fluctuations, leverage adjustments, and corporate hedging theories.

2 Literature review and hypotheses statement

Two conflicting assumptions arise when looking at the effect of currency depreciations on firms – expansionary versus contractionary. The expansionary view argues that currency depreciations should be beneficial, thanks to the increased competitiveness of domestic exporters (Bleakley and Cowan, 2008). The contractionary view, in contrast, postulates that in economies with financial frictions, currency depreciations may exert a significant negative effect on balance sheets due to the presence of foreign currency liabilities that are not entirely hedged (Caballero, 2021). Consequently, firms engaging in international trade and borrowing in foreign currency are significantly exposed to currency risk, as the use of operational hedging is limited (Alfaro et al., 2023).

Firms can opt to borrow in foreign currency to capitalize on deviations in uncovered interest rate parity, boosting their investments. However, this financing approach may expose firms to balance sheet impacts that could result in the deterioration of their financial conditions (Alfaro et al., 2019; Niepmann and Schmidt-Eisenlohr, 2022), underinvestment (Caballero, 2021), and stock price decline (Bruno and Shin, 2020). Therefore, unhedged foreign exchange liabilities on the balance sheets of firms play a significant role in the neg-

ative macroeconomic consequences that arise from currency depreciation events.[3] Foreign currency debt poses a risk to balance sheets at the time of depreciation of the currency. This trade-off generates heterogeneity in foreign borrowing decisions across firms. Only highly productive firms can bear the exchange rate risk and borrow in foreign currency. From these, capital-scarce firms with a high return on investment use this type of financing to a greater extent (Salomao and Varela, 2022). Thus, firms' characteristics and macroeconomics may impact which firms decide to borrow in foreign currency.

According to our rationale, we should expect a negative relation between the use of DFC and the SoA. The exposure to FX fluctuations caused by DFC creates additional shocks, negatively affecting the speed at which they adjust toward target leverage. Firms without DFC, in contrast, do not have these additional costs. Thus, we propose our first hypothesis:

Hypothesis 1. Firms with foreign currency debt have a slower speed of adjustment compared to firms without foreign currency debt.

Differences in the institutional setting may explain part of the variance in the speed of adjustment of the firms towards a desired debt ratio. In emerging economies, local capital markets are thinner and present more friction. However, DFC enables firms to increase their investment and expand more quickly, and more inclined to take on foreign currency debt and bear its currency risk (Salomao and Varela, 2022). Thus, there is a high degree of liability dollarization and currency mismatch that creates the conditions for a balance sheet effect in the aftermath of currency depreciation in emerging markets (Carranza et al., 2003) and markets with more volatile currencies (Sikarwar, 2020). We present the following hypothesis:

Hypothesis 2. Firms in countries with higher FX volatility have a slower speed of capital structure adjustment than in countries with lower FX volatility.

[3]Foreign exchange effects on the balance sheet were introduced by seminal works such as Krugman (1999), Caballero and Krishnamurthy (2003), and Céspedes et al. (2004). Recent studies by Gopinath and Stein (2021) and Eren and Malamud (2022) have highlighted the dominant role of the dollar in areas of international trade, and corporate borrowing, among others. Further, Salomao and Varela (2022) present a theoretical and empirical analysis showing how critical are firms' characteristics when borrowing in foreign currency to assess the aggregate consequences of this financing on investment decisions.

Globalization has provided firms with several opportunities in the strategic aspects of their business, opening the doors for them to internationalize and start some level of relationship with other countries (Graham et al., 2015) but the firms in emerging markets suffer for not having access to all financing and investment opportunities and are more sensitive to cyclical and spillover effects than firms in advanced markets (Gamba-Santamaria et al., 2017). However, export-oriented firms tend to borrow more heavily in foreign currency and currency depreciations induce exporters to invest more than non-exporters (Pratap et al., 2003), as the exports partially offset the currency risk, acting as an operational hedging. Also, firms can overcome cross-country barriers to borrowing through foreign asset connections (Houston et al., 2017).

However, firms without exports may have risk exacerbated due to currency depreciations encouraging the least productive firms to use foreign loans and do it to the levels that, otherwise, they would not tolerate (Salomao and Varela, 2022), exposing them to a currency risk that they would not initially have. DFC may be associated with the use of foreign currency derivatives (Rossi, 2011) due to financial hedging being a more favored choice for larger firms, especially for significant amounts, while operational hedging of currency risk has its limitations and firms in international trade are more likely to use FX derivatives to hedge their gross cash currency risk (Hoberg and Moon, 2017; Alfaro et al., 2023). However, derivative usage may have a negative impact on firms when they face greater agency and monitoring problems (Fauver and Naranjo, 2010). Hence, we present our next hypotheses:

Hypothesis 3. Foreign currency borrowing is more (less) negatively related to the speed of capital structure adjustment for exporting (non-exporting) firms.

Hypothesis 4. Foreign currency borrowing is more (less) negatively related to the speed of capital structure adjustment for firms that (do not) have hedge positions.

3 Data and methods

3.1 Data

We use a cross-country sample of 37 countries, including advanced and emerging economies, from Compustat merged with a Capital IQ unique dataset of debt instruments from 2002 to 2021. To create this novel dataset, we collected each debt instrument and grouped it for each company to get the ratio of foreign currency borrowing under the influence of currency fluctuations over total debt, comprising more than 200,000 firm-year observations, we provide additional details on data sources and variable construction on Appendix A1.

The sample includes both listed and nonlisted private non-financial companies. Given the need for detailed information on outstanding company debt in this paper, the sample of nonlisted private firms comprises firms with public financial and/or public debt. To address the issue of double counting, the sample only comprises firms that are ultimate corporate parents, which ensures that a sample firm is not a direct subsidiary of another sample firm. We used annual observations on the basis of fiscal years and all variables are winsorized at the 1st and 99th percentiles to avoid the influence of extreme observations. We cluster the standard errors at the firm level.

The variables used in our main specifications and robustness checks are defined in detail on Appendix B. Regarding the currency of denomination of each debt instrument, we follow the steps of Kim et al. (2020) that collected the FX currency of a debt instrument. To check out the accuracy of our data, we compared the aggregated debt amount of the debt instruments based on the share in total nonfinancial corporate debt with the FX debt estimates of the annual financial report of financial statements for each country. To evaluate the currency effect on the SoA, we collected from Bloomberg for each country the exchange rate and calculated the historical and implied volatility both in annualized terms against the United States dollar (USD).[4]

[4]We plot the average time series of both metrics for the full sample (Appendix - Figure C1).

To measure the target debt ratio, we used the book and market debt ratio[5], measured as the proportion of short- and long-term debt to the firm book and market value. To model the target leverage, we use a set of firm characteristics commonly used in the literature of target debt ratio (Flannery and Rangan, 2006; Flannery and Hankins, 2013; Flannery et al., 2022) – Profitability; Return on Assets; Market-to-Book; Depreciation; Size; Tangibility; R&D; Taxes; Liquidity; Industry median leverage ratio. We also included other control variables related to FX volatility to test the robustness of our results, such as Industry Export, Hedge Position, Average Historical and Implied Exchange Rate Volatility, and Currency Depreciation. The estimations include unobserved firm fixed effects that capture time-invariant heterogeneity among firms and country-year fixed effects that account for macroeconomic shocks affecting target leverage and speed of adjustment across countries each year.

3.2 Methods

3.2.1 Leverage adjustments approach

We propose a theoretical and empirically supported balance sheet effect over the debt structure to capture the effects of DFC on the target leverage. Since correctly measuring firms' FX exposure and identifying the main channels through which exchange rate fluctuations exert an impact on the firm's debt structure are consistent with the dynamic trade-off theory of capital structure choice. To determine whether the debt currency denomination significantly affects firms' adjustment speeds, we estimate a partial adjustment model of leverage for the 37 countries to both measures of debt ratio: book and market debt leverage.[6]

In the methodology, the initial stage involves establishing a model that allows for a gradual adjustment of the company's capital ratio toward its target during each period.

[5]Yin and Ritter (2020) show that existing market SoA estimates are substantially upward biased due to the passive influence of stock price fluctuations, so we include both measurements.

[6]Despite the mixed results presented in the literature regarding the choice of estimation method for assessing the SoA in leverage ratios (Flannery and Rangan, 2006; Strebulaev, 2007; Lemmon et al., 2008; Huang and Ritter, 2009; Hovakimian and Li, 2012; Faulkender et al., 2012; Elsas and Florysiak, 2015; DeAngelo, 2022), we opt for a parsimonious approach to address the primary issues in estimating a partial adjustment model based on Flannery and Hankins (2013).

To test for a dynamic capital structure trade-off, the regression specification must allow for fluctuations in each firm's target debt ratio over time. We start with a general partial adjustment model as

$$LEV_{ij,t} - LEV_{ij,t-1} = \lambda_i(LEV^*_{ij,t} - LEV_{ij,t-1}) + \delta_{ij,t} \tag{1}$$

where $LEV_{ij,t}$ is firm i's debt ratio at the end of year t and j denote a country or a group of countries with identical functional currencies; $LEV^*_{ij,t}$ is firm i's desired debt ratio in firms i in year t; and λ_j measures the proportional adjustment during one year for firms. This specification permits each firm's optimal leverage $LEV^*_{ij,t}$ to vary over time and according to its characteristics. The adjustment speed λ_j permits the typical firm to move only part way to its target leverage within any given year.

To measure the target leverage we follow the procedure of Flannery and Hankins (2013), Devos et al. (2017), and Flannery et al. (2022). Using a two-step approach that each firm's optimal leverage as a function of firm and macroeconomic characteristics, we also include a set of country, firm, and year fixed effects to control for unobserved heterogeneity

$$LEV^*_{ij,t} = \beta_i X_{ij,t-1} + \mu_{ij,t} \tag{2}$$

where, $LEV^*_{ij,t}$ is the target leverage ratio; β_j is a vector of firm and macroeconomic characteristics that are included in the regressions to estimate the target. We follow the procedures of (Flannery and Hankins, 2013) and also estimate the results using two alternative estimation methods: a two-step system generalized method of moments (GMM) (Blundell and Bond, 1998) and the bias-corrected least squares dummy variable approach (LSDVC) (Bruno, 2005). The results remain qualitatively and quantitatively consistent.

To show the effects of a firm's foreign borrowing currency on the net incentive to move toward a target leverage ratio, we interacted adjustment speed measures with foreign borrowing currency, and thus evaluate the joint effect of transaction costs and financing needs

on firms' adjustments toward the target and test a variable adjusting cost. Thus, we verify the speed of capital adjustment depends on whether a firm has or does not have foreign-denominated debt in the firm's debt.

Substituting and rearranging eqs.(1) and (2) gives the estimate of an adjustment model. To examine the adjustment of leverage ratios in the presence of DFC, we interact DFC with the SoA. Thus, we specify our baseline model as

$$\Delta LEV_{ij,t} = (\lambda_i \beta_i) X_{ij,t-1} + \lambda_i LEV_{ij,t-1} + \lambda_i DFC_{ij,t-1} + \lambda_i (LEV_{ij,t-1} \times DFC_{ij,t-1}) + \epsilon_{ij,t} \quad (3)$$

where λ_i is the coefficient of interest that captures the effects of DFC on the SoA. The dynamics of exchange rates can cause leverage adjustments to deviate further from the target when firms have DFC. Consequently, we expect the coefficients associated with the DFC dummy to be negative, indicating a slower SoA for firms with DFC.

To determine whether the foreign currency debt and environment significantly affect firms' adjustment speeds, we estimate the partial adjustment model of leverage interacting with foreign currency debt. Thus, currency fluctuations should affect a firm's adjustment to optimal capital structure. Each firm's adjustment speed directly reflects both its characteristics and the institutional features under which it operates and provides information on the specific channels through which FX volatility affects adjustment speeds.

3.2.2 Addressing self-selection into DFC usage

Decisions regarding target leverage and adjustments towards the target are made jointly with the choice to borrow in foreign currency. DFC allows firms to align cash flows with their financing sources when operating in the international market and to reduce financial constraints in thin local capital markets. Consequently, some firms can more swiftly attain their target leverage, all else equal. However, DFC also exposes firms to FX volatility. Therefore, a firm's decision to opt for DFC depends on weighing the benefits and costs

against the inherent asset risk arising from currency exposure and foreign trade.

To address the endogeneity issues caused by the selection on unobservables of the impact of DFC on firm borrowing, we employ a two-stage estimation procedure with carefully selected excluded variables (Z_i'). Drawing upon economic theory and prior literature, we argue that a firm decision to borrow in foreign currency is related to the country-level economic regime, industry-level exposure to international trade, and availability of foreign currency hedging instruments. These variables are likely to influence a firm's decision to hold DFC but do not directly affect the level of borrowing, except through the DFC channel. Moreover, they are determined at the country or industry level, or by market conditions, making them plausibly uncorrelated with the error terms in the second stage. Prior studies by Allayannis et al. (2003); Kedia and Mozumdar (2003); Salomao and Varela (2022); Alfaro et al. (2023) support the validity of these assumptions, as they show that firms' foreign currency exposure and hedging decisions are influenced by country-level and industry-level factors. By employing this identification strategy, we aim to mitigate the selection bias and obtain consistent estimates of the impact of DFC on firm leverage adjustments. The decision to borrow in foreign currency is expressed as a probit model:

$$DFC_i = \gamma(y_{1i} - y_{2i}) + Z_i'\xi - \epsilon_i \tag{4}$$

where DFC_i equals one if a firm has DFC and zero otherwise, y_{1i}, and y_{2i} are the leverage ratio of DFC and non-DFC firms, respectively. Thus, $(y_{1i} - y_{2i})$ is the expected difference in leverage from a DFC and non-DFC firm. The vector Z_i' comprises variables influencing the net costs of borrowing in foreign currency. Z_i' includes variables of firm characteristics and dummies for industry, country, and period. The leverage adjustments of DFC and non-DFC firms are separately specified as functions of the vector X_i:

$$y_{1i} = X_i'\beta_1 + \mu_{1i} \tag{5}$$

$$y_{2i} = X_i'\beta_2 + \mu_{2i} \tag{6}$$

Equation (5) represents the leverage regression for non-DFC firms, and Eq. (6) is for DFC firms. Since the observed leverage is a conditional outcome and depends on DFC inclusion, directly estimating the model consisting of Eqs. (4)–(6) cannot be estimated. The error terms, μ_{1i} and μ_{2i}, correlate with ϵ_i, and the conditional expectations, $E(\mu_{1i}|DFC_i = 0)$ and $E(\mu_{2i}|DFC_i = 1)$, are both non-zero. A two-stage estimation to correct this bias follows the procedures of Goyal (2005); Tucker (2010); Oster (2019). The first step involves substituting the leverage equations, (5) and (6), into the DFC choice equation (4) to obtain a reduced form model:

$$DFC_i = \gamma((X_i'\beta_1 + \mu_{1i}) - (X_i'\beta_2 + \mu_{2i})) + Z_i'\xi - \epsilon_i, \tag{7}$$

or

$$DFC_i = X_i'\theta + Z_i'\xi + \nu_i, \tag{8}$$

where $\nu_i = \gamma(\mu_{1i} - \mu_{2i}) - \epsilon_i$ and $\theta = \gamma(\beta_1 - \beta_2)$. The reduced-form Eq. (8) is estimated using a probit maximum likelihood procedure, and the model prediction is utilized to generate the inverse Mills ratio, defined as $\phi(\psi)/(1 - \Phi(\psi))$ when a firm does not have DFC and $-\phi(\psi)/(1 - \Phi(\psi))$ when a firm has DFC. Here, ϕ is the standard normal density function, and Φ is the standard normal cumulative distribution function.

The second step involves augmenting Eqs. (5) and (6) with the inverse Mills ratio as the right-hand side variables. The augmented regression for the two sub-samples yields consistent estimates of β_1 and β_2 since the addition of the inverse Mills ratio corrects for a non-zero expectation of errors. Finally, the difference in predicted leverage adjustments for the entire sample (DFC and non-DFC), $\hat{y}_{1i} - \hat{y}_{2i} = (X_1'\hat{\beta}_1 - X_2'\hat{\beta}_2)$, is substituted into the structural probit equation (4) to obtain consistent estimates of structural probit model parameters γ and ξ.

4 Results

4.1 Summary statistics

Table 1 reports the data on our initial sample which comprises firms' debt instruments in a firm-year level of data, retrieved from CIQ. We obtained information about the debt instruments to calculate the proportional debt amount by currencies for each country We classify them into two: Functional and Foreign currencies. Table 1 shows that firms predominantly rely on their functional currencies to fund their activities, while they also issue debt with another currency to finance their activities. Advanced countries' firms typically rely on their chosen functional currency to finance their operations, whereas firms in emerging economies have a lower reliance on the defined functional currency. The proportion of debt instruments and outstanding debt in functional and foreign currencies varies significantly across countries, reflecting the differences in economic structures, the currency denomination of trade, and the risks associated with borrowing in foreign currencies. We also show the time series and distribution of DFC at the country-level (Appendix Fig. C1-C3).

Table 1: Proportion of debt instruments amount by currencies for each country

This table presents the proportion of debt instruments by currencies for each country. We classify them into three parts: Functional currency: which contains the ratio of debt instruments issued at the currency as the filling currency; Foreign Currency: the proportion of debt instruments that are in non-functional currencies. Panel A (B) presents the proportional part of the quantity (amount) of debt instruments that are in Functional and Foreign currency for each country.

	Proportion of Quantity of Debt Instruments by currency (A)		Proportion of Amount of Debt Outstanding by currency (B)	
Countries	Functional currency (%)	Foreign currency (%)	Functional currency (%)	Foreign Currency (%)
Argentina	67.12	32.88	77.30	22.70
Australia	71.94	28.06	87.11	12.89
Austria	92.69	7.31	85.02	14.98
Belgium	84.41	15.59	86.15	13.85
Brazil	60.75	39.25	79.97	20.03
Canada	70.08	29.92	84.18	15.82
Chile	66.37	33.63	65.31	34.69
Colombia	55.79	44.21	64.02	35.98
Denmark	73.15	26.85	81.28	18.72
Finland	93.41	6.59	94.25	5.75
France	87.88	12.12	90.97	9.03
Germany	87.89	12.11	92.39	7.61
Greece	93.88	6.12	96.91	3.09
Hong Kong	62.32	37.68	77.28	22.72
India	81.59	18.41	92.64	7.36
Indonesia	52.54	47.46	73.64	26.36
Ireland	80.12	19.88	81.14	18.86
Israel	84.13	15.87	83.84	16.16
Italy	92.42	7.58	95.38	4.62
Japan	95.71	4.29	98.55	1.45
Malaysia	72.66	27.34	89.71	10.29
Mexico	54.63	45.37	62.59	37.41
New Zealand	82.83	17.17	85.42	14.58
Norway	75.01	24.99	77.80	22.20
Pakistan	96.61	3.39	96.93	3.07
Peru	65.91	34.09	62.44	37.56
Philippines	66.75	33.25	82.75	17.25
Portugal	91.14	8.86	94.78	5.22
Singapore	83.14	16.86	81.01	18.99
South Africa	69.41	30.59	85.73	14.27
South Korea	82.06	17.94	78.79	21.21
Spain	89.91	10.09	89.72	10.28
Switzerland	75.50	24.50	79.79	20.21
Thailand	80.42	19.58	93.13	6.87
Turkey	23.37	76.63	56.18	43.82
United Kingdom	70.98	29.02	79.11	20.89
United States	94.25	5.75	94.38	5.62

In Table 2, we present the summary statistics for the main variables used in our empirical analyses by three samples: full sample, firms with and without foreign currency debt. We report means and medians for all of them. For the full sample, the book debt leverage (Blev) has a mean (median) value of 22% (18%). For the subsamples, firms with non-DFC have a mean (median) of 20% (16%) and firms with DFC have a mean (median) book debt ratio of 25% (23%). The mean and median differences are both significant at the 1% levels. These

statistics are consistent with the expectation that firms with DFC are more indebted due to having more access to capital markets. We also find significant differences (at the 1% levels) in market debt leverage (Mlev), as firms without DFC report a mean (median) of 16% (11%) and firms with DFC report a mean (median) of 24% (19%).

Panel A (Full sample) also shows the differences in the mean and median of the variables between the subsamples based on DFC and non-DFC. The mean and median of Blev, Mlev, Prof, MB, Tang, Rd, and Liq are higher for the DFC subsample than for the non-DFC subsample, indicating that firms with foreign currency debt tend to have higher leverage ratios, profitability, market-to-book ratios, tangibility, and liquidity. The mean and median of Size and Dep are higher for the non-DFC subsample than for the DFC subsample, indicating that firms without foreign currency debt tend to be larger and have longer asset-useful lives. The mean of Taxes is slightly higher for the DFC subsample than for the non-DFC subsample, indicating that firms with foreign currency debt have a slightly higher tax burden, although the difference is not statistically significant at conventional levels. Therefore, the summary statistics suggest that firms with foreign currency debt have higher leverage ratios, profitability, market-to-book ratios, tangibility, and liquidity, but lower asset size and shorter asset useful lives compared to firms without foreign currency debt.

We split the full sample summary statistics into two panels: Panel B displays data for advanced economies, while Panel C presents data for emerging economies. In Panel B, it can be observed for the full sample that the mean values for Blev, Mlev, and Prof are lower than those for the full sample, while the mean values for MB, Size, Tang, RD, Taxes, and Liq are higher. In Panel C, the mean values for Blev, Mlev, Prof, MB, Dep, and Tang are higher than those for the full sample, while the mean values for Size and Liq are lower. It provides insight into the characteristics of the companies in the sample, as well as differences between advanced and emerging economies. It indicates differences across economies, with advanced economies being larger (higher Size and Tang) while emerging economies are more leveraged (higher Blev and Mlev).

Table 2: Summary statistics by samples

This table presents the summary statistics for the full sample used to estimate leverage targets along with the subsamples by debt in foreign currency. The definitions and the sources of the variables employed in the regressions are provided on Appendix B. The last two columns are the difference in the mean (Paired Student's t-test) and median (Wilcoxon signed-rank test). The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	All firms		Non-DFC		DFC		Differences	
	Mean	Median	Mean	Median	Mean	Median	Mean (t-value)	Median (z-value)
Panel A: Full Sample								
Blev	0.215	0.180	0.198	0.151	0.296	0.279	-93.571***	-109.108***
Mlev	0.182	0.129	0.166	0.106	0.255	0.218	-89.954***	-105.489***
Prof	-0.019	0.045	-0.031	0.042	0.039	0.058	-47.033***	-46.108***
MB	1.675	0.946	1.694	0.961	1.585	0.893	7.489***	16.974***
Dep	0.037	0.030	0.037	0.029	0.038	0.033	-5.126***	-27.564***
Size	5.044	4.941	4.795	4.693	6.200	6.093	-125.936***	-118.690***
Tangibility	0.293	0.235	0.283	0.217	0.337	0.302	-40.501***	-55.862***
R&D	0.025	0.000	0.028	0.000	0.010	0.000	45.577***	16.731***
Taxes	0.188	0.006	0.189	0.002	0.182	0.060	2.526***	-5.060***
Liq	2.763	1.623	2.986	1.698	1.729	1.399	61.370***	63.173***
Panel B: Advanced Economies								
Blev	0.201	0.162	0.189	0.139	0.276	0.259	-63.958***	-80.328***
Mlev	0.159	0.108	0.149	0.091	0.224	0.189	-64.002***	-81.414***
Prof	-0.051	0.038	-0.062	0.034	0.020	0.053	-36.851***	-38.017***
MB	1.707	1.009	1.765	1.024	1.353	0.933	23.999***	19.771***
Dep	0.039	0.031	0.038	0.03	0.039	0.034	-3.995***	-21.437***
Size	5.250	5.196	5.033	4.998	6.575	6.619	-101.852***	-94.745***
Tangibility	0.271	0.196	0.267	0.186	0.296	0.243	-16.325***	-31.882***
R&D	0.035	0.000	0.037	0.000	0.017	0.000	35.121***	11.155***
Taxes	0.202	0.002	0.203	0.000	0.196	0.069	2.001**	-5.889***
Liq	2.947	1.693	3.140	1.763	1.770	1.435	48.179***	50.878***
Panel C: Emerging Economies								
Blev	0.249	0.225	0.223	0.185	0.322	0.310	-58.511***	-63.779***
Mlev	0.237	0.193	0.216	0.160	0.294	0.272	-43.494***	-49.731***
Prof	0.059	0.061	0.057	0.060	0.064	0.064	-7.049***	-6.871***
MB	1.596	0.820	1.490	0.807	1.884	0.851	-14.126***	-12.433***
Dep	0.033	0.028	0.032	0.026	0.035	0.031	-15.896***	-25.471***
Size	4.539	4.441	4.108	4.046	5.717	5.635	-110.659***	-99.062***
Tangibility	0.345	0.325	0.329	0.301	0.389	0.380	-31.117***	-34.220***
R&D	0.002	0.000	0.003	0.000	0.002	0.000	0.322	-19.350***
Taxes	0.152	0.022	0.147	0.014	0.164	0.051	-4.175***	-2.989***
Liq	2.310	1.482	2.542	1.542	1.676	1.361	32.523***	29.705***

4.2 Baseline results

Our first evidence on the impact of firms dynamically adjusting their capital structures is consistent with targeting behavior, even when using DFC under macroeconomic environments. If we assume that over time firms adjust toward their debt targets, then we should expect that managers' financing decisions are based on the deviation from the firm's estimated target leverage. Figure 1 displays how managers make financing decisions based on

the firm's deviation from the estimated book target leverage in two different settings when dealing with transaction costs that are associated with adjusting a firm's leverage – advanced and emerging economies, both by the full sample and firms with DFC. To sort firms into quartiles on this basis, we use the difference between the estimated target leverage (LEV^*) and the actual leverage (Mlev) for each year from 2002 to 2021 by each setting.

The vertical axis in Figure 1 shows the subsequent year's change in book debt ratios (Blev), reflecting the manager's efforts to move towards its target, while the horizontal axis shows the quartiles. Quartile 1 is comprised of the firms that were more overleveraged, they reduce their book leverage by a mean (median) of 0.81% (0.01%) to the firms in the advanced economies, and 0.85% (0.08%) to the emerging economies. Meanwhile, quartile

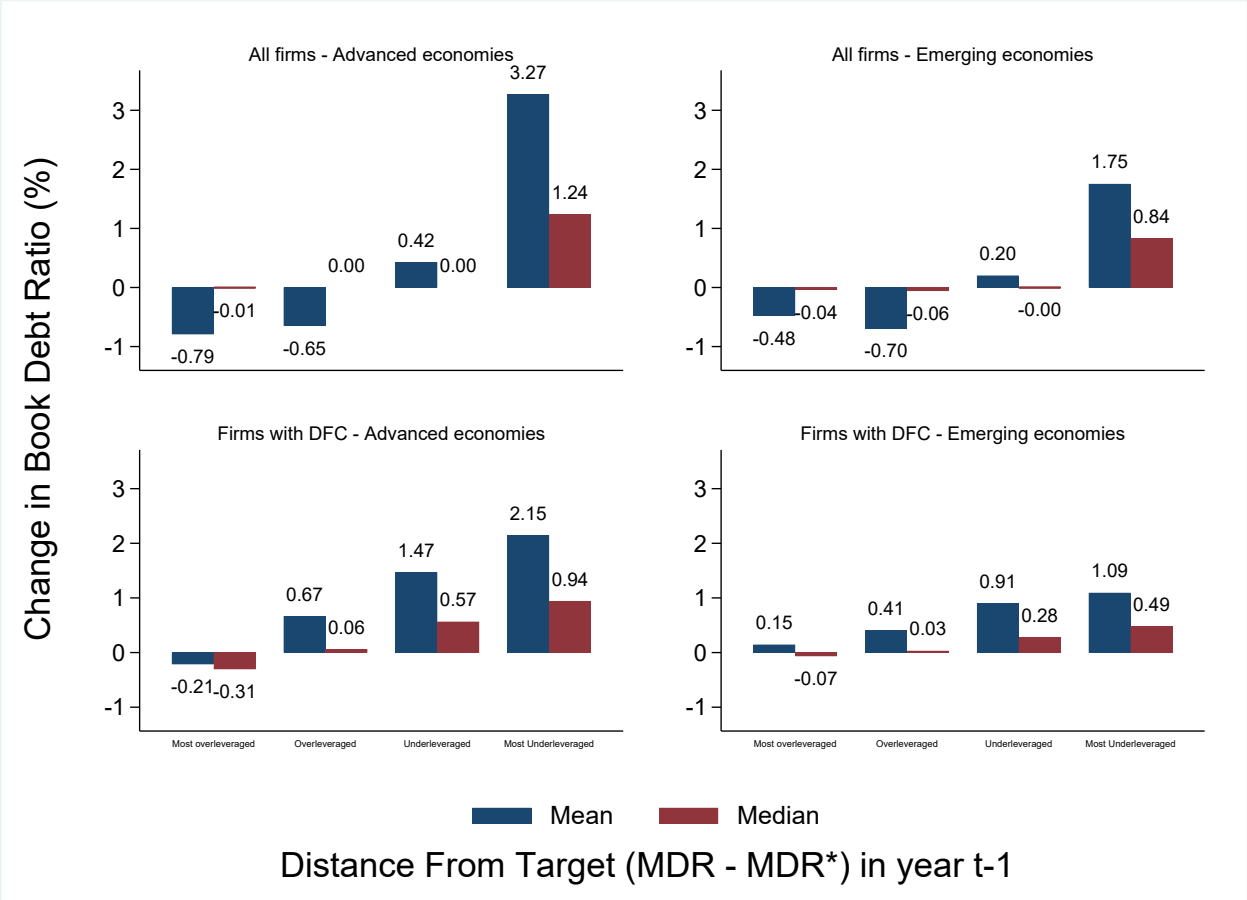

Fig. 1. Subsequent year's change in book debt ratio. The figure reports countries according to IMF 2021 Economic Outlook classification of economies according to the firm's deviation from its estimated target leverage obtained from the FE model.

4 is comprised of the firms that were most underleveraged, with firms from advanced and emerging economies increasing their book leverage by a mean (median) of 3.27% (1.23%) and 1.95% (0.94%), respectively. Firms in the middle two quartiles also move towards their target ratios but with smaller adjustments. When we analyze only the DFC subsample, the results are consistent with the idea that firms move toward the target leverage reducing (increasing) their book leverage in the next year when they are more (less) leveraged, but the level of adjustment is lower to firms with DFC than to the full sample. Also, firms in advanced economies with DFC present a different pattern in the average leverage adjustment in quartiles 3 and 4 with a lower-level adjustment but the median values corroborate the assumption of adjustment toward a desired level of debt. The evidence in Figure 1 supports the idea of convergence towards the target leverage ratios and the adjustment over market leverage confounds the effects of managerial actions and changes in the firm's stock price. Furthermore, it shows differences in the leverage adjustments of firms in advanced and emerging economies, especially when firms have DFC.

In Appendix - Table C1, we present the dynamic panel structure and adjustment speed estimates for book and market leverage for our sample of countries over the period of 2002-2021. To ensure that our results are not influenced by the choice of estimation method, we employ various techniques used by Flannery and Hankins (2013) and Öztekin and Flannery (2013), namely Two-Stage estimation with the inclusion of firm and time fixed effects (FE), Blundell and Bond (BB), and Least Squares Dummy Variable (LSDVC), as explained in the Methods section. The rows represent each country included in the sample, while the columns present the estimation results for each technique, separately for book leverage (Blev) and market leverage (Mlev). The adjustment speed coefficients are reported in the table as λ, where λ represents the speed of adjustment toward the target leverage. A higher value of λ indicates a faster speed of adjustment toward the target leverage, with a coefficient of 1 indicating instant adjustment and a coefficient of 0 indicating no adjustment at all. Coefficients between 0 and 1 suggest a gradual adjustment toward the target level. The

estimated adjustment speeds are consistent across the sample of countries, demonstrating that the SoA estimation is robust to the choice of model. However, the adjustment speeds vary across all countries, indicating that country-specific factors may influence the speed of adjustment. The estimated speeds lie within the zero-one interval, consistent with a typical firm's capital structure converging to its desired level over time due to a dynamic structure of capital. Furthermore, the results are similar for both Mlev and Blev across the estimation methods, although the coefficients of the LSDVC model tend to be slightly lower than those of the FE and BB models. The minimal differences in the coefficients across the three models suggest that our results are consistent, regardless of the estimation approach, and are in line with the findings of Öztekin and Flannery (2013).

4.3 Identification strategy to deal with endogeneity issues

While our evidence suggests firms adjust leverage when borrowing in foreign currency depending on their exchange rate exposure and financial environment, it may be the case that better firms (e.g., more productive, better managed, financially healthier) can adjust capital structure faster and more easily access foreign markets to obtain DFC and reduce borrowing costs (especially so for firms in emerging economies). This means that unobservable determinants of higher DFC are positively associated with higher adjustment speed, which creates a positive bias on your estimates of the impact of DFC on adjustment speed. The ambiguous estimated effects are consistent with the idea that firms that choose to have DFC and do not hedge (due to low operating exposure) are likely better than those that choose to have DFC and do hedge (to protect against high operating exposure); since the former can adjust faster, it creates a negative bias on the interaction term. Moreover, currency swaps obfuscate true foreign exposures, exacerbating selection concerns.

To correct for this potential endogeneity problem on the selection on unobservables, we follow the procedures of Goyal (2005); Tucker (2010); Oster (2019), detailed in the Methodology section. The approach is to estimate the choice model in the first stage and add a

bias correction term in the second-stage regression. After further restricting unobservables to multivariate normal distributions, we derive the bias correction variable in the form of inverse Mills ratio (IMR) to obtain consistent estimates of structural probit model parameters.

In estimating the self-selection model outlined, it is important to note that the first stage reduced-form probit model includes all independent variables included in the leverage adjustments regressions and the DFC choice models. Therefore, to measure the impact of debt in foreign currency on the speed of adjustment with the inclusion of a selection on unobservables model to deal with endogeneity using IMRs on firm DFC choice regression is used as part of the reduced form model. The estimates from the first stage reduced-form probit model and target leverage estimation models are presented in Table 3 and 4[7]. While one can make predictions regarding the sign of γ, β_1, and β_2, it is difficult to predict the signs of the combinations of these variables as represented by θ.

Table 3 presents the probit estimation results of the determinants of debt in foreign currency (DFC) for the full sample and subsamples of developed and emerging economies. The key findings reveal that higher book and market leverage increase the likelihood of DFC, especially in emerging economies. Profitability has a negative impact on DFC in developed economies but a positive impact in emerging economies, while larger firms are more likely to engage in DFC across all subsamples. R&D intensity negatively affects DFC in developed economies but positively affects it in emerging economies. Higher tax rates and lower liquidity increase the likelihood of DFC across all subsamples, and industry leverage negatively affects DFC, particularly in emerging economies. These findings support the main results of the paper, highlighting the factors influencing firms' decisions to borrow in foreign currency and the differences between developed and less developed economies. The results provide context for understanding how DFC affects firms' leverage adjustments and how the impact varies across different types of economies.

[7]To each of the follow-on splits of the sample we reestimate the first stage reduced-form probit and target leverage estimation models.

Table 3: Probit estimation of DFC determinants - Full Sample

This table presents the results of estimating DFC determinants of book leverage. The estimation aims to understand the variables influencing the likelihood of a firm engaging in foreign currency borrowing. The significance levels of 10%, 5%, and 1% are represented by ∗, ∗∗, and ∗∗∗ respectively.

	Full Sample		Developed Economies		Developing and Emerging Economies	
	Dummy DFC	Dummy DFC	Dummy DFC	Dummy DFC	Dummy DFC	Dummy DFC
	(1)	(2)	(3)	(4)	(5)	(6)
Blev	1.024***		0.868***		1.370***	
	(0.069)		(0.111)		(0.095)	
Mlev		0.911***		0.813***		1.113***
		(0.076)		(0.120)		(0.081)
Prof	-0.143***	-0.174***	-0.140***	-0.159***	0.334***	0.243**
	(0.035)	(0.035)	(0.039)	(0.037)	(0.116)	(0.113)
MB	-0.015***	0.000	-0.001	0.013**	-0.028***	-0.011***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)
Dep	0.122	0.374	-0.093	0.111	1.204*	1.594**
	(0.471)	(0.500)	(0.477)	(0.502)	(0.681)	(0.672)
Size	0.270***	0.274***	0.249***	0.253***	0.326***	0.332***
	(0.012)	(0.012)	(0.011)	(0.012)	(0.014)	(0.015)
Tangibility	-0.027	-0.034	-0.171	-0.182*	0.242***	0.245***
	(0.086)	(0.084)	(0.111)	(0.108)	(0.086)	(0.086)
R&D	-0.784**	-0.754**	-1.304***	-1.284***	1.151***	1.118***
	(0.339)	(0.320)	(0.376)	(0.366)	(0.396)	(0.399)
Dummy_R&D	-0.181***	-0.182***	-0.202***	-0.204***	-0.105***	-0.104***
	(0.033)	(0.033)	(0.044)	(0.044)	(0.040)	(0.040)
Taxes	0.054***	0.053***	0.045***	0.045***	0.062***	0.056***
	(0.010)	(0.010)	(0.012)	(0.012)	(0.015)	(0.014)
Liq	-0.052***	-0.059***	-0.061***	-0.067***	-0.037***	-0.050***
	(0.006)	(0.006)	(0.007)	(0.008)	(0.007)	(0.007)
Ind_Lev	-0.686**	-0.836***	-0.347	-0.680	-1.345***	-1.134***
	(0.302)	(0.255)	(0.435)	(0.414)	(0.298)	(0.271)
Constant	-0.507	-0.545	-1.856***	-1.836***	-1.097**	-1.167**
	(0.452)	(0.455)	(0.192)	(0.201)	(0.473)	(0.473)
Observations	232,895	232,895	165,550	165,550	67,321	67,321
Pseudo R-squared	0.271	0.268	0.255	0.253	0.271	0.265
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 shows the results of estimating the target leverage and provide insights into how various firm-specific and macroeconomic factors influence the desired book and market leverage for the subsequent period. Across the full sample, profitability exerts a significantly negative impact on both book and market leverage targets, consistent with the thoery wherein more profitable firms prefer internal financing over debt. Market-to-book ratio exhibits contrasting effects, with a positive association for book leverage but a negative relation for market leverage targets. Firm size is negatively linked to book leverage targets but positively related to market leverage targets. Tangibility and industry leverage are positively associated with both leverage targets, as firms with more collateralizable assets and

those operating in highly leveraged industries tend to have higher target leverage ratios.

Table 4: Target leverage estimation

This table presents the results of estimating the target leverage by presenting the results of different specifications. The focus is on understanding how various firm-specific and macro variables impact the target book and market leverage for the next period. The analysis is conducted separately for the full sample, advanced economies, and emerging economies. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	Full Sample		Advanced Economies		Emerging Economies	
	$Blev_{t+1}$	$Mlev_{t+1}$	$Blev_{t+1}$	$Mlev_{t+1}$	$Blev_{t+1}$	$Mlev_{t+1}$
	(1)	(2)	(3)	(4)	(5)	(6)
Prof	-0.031***	-0.031***	-0.030***	-0.045***	-0.171***	-0.156***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.010)	(0.010)
MB	0.001**	-0.005***	-0.001**	-0.004***	0.007***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Dep	0.037	-0.074***	0.110***	0.036	-0.414***	-0.512***
	(0.028)	(0.023)	(0.032)	(0.026)	(0.060)	(0.056)
Size	-0.004**	0.009***	0.005***	0.036***	-0.038***	-0.015***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
Tangibility	0.091***	0.089***	0.094***	0.091***	0.039***	0.038***
	(0.006)	(0.005)	(0.008)	(0.006)	(0.009)	(0.009)
R&D	0.035*	0.018	0.057***	-0.044***	-0.182***	-0.207***
	(0.019)	(0.012)	(0.020)	(0.013)	(0.044)	(0.050)
R&D_d	0.026***	0.024***	0.021***	0.002	0.024***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Taxes	-0.010***	-0.009***	-0.008***	-0.005***	-0.014***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Liq	-0.001***	0.000**	-0.001***	-0.002***	-0.001**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ind_Lev)	0.392***	0.389***	0.401***	0.371***	0.525***	0.497***
	(0.023)	(0.018)	(0.028)	(0.023)	(0.037)	(0.033)
DFC	0.675***	0.604***	0.560***	0.050**	0.850***	0.812***
	(0.015)	(0.014)	(0.018)	(0.023)	(0.019)	(0.021)
IMR	-0.377***	-0.337***	-0.307***	-0.020	-0.489***	-0.467***
	(0.009)	(0.008)	(0.010)	(0.013)	(0.012)	(0.013)
Constant	0.009	-0.047***	-0.004	-0.091***	0.080***	0.012
	(0.008)	(0.006)	(0.010)	(0.008)	(0.015)	(0.014)
Observations	185,007	185,007	122,869	122,869	53,775	53,775
R-squared	0.782	0.808	0.322	0.359	0.268	0.353
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

When examining advanced and emerging economies separately, some notable differences emerge. While profitability remains a negative determinant across both subsamples, the effect is considerably larger for emerging markets. R&D expenditure impacts leverage targets positively for advanced nations but negatively for emerging markets, potentially reflecting divergent financing patterns. Firm size exerts a negative impact on emerging market leverage targets but a positive effect on advanced economies. The debt tax shield appears to discourage leverage more strongly in emerging markets. These findings underscore how firm

characteristics and country-level factors shape leverage policies, highlighting the importance of accounting for such heterogeneity in estimating the effects of DFC on leverage adjustments.

Table 5 presents the results using both market and book leverage ratios. We estimate three different specifications of our baseline regressions models (1) and (4) with no controls; models (2) and (5) include firm and macro controls; and models (3) and (6) include two-way fixed effects. Across all estimations, we found a prominent difference among the SoA when using the two-way fixed effects, which reports a faster adjustment speed than the OLS estimations ($\approx 27\%$).[8] Thus, unobserved effects explain a proportion of the variation in target debt ratios, as found by (Flannery and Rangan, 2006; Flannery and Hankins, 2013). These findings support the idea that managerial actions and macroeconomics have an impact on the speed at which firms adjust toward the target leverage.

The empirical results of the study, reported in Table 5, show that foreign currency borrowing substantially affects the endogenous decision to adjust leverage. Our regression specifications capture this effect by interacting a firm's foreign currency borrowing measure with its deviation from target leverage. Our estimation of the full sample of 37 countries found that the estimated SoA (λ) for Blev is 39.9%. This estimated SoA implies that the typical firm closes half of a leverage gap in about 19 months.[9] Yet the average firm with DFC takes approximately 21 months to close half of the gap. Indicating that firms with DFC adjust slower toward a target debt ratio than non-DFC firms. Moreover, the coefficient of DFC remains consistently negative and statistically significant across all specifications, albeit with a small magnitude, suggesting a minimal balance sheet effect on firms. Firms with DFC tend to borrow less due to their exposure to foreign exchange volatility, which introduces debt uncertainty and leads to a more precautionary approach to leverage. However, the impact of this behavior on overall borrowing is negligible.

The results in Panel A show that debt in foreign currency has a negative and significant

[8]We also run variance decomposition of the SoA (Appendix - Table C2) to corroborate the importance of unobserved effects to explain a proportion of the variation in target debt ratios.

[9]The calculation is LN(2)/(λ), where λ is the sample average of the adjustment speeds.

impact on the speed of adjustment of the leverage ratio in all specifications. This indicates that firms with foreign currency debt adjust their leverage ratio more slowly. Over the effects of DFC on the debt ratios, we found that the effect is negative and significant in both book and market leverage to the firms in advanced economies. In terms of Mlev, the difference in the SoA is lower than in Blev, which may be explained by operations that the firms make in the market to mitigate exposure to FX volatility, such as operational hedging. The emerging economies present a positive impact on the speed of adjustment which makes them adjust faster and this effect only concerns the market leverage, which shows that the firms in environments with more volatile currency should close the gap faster and/or match inflows and outflows of capital because of they are more susceptible to currency fluctuations.

Table 5: Effect of DFC on leverage adjustment

This table presents the impact of debt in foreign currency on the speed of adjustment with the inclusion of a selection on unobservables correction model to deal with endogeneity concerns. The dependent variable is the leverage ratio. ΔBlev (ΔMlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Column (1) shows the SoA with the effect of DFC as the interaction variable, column (2) and (3) includes additional control variables. Control variables are not reported for brevity. Table A (B) presents regression results when target leverage is estimated using book (market) leverage. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	ΔBook Leverage (A)			ΔMarket Leverage (B)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full Sample						
SoA	0.106***	0.133***	0.442***	0.103***	0.127***	0.454***
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.004)
DFC	-0.012***	-0.004***	-0.004***	-0.012***	-0.003***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SoA x DFC	-0.055***	-0.035***	-0.072***	-0.034***	-0.024***	-0.057***
	(0.003)	(0.004)	(0.006)	(0.003)	(0.003)	(0.005)
Constant	0.007***	0.015***	0.012**	0.006***	0.022***	-0.001
	(0.000)	(0.001)	(0.005)	(0.000)	(0.001)	(0.004)
Observations	185,005	185,005	185,005	185,005	185,005	185,005
R-squared	0.035	0.069	0.295	0.036	0.139	0.351
Panel B: Developed Economies						
SoA	0.125***	0.145***	0.454***	0.114***	0.131***	0.436***
	(0.003)	(0.003)	(0.006)	(0.002)	(0.002)	(0.005)
DFC	-0.010***	-0.005***	-0.004***	-0.006***	-0.002***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SoA x DFC	-0.058***	-0.043***	-0.072***	-0.000	-0.002	-0.019**
	(0.005)	(0.005)	(0.008)	(0.005)	(0.005)	(0.009)
Constant	0.007***	0.014***	0.007	0.005***	0.022***	0.001
	(0.000)	(0.001)	(0.006)	(0.000)	(0.001)	(0.004)
Observations	130,026	130,026	130,026	130,026	130,026	130,026
R-squared	0.044	0.077	0.313	0.045	0.137	0.361
Panel C: Developing and Emerging Economies						
SoA	0.075***	0.105***	0.408***	0.089***	0.121***	0.454***
	(0.003)	(0.004)	(0.008)	(0.003)	(0.003)	(0.008)
DFC	-0.011***	-0.005***	-0.006***	-0.014***	-0.004***	-0.004**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
SoA x DFC	-0.032***	-0.011**	-0.035***	-0.037***	-0.016***	-0.035***
	(0.004)	(0.005)	(0.008)	(0.004)	(0.004)	(0.008)
Constant	0.005***	0.015***	0.023***	0.006***	0.024***	-0.005
	(0.000)	(0.002)	(0.009)	(0.000)	(0.002)	(0.008)
Observations	54,960	54,960	54,960	54,960	54,960	54,960
R-squared	0.021	0.050	0.247	0.027	0.152	0.342
Controls						
Firm Controls	No	Yes	Yes	No	Yes	Yes
Country x Year FE	No	Yes	Yes	No	Yes	Yes
Firm FE	No	No	Yes	No	No	Yes

Over the institutional setting, the results show that firms in advanced economies adjust faster than firms in emerging economies, respectively, their SoA for Blev (Mlev) are 42.7% (43.3%) and 33.4% (38.4%). These results suggest that the effect of debt in foreign currency on the speed of adjustment of the leverage ratio depends on the level of SoA and the FX volatility of the environment in which firms are operating.

In Table 5, we include the leverage ratio, the set of control variables, dummy variables for industry, country, and year, and the inverse Mills ratio. When controlling for endogeneity issues – selection bias – we provide evidence consistent with firms adjusting slower when borrowing in foreign currency depending on their exchange rate exposure and financial environment. That is when controlling for unobservable determinants of DFC we got consistent negative estimated coefficients in the interaction term of DFC and SoA. This goes in the direction of the idea that firms that choose to have DFC are susceptible to negative shocks when making leverage adjustments due to FX volatility imposes exogenous deviations on their target leverage. These results are consistent with both advanced and emerging economies[10]

Foreign currency debt poses a risk to balance sheets at the time of depreciation of the functional currency. However, export-oriented firms in the tradable sector tend to borrow more heavily in foreign currency and currency depreciations induce exporters to invest more than non-exporters and this FX exposure is related to the use of currency derivatives. In addition, the impact of exchange rate fluctuations on the value of firms shows that productive firms that hold foreign currency-denominated debt are more likely to take advantage of the exchange rate fluctuations. Foreign currency debt may be used to hedge the firm's operational exposure to exchange rate risk, implying smaller deviations from the target

[10]In unreported results, we rerun the models of Table 5 using DFC as a continuous variable and the results keep qualitatively and quantitatively consistent for all the estimations. We also estimate the results with different cutoffs to define a DFC firm, the results show differences between the DFC levels in advanced and emerging markets, with low DFC levels ($< 25\%$) being correlated with firms in advanced economies and high DFC levels ($> 25\%$) with emerging market firms. Also, we estimated the models without the variable of DFC in the first stage of the estimation and the results remained consistent, only affecting the DFC estimated coefficient in the second stage as expected. Furthermore, when we omit zero-leverage firms from the sample the estimated coefficients do not substantially change.

leverage.

These assumptions lead us to estimate our baseline model with interacting variables of industry exports (Table 6) and hedge positions (Table 7), the construction of these variables is reported on Appendix A2 and Appendix A3, respectively. These tables report two regression models, one using book leverage to estimate the target leverage (columns A), and the other using market leverage (columns B). The results are presented separately for the full sample, advanced economies, and emerging economies.

The baseline results of Tables 6 and 7 are consistent in all estimations even with the inclusion of industry exports and hedge positions variables. DFC is negatively and significantly related to the leverage adjustment and firms in advanced markets adjust faster when compared with firms in emerging economies.

The results from Table 6 shed light on the influence of exports and DFC on the SoA and leverage ratios among firms in both advanced and emerging economies. In advanced economies, the interaction between industry exports, DFC, and SoA remains a significant determinant of leverage adjustments. Specifically, firms in export-oriented industries leverage DFC to manage currency exposure. Conversely, in emerging economies, the impact of exports on firms' leverage ratios primarily manifests through exports themselves, with a small but significant negative effect on firms' measurements of leverage adjustments, which is partially offset when considering the interaction of exports with DFC on market leverage. This suggests that firms in emerging economies face a trade-off between the costs associated with FX volatility and the benefits, such as accessing cheaper debt and deep capital markets through DFC. Ultimately, these firms rely on market dynamics to mitigate the risks posed by FX volatility.

Moreover, our findings reveal that while exports directly affect DFC for firms across economies. Firms with FX exposure tend to match inflows (exports) and outflows (interest payments) within the same currency, mitigating FX risks. Consequently, the impact of exports on leverage ratios and adjustment speed varies, contingent upon DFC levels and

industry and country characteristics. The results underscore the nuanced interplay between exports, DFC, and leverage dynamics, emphasizing the differential strategies employed by firms in advanced and emerging economies to navigate currency fluctuations and manage financial risks.

Table 6: Effect of industry exports on DFC and leverage adjustment

This table presents the impact of exports on debt in foreign currency and the speed of adjustment. The dependent variable is the leverage ratio. Blev (Mlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Ind_Exports is the quantity of exports by industry and country by in-sample revenue from the CEPII database. Control variables are not reported for brevity. Column A (B) presents regression results when target leverage is estimated using book (market) leverage. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	Full Sample		Advanced Economies		Emerging Economies	
	ΔBlev (A)	ΔMLev (B)	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)
	(1)	(2)	(3)	(4)	(5)	(6)
SoA	0.450***	0.458***	0.468***	0.445***	0.409***	0.454***
	(0.008)	(0.006)	(0.010)	(0.008)	(0.012)	(0.011)
DFC	-0.003*	-0.004**	-0.001	-0.004**	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
SoA x DFC	-0.083***	-0.055***	-0.093***	-0.033**	-0.036***	-0.025**
	(0.009)	(0.007)	(0.013)	(0.015)	(0.011)	(0.010)
Ind_Exports	-0.000	-0.000	0.000	0.000	-0.002	-0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)
SoA x Ind_Exports	0.007	-0.013	0.008	-0.010	0.002	-0.031**
	(0.013)	(0.010)	(0.017)	(0.014)	(0.016)	(0.016)
DFC x Ind_Exports	-0.006*	0.002	-0.013***	-0.004	0.007	0.017***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.005)	(0.006)
SoA x DFC x Ind_Exports	0.031*	0.022	0.053**	0.047*	0.003	0.016
	(0.017)	(0.015)	(0.026)	(0.026)	(0.023)	(0.022)
Constant	0.015**	-0.003	0.011	0.002	0.050***	0.010
	(0.007)	(0.005)	(0.009)	(0.006)	(0.012)	(0.012)
Observations	89,702	89,702	60,681	60,681	29,021	29,021
R-squared	0.296	0.358	0.315	0.367	0.246	0.353
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 7 presents the results of the impact of hedge positions on leverage adjustments. For all firms, the triple interactions exhibit a significant and positive effect on both measures of target leverage, indicating faster adjustment to the leverage target when considering the joint influence of hedge positions, DFC, and SoA. Conversely, the interaction between DFC and hedge positions demonstrates a negative effect, suggesting a mitigating influence on leverage when firms employ both strategies concurrently.

In advanced economies, a similar trend is observed, with the triple interactions exerting a positive effect on both measures of target leverage. Additionally, a negative effect is observed for the interaction between hedge positions and SoA, suggesting a nuanced relationship between hedging strategies and the speed of leverage adjustments. However, for firms in emerging economies, the triple interactions continue to positively influence both measures of target leverage, although statistical significance is observed only for book leverage, not market leverage. Notably, the interaction between DFC and hedge positions exhibits a negative effect on leverage, highlighting a similar dampening influence on leverage dynamics as observed in advanced economies. These results underscore the significance of considering the joint impact of hedge positions and DFC on leverage adjustment in the context of emerging economies, where financial market dynamics may differ from those in advanced economies.

The results suggest that foreign currency debt and hedge positions have significant impacts on leverage adjustment and that these effects differ across advanced and emerging economies. This suggests that the effect of foreign currency debt on leverage adjustment depends on whether a company adjusts its hedge positions, this is relevant to firms in advanced economies due to access to a more advanced financial market that allows using these instruments due to a lower cost to protect against currency fluctuations. Yet, in emerging economies, while hedge positions serve as an auxiliary strategy, their effectiveness may be hampered by high FX volatility. This underscores the importance of considering market dynamics in leveraging, as reported by Yin and Ritter (2020), which can mitigate the effect of hedge positions to deal with FX risks effectively. Financial contracts primarily aim to mitigate nominal fluctuations in exchange rates, thus offering only a partial hedge against a firm's operational vulnerability to real changes in exchange rates, particularly prominent in emerging economies.

Table 7: Effect of hedge positions and DFC on leverage adjustment

This table presents the impact of hedge positions on debt in foreign currency and the speed of adjustment. The dependent variable is the leverage ratio. Blev (Mlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Dummy_hedge is a dummy variable that indicates if a company adjusted or used a derivative during each year. Control variables are not reported for brevity. Column A (B) presents regression results when target leverage is estimated using book (market) leverage. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	Full Sample		Advanced Economies		Emerging Economies	
	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)
	(1)	(2)	(3)	(4)	(5)	(6)
SoA	0.443***	0.456***	0.458***	0.441***	0.409***	0.455***
	(0.005)	(0.004)	(0.006)	(0.005)	(0.008)	(0.008)
DFC	0.000	0.001	0.001	-0.002	-0.004**	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
SoA x DFC	-0.078***	-0.059***	-0.079***	-0.027**	-0.041***	-0.035***
	(0.007)	(0.006)	(0.010)	(0.011)	(0.008)	(0.008)
Dummy_Hedge	0.001	0.001	0.001	0.001	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
SoA x Dummy_Hedge	-0.006	-0.008	-0.018**	-0.020***	-0.005	-0.010
	(0.006)	(0.006)	(0.008)	(0.007)	(0.013)	(0.012)
DFC x Dummy_Hedge	-0.013***	-0.011***	-0.015***	-0.004**	-0.010***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
SoA x DFC x Dummy_Hedge	0.030***	0.021**	0.033**	0.027**	0.036**	0.014
	(0.009)	(0.009)	(0.013)	(0.014)	(0.016)	(0.015)
Constant	0.012**	-0.001	0.008	0.001	0.023***	-0.006
	(0.005)	(0.004)	(0.006)	(0.004)	(0.009)	(0.008)
Observations	185,005	185,005	130,026	130,026	54,960	54,960
R-squared	0.296	0.352	0.313	0.361	0.247	0.342
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 8 presents the impact of debt in foreign currency (DFC) on firms' speed of adjustment (SoA) towards target leverage, revealing a nuanced relationship that varies based on the level of economic development. In the full sample and particularly in developed economies, DFC firms exhibit slower adjustment speeds in terms of book leverage, typically by around 2 percentage points, compared to their non-DFC counterparts. This finding aligns with the paper's central hypothesis that currency volatility increases transaction costs, thereby impeding leverage adjustments. Conversely, in Emerging Economies, DFC firms adjust faster than non-DFC firms, suggesting that access to international capital markets through DFC may offset the disadvantages of currency volatility. Despite this faster adjustment, DFC firms in emerging markets still adjust slower than their counterparts in advanced economies.

Table 8: Leverage adjustments based on the DFC sample split

This table presents the impact of debt in foreign currency on the speed of adjustment. The dependent variable is the leverage ratio. ΔBlev (ΔMlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Control variables are not reported for brevity. Table A (B) presents regression results when target leverage is estimated using book (market) leverage. The sample split consists of seating the estimations into DFC and non-DFC firms. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	DFC Firms		Non-DFC Firms	
	ΔBlev	ΔMlev	ΔBlev	ΔMlev
	(1)	(3)	(4)	(6)
Panel A: Full Sample				
SoA	0.404***	0.451***	0.411***	0.424***
	(0.009)	(0.009)	(0.005)	(0.004)
Constant	0.005	-0.028*	0.012**	0.001
	(0.016)	(0.015)	(0.005)	(0.004)
Observations	32,616	32,616	150,599	150,599
R-squared	0.379	0.469	0.317	0.365
Panel B: Developed Economies				
SoA	0.420***	0.476***	0.437***	0.442***
	(0.013)	(0.012)	(0.006)	(0.005)
Constant	0.007	-0.023	0.008	0.001
	(0.023)	(0.019)	(0.006)	(0.005)
Observations	17,939	17,939	110,851	110,851
R-squared	0.408	0.475	0.328	0.367
Panel C: Developing and Emerging Economies				
SoA	0.395***	0.437***	0.345***	0.399***
	(0.013)	(0.013)	(0.007)	(0.007)
Constant	0.004	-0.040*	0.025***	-0.001
	(0.023)	(0.023)	(0.010)	(0.009)
Observations	14,677	14,677	39,748	39,748
R-squared	0.348	0.467	0.285	0.363
Controls				
Firm Controls	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

When considering market leverage, DFC firms adjust faster than non-DFC firms across all subsamples. This faster adjustment may be attributed to investors' perception of the risks

involved in DFC operations and they may view DFC firms as more responsive to changes in market conditions, leading to faster adjustments in market leverage.

The heterogeneity in SoA across firm types and economies underscores the interplay between financial constraints, market efficiency, and currency risk. In developed markets with lower financial frictions, the negative impact of currency volatility on DFC firms' SoA is more pronounced. However, in emerging markets characterized by higher volatility and financial constraints, firms that can access DFC markets appear less financially constrained and adjust faster than local peers. The findings highlight the importance of accounting for market dynamics and the level of economic development in capital structure research. Further research could explore the specific hedging strategies employed by DFC firms and the potential trade-offs between the slower adjustment of book leverage and the faster adjustment of market leverage.

5 Robustness checks

5.1 Identification based on country financial structure

We constructed a financial structure measure using the Global Financial Development Report dataset (Beck et al., 2000, 2009; Čihák et al., 2012). Their methodology captures the bank versus market dichotomy. However, we aim to capture financial system depth and sophistication to better distinguish nuanced cross-country differences in financial constraints when splitting the sample.

To construct the variables related to financial structure, we adapted their methodology. Instead of using ratios, we multiplied the variables, with higher values indicating a deeper financial structure. Ratios capture the bank versus market dichotomy but they may inadequately represent overall depth and sophistication. Multiplying variables accounts for absolute market activity, capitalization, and efficiency levels. This modification is particularly relevant to our study, where the depth of financial markets plays a crucial role in facilitating

cross-border capital flows, risk management, financing, and investment opportunities. We employed principal component analysis (PCA) on the natural logarithm of the variables: Activity (Total Value Traded × Bank Credit Ratio) and Size (Market Capitalization × Bank Credit Ratio) to create an aggregate measurement of financial structure.[11]

Table 9 shows that when splitting the sample based on the measure of financial structure is consistent with our main findings for countries for all levels of financial structure. Our findings consistently show a negative and significant relationship between foreign currency debt usage and leverage adjustments. The results suggest a financial constraint indicator of adjustment among the capital markets in how firms adjust their capital structures in response to foreign currency borrowing, the effect is increasing with the development of the capital markets in both SoA and the interaction term. One potential explanation is that firms operating in markets with a higher financial structure typically adjust their capital structures faster. However, when firms borrow in foreign currency, the speed of adjustment (SoA) becomes similar across different levels of financial structure, with firms adjusting at approximately the same rate (approximately 40%). This suggests that the use of foreign currency debt reduces the impact of financial structure on the speed of leverage adjustments. This access to foreign currency funding enables firms to adjust their capital structures at a similar pace, regardless of the depth of their domestic capital markets.

Therefore, we corroborate evidence that foreign currency volatility acts as a moderate effect on the speed of adjustment toward target leverage, showing that the difference in financial constraint to the foreign exchange rate – the difference among capital financial constraint indicator of adjustment costs – affects the leverage adjustment decisions of firms to a desired level. The ambiguous estimated effects derive from firms making leverage adjustments when borrowing in foreign currency are based on their exchange rate exposure and financial environment. Firms in deep capital markets, where there is less friction to close the

[11] In Appendix Fig. C5 and C6. we show the Clustering based on Principal Components of Financial Structure (FS) Score. Clustering of firms based on the quantiles of the first component of the PCA of the average score of financial structure adapted from Beck et al. (2000, 2009); Čihák et al. (2012).

gap, the firms behave as expected by the theory - adjust slower due to FX volatility. Yet, firms in thin capital markets due to the context of high volatility and financial constraints behave differently. The ones that can borrow in FX have lower financial constraints and close the gap faster than their counterparties that cannot access the DFC market but yet slower than the firms in deep capital markets.

Table 9: Effect of country Financial Structure and DFC on leverage adjustment
This table presents the impact of debt in foreign currency on the speed of adjustment. The dependent variable is the leverage ratio. ΔBlev (ΔMlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Control variables are not reported for brevity. Table A (B) presents regression results when target leverage is estimated using book (market) leverage. The split of the sample consists of forcing the distribution among the different splits based on the average score of financial structure adapted from Beck et al. (2000, 2009); Čihák et al. (2012). P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by ∗, ∗∗, and ∗∗∗ respectively.

	Low Financial Structure		Medium Financial Structure		High Financial Structure	
	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)
	(1)	(2)	(3)	(4)	(5)	(6)
SoA	0.411***	0.458***	0.425***	0.444***	0.551***	0.496***
	(0.009)	(0.009)	(0.012)	(0.010)	(0.008)	(0.007)
DFC	-0.006***	-0.003*	-0.003	-0.001	-0.002	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
SoA x DFC	-0.034***	-0.027***	-0.049***	-0.045***	-0.192***	-0.060***
	(0.009)	(0.009)	(0.014)	(0.012)	(0.012)	(0.010)
Constant	0.030***	0.004	0.011	-0.004	0.009	-0.001
	(0.010)	(0.010)	(0.012)	(0.010)	(0.006)	(0.005)
Observations	42,005	42,005	28,585	28,585	113,856	113,856
R-squared	0.252	0.356	0.299	0.368	0.298	0.334
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

5.2 Identification based on currency shocks

In Table 10 we evaluate the robustness of the baseline results by resampling the dataset based on the level of currency volatility. To test whether the leverage adjustments are driven by the FX volatility, specifically whether firms with higher FX volatility have a larger effect on the leverage adjustments. We start by looking at the distribution of the historical currency volatility over the period studied and are grouped into three groups: low, moderate, and high

volatility. The low volatility consists of firms in which the functional currency fluctuated less than 1% on average; moderate volatility is comprised of firms in which the average functional currency oscillated between 1 to 10%; high volatility consists of firms in which the average functional currency fluctuation was greater than 10%.

Table 10: Effect of FX volatility and DFC on leverage adjustment

This table presents the impact of debt in foreign currency on the speed of adjustment. The dependent variable is the leverage ratio. ΔBlev (ΔMlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Control variables are not reported for brevity. Table A (B) presents regression results when target leverage is estimated using book (market) leverage. The split of the sample consists of forcing the distribution among the different splits based on the average currency volatility level. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	Low volatility		Moderate Volatility		High Volatility	
	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)
	(1)	(2)	(3)	(4)	(5)	(6)
SoA	0.440***	0.438***	0.416***	0.438***	0.509***	0.545***
	(0.009)	(0.008)	(0.006)	(0.006)	(0.013)	(0.011)
DFC	-0.005**	-0.003	-0.004***	-0.003**	-0.005**	-0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)
SoA x DFC	-0.046***	-0.029**	-0.071***	-0.057***	-0.056***	-0.044***
	(0.014)	(0.012)	(0.008)	(0.006)	(0.013)	(0.012)
Constant	0.002	0.002	0.017***	0.000	0.013	-0.004
	(0.011)	(0.007)	(0.006)	(0.005)	(0.011)	(0.009)
Observations	51,472	51,472	92,092	92,092	40,883	40,883
R-squared	0.321	0.354	0.271	0.341	0.330	0.409
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

The resampling of the dataset based on the level of currency volatility corroborates the estimated negative balance sheet effect of DFC on leverage adjustments. The disparities in adjustment speeds across volatility levels suggest distinct market dynamics at play. Firms with low volatility, while experiencing a negative effect of DFC on leverage adjustments, tend to adjust faster. This trend may be attributed to their access to deeper and more stable capital markets, enabling them to adapt swiftly to changes in financial conditions. Conversely, firms operating in high volatility environments, although also exhibiting a negative effect of DFC on leverage adjustments, must adjust faster due to their susceptibility to larger

shocks of FX volatility. The faster adjustment reflects their heightened vulnerability to FX fluctuations, necessitating proactive measures to safeguard financial stability and resilience against potential adverse impacts.[12]

This paper contributes to the literature in several dimensions. First, we add to the literature on the balance sheet effects of currency fluctuations (e.g., Krugman (1999); Caballero and Krishnamurthy (2003); Céspedes et al. (2004)) by gauging how much firms deviate from their target leverage upon these fluctuations and at which speed firms adjust their leverage according to their exposure to foreign currency. Second, we contribute to the literature on firm dynamics and leverage adjustments (e.g., Flannery and Rangan (2006); Flannery and Hankins (2013); DeMarzo and He (2021); Flannery et al. (2022); Salomao and Varela (2022)). More indirectly, we also contribute with the extensive literature on corporate hedging (e.g., Alfaro et al. (2023)), as our paper aims at understanding how firms with different exposure to currency risks set their target leverage and adjust their capital structure towards this target. The practical implications of the paper indicate that debt in foreign currency plays a key role in the adjustment of the leverage ratio for firms regarding the managerial and industry characteristics and choices and where these firms are operating. Furthermore, firms engaging in international trade and borrowing in foreign currency are significantly exposed to currency risk, and the use of operational hedging is limited (Alfaro et al., 2023), as the case of firms in emerging economies. Furthermore, our paper also contributes to the recent policy debate given the importance of foreign currency debt for financial stability (e.g., Du and Schreger (2022)). These results have important implications for policymakers and firms seeking to manage their debt exchange rate exposure.

Therefore, this paper provides evidence that the speed of capital adjustment depends on whether a firm has or does not have foreign-denominated debt. Also, we capture the difference in financial constraints imposed by the exchange rate between advanced and emerging markets, which is defined as an indicator of adjustment costs related to FX volatility. Such

[12]We rerun the models of Table 10 using the implied volatility, and the findings remained consistent.

associations between exchange rate fluctuations and leverage adjustment speeds are consistent with the dynamic trade-off theory of capital structure choice.

6 Conclusions

This paper compares firms' leverage adjustments across countries and investigates whether exchange rate fluctuations help explain the variance in estimated adjustment speeds. In our model, foreign currency volatility acts as a moderate effect on the speed of adjustment toward target leverage. We use a cross-country panel sample of firms from 37 countries (including both advanced and emerging economies) from 2002 to 2021. With this novel dataset of firm foreign currency borrowing, we show empirical evidence that debt in foreign currency substantially affects the endogenous decision to adjust leverage.

Our findings show one of the channels of how managerial and macro aspects affect the target leverage itself and at which speed firms adjust toward the target when they have DFC. The paper explores the intricate dynamics surrounding the choice between utilizing foreign or domestic currency within firms, specifically examining the decision-making processes within advanced and emerging economies. In advanced economies, the adoption of DFC is influenced by considerations of operational exposure, often leading to operational hedging with typically low ratios of DFC, alongside the possibility of employing financial hedges. Conversely, in emerging economies, firms lean towards DFC utilization primarily due to its cost advantages, stemming from historically higher real interest rates and deeper liquidity compared to domestic markets. However, they face elevated vulnerability to FX fluctuations due to uncertainties inherent in their markets and limited access to robust capital markets for hedging purposes. Consequently, these firms tend to rely more extensively on DFC, surpassing the usage rates of advanced economies firms, which leaves them more exposed and less effective in adjusting their leverage positions.

This reliance on DFC in EM firms can lead to challenges in managing leverage ad-

justments effectively, potentially exacerbating transaction costs and increasing exposure to adverse exchange rate movements. Notably, firms with DFC adjust faster than their local counterparts but slower than both DFC and non-DFC firms in developed markets, contributing to the complexity of currency choice dynamics across different market contexts. Additionally, firms in advanced economies generally experience lower transaction costs and exhibit behaviors aligned with finance theory, while firms in emerging economies exhibit greater heterogeneity in their results due to being exposed to higher FX volatility and financial constraints.

Therefore, we show in this paper that foreign currency borrowing substantially affects the decision to adjust leverage. Our regression specifications capture this effect by interacting a firm's foreign currency borrowing measure with its deviation from target leverage. By showing that adjustments toward target leverage vary with the marginal cost of implementing leverage changes, especially in markets more susceptible to currency volatility. Thus, our findings provide valuable insights into how firms adjust their leverage positions in response to exchange rate fluctuations. This understanding is crucial for practitioners, researchers, and policymakers. By identifying specific behaviors and strategies employed by firms during such periods, our research can inform the development of more effective macroprudential policies. These policies can mitigate the adverse effects of sudden stops in DFC triggered by FX volatility. Our study extends the existing literature by offering a comprehensive analysis of the dynamic interplay between corporate leverage adjustments and FX movements. It provides compelling evidence that DFC plays an important role in hedging operational exposure and mitigating financial constraints. This nuanced understanding highlights the importance of DFC in helping firms navigate the challenges posed by exchange rate fluctuations.

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Appendix

A Data Sources and Sets

This appendix provides additional details on data sources and sets used in this paper. We provide a detailed description of each source, describe variable construction, and guide through sample selection step-by-step.

A.1 Foreign currency debt

This data is downloaded from Capital IQ's online platform (https://www.capitaliq.com) using its company screening tool. The processing of the data is based on collecting each debt instrument issued by the firm for each year. The data includes information about the total debt, principal, amount outstanding, and issuing and filling currency. Also, it has information on the instrument description, security type and level, and start and maturity date.

Our initial sample consists of more than 3,000,000 firms' debt instruments, retrieved from Capital IQ. From each instrument, we obtained information about the interest rate, currency denomination, issue and maturity dates, and security type and level. This information is collected by CIQ from annual financial reports of companies filed to national regulatory agencies, typically found in the supplementary note accompanying the main financial statements.

1. An entity's functional currency is the currency associated with its main economic environment, the currency in which the entity predominantly conducts cash-related activities.

A.2 Industry Exports data

Industry export data were retrieved from BACI, which is a detailed international trade database, which covers more than 200 countries and 5,000 products. Users of Comtrade can freely download our BACI database in different available classifications (HS92, HS96, SITC) from http://www.cepii.fr/anglaisgraph/bdd/baci.htm. BACI provides yearly data on bilateral trade flows at the product level.

Products are identified using the Harmonized System (HS), which is the standard nomenclature for international trade, used by most customs. These files associate the ISO 3-digit numeric codes used in BACI with country full names and with other versions of the ISO codes (3-letter and 2-letter). They were constructed based on the metadata provided by Comtrade. They also contain lists of the product codes used in each revision of the Harmonized System, along with a description of each product. They were constructed based on the metadata provided by Comtrade.

The three main advantages of BACI data, in comparison to other similar databases, are its product-level (more than 5,000), its geographical coverage (more than 200 countries) and its unit values, which are more reliable than the raw data, since the reconciliation

of mirror figures tend to correct discrepancies. The industry values of total exports are based on a backward approach going from six-digit to two-digit NAICS code by country and year of the CEPII database of exported products.

A.3 Hedge and Derivatives data

To create the dummy variable of whether the firm has a hedge position or not, we collected from Capital IQ's online platform (https://www.capitaliq.com) the information from a list of variables provided by the platform. We detail each of these variables below:

a. Hedging and Derivative Adjustments are as-reported adjustment values of debt that occurred due to interest rate hedging activities. The following derivative adjustments are as reported by the company are captured as Hedging and Derivative adjustments: Fair Value Hedges/ Adjustments; Derivative Adjustments; Interest Rate Swap Adjustments; Currency Swaps; Cash flow Hedges; etc.

b. Short-Term Borrowing Derivative is a supplemental line item that represents derivative contracts that are relating to short-term debt, where the main purpose of the derivatives is to mitigate the risk either relating to interest rate risk, exchange rate risk, and fair value changes, ultimately affecting the amounts paid under debt contracts. These amounts are included in total short-term debt. Sample line items that will be categorized as short-term borrowing derivatives include: Unrealized loss from cross-currency interest rate swaps; Unrealized depreciation on interest rate swap contracts; Unrealized loss on interest rate swap; Unrealized gain from cross-currency interest rate swaps; Unrealized appreciation on interest rate swap contracts; Unrealized gain on Interest rate swap; and Deferred gain on Interest rate swap.

c. Current Portion of Long Term Debt Derivative is a supplemental line item that represents derivative contracts that are relating to the current portion of long-term debt, where the main purpose of the derivatives is to mitigate the risk either relating to interest rate risk, exchange rate risk and fair value changes, ultimately affecting the amounts paid under debt contracts. These amounts are included in current portion of long-term debt. Sample line items that will be categorized as current portion of long-term debt derivatives include: Unrealized loss from cross-currency interest rate swaps; Unrealized depreciation on interest rate swap contracts; Unrealized loss on interest rate swap; Unrealized gain from cross-currency interest rate swaps; Unrealized appreciation on interest rate swap contracts; Unrealized gain on interest rate swap.

d. Derivative Liabilities - Current is a supplemental line item that represents non-debt related derivatives that are classified as part of current liabilities. This is included in other current liabilities and includes the following sample line items: Derivative liabilities; Derivative financial instruments at Estimated fair value; Derivative instruments; Derivative liabilities, current; Liabilities due to derivative Instruments; Liabilities by financial derivative Instruments; Derivative securities; Unrealized loss from derivatives;

Unrealized depreciation on derivative contracts; Unrealized gain From derivatives; Unrealized appreciation on derivative contracts; Unrealized gain on swaps/hedging; Deferred gain on swap/hedging.

e. Derivative Trading Asset Securities is a supplemental line item that represents current portion of all types of derivative assets in banks, financial services, capital markets and thrifts templates. In case of non-financial templates (i.e., other than banks, financial services, capital markets and thrifts) this represents current portion of trading nature derivatives and interest rate-related derivative assets. For trading commodities which usually is reported in capital markets and asset management industry, these will be classified as derivative trading assets, if the notes clearly mention that the derivative assets relate exclusively to trading commodities such as crude oil, metals, etc. On the balance sheet, these will be included in trading asset securities. This item includes: Derivatives; Trade derivatives; Interest rate swaps.

f. Long-Term Debt Derivatives is a supplemental line item that represents derivative contracts that are relating to long-term debt, where the main purpose of the derivatives is to mitigate the risk either relating to Interest Rate risk, exchange rate risk, and fair value changes, ultimately affecting the amounts paid under debt contracts. These amounts are included in Long Term Debt. Sample line items that will be categorized as Long-Term Debt Derivatives include: Unrealized loss from cross-currency interest rate swaps; Unrealized depreciation on interest rate swap contracts; Unrealized loss on Interest rate swap; Unrealized gain from cross-currency interest rate swaps; Unrealized appreciation on interest rate swap contracts; Unrealized gain on interest rate swap; Deferred gain on interest rate Swap.

g. Derivative Assets Current is a component of Other Current Assets and represents derivatives assets in the current section of the balance sheet. This item includes: Swaps; Derivatives; Derivative assets - current; Risk Management Assets; Fair Value of Derivative Financial Instruments; Price risk management assets; Fair value of hedging contracts; Commodity contracts; Energy marketing and risk management assets; Utility energy commodity derivative assets; Mark-to-market energy assets. Note: In all templates (Other than Utilities) these line items are categorized as Other Current Assets.

h. Long-Term Derivative Asset is a supplemental line item in standard, REIT, utilities, and insurance templates that represent non-current portion of other operating nature derivatives (non-interest rate derivatives). This item includes: Swaps; Derivatives; Derivative assets - long term; Risk management assets; Fair value of derivative financial instruments; Price risk management assets; Fair value of hedging contracts; Commodity contracts; Energy marketing and risk management assets; Utility energy commodity derivative assets; Mark-to-market energy assets.

B Variables Description

This appendix provides a detailed description of each variable used in this paper.

Blev: Book debt ratio $= \dfrac{\text{(Long-term + Short-term Debt)}}{\text{Total Assets}}$

Mlev: Market debt ratio $= \dfrac{\text{(Long-term + Short-term debt)}}{\text{(Total Assets + Book Equity - Market Equity)}}$

DFC: Dummy that equals 1 if a firm has foreign currency debt, 0 otherwise

If Capital IQ reports the currency information as unavailable, it means the company reports the repayment currency as either "foreign currency" or "multiple currencies", following the approach Kim et al. (2020).

Prof: Profitability $= \dfrac{\text{(Operating Income + Interest and related expense + Current Income Taxes)}}{\text{Total assets}}$

ROA: Return on Assets $= \dfrac{\text{Earnings before interest and taxes}}{\text{Total assets}}$

MB: Market-to-Book $= \dfrac{\text{(Long-term Debt + Short-term Debt + Preferred Capital + Market Value of Equity)}}{\text{Total assets}}$

DEP: Depreciation $= \dfrac{\text{Total Depreciation and Amortization}}{\text{Total assets}}$

Size: Natural Logarithm of Total Assets

Tangibility: $\dfrac{\text{Fixed assets}}{\text{Total assets}}$

R&D_D: Dummy variable indicating that the firm did not report R&D expenses

R&D: $\dfrac{\text{R\&D expenses}}{\text{Total Assets}}$

Taxes: $\dfrac{\text{Current Income Taxes}}{\text{Income Before Income Taxes}}$

Liq: Liquidity $= \dfrac{\text{Total Current Assets}}{\text{Total Current Liabilities}}$

IndBlev (IndMlev): The median book (market) leverage ratio for the firm's industry is based on a two-digit SIC code.

Industry Exports: Dummy variable that equals one if the ratio of total exports by country and in-sample revenue is above the 75^{th} percentile of its distribution based on the four-digit NAICS industry code.

Hedge Position: Dummy variable indicating whether the firm reports hedge/derivatives positions in its financial statements.

Depreciation: Dummy variable that takes the value of one if the bilateral exchange rate vis-à-vis a basket of currencies, Special Drawing Rights (SDR) from IMF, depreciated more than 10%

C Additional Results

Table C1: Dynamic panel structure and adjustment speed estimates

The table summarizes the dynamic panel structure and the adjustment speed estimates for book and market leverage for the sample period 2002–2021. The definitions and the sources of the variables employed in the regressions are provided in Table 2. Rows (1) – (37) provide information on each country included in the sample. The dynamic panel structure columns report the annual adjustment speeds (λ) obtained from the Fixed Effects (FE) model, the Blundell and Bond (1998) two-step system generalized method of Moments (BB) and the Bruno (2005) corrected least squares dummy variable (LSDVC) through the estimation of the following model run separately for each country, using book and market leverage:

		FE		Blundell and Bond		LSDVC	
Countries	Obs.	Blev	Mlev	Blev	Mlev	Blev	Mlev
Argentina	632	0.222	0.251	0.539	0.411	0.195	0.195
Australia	14,633	0.486	0.479	0.325	0.374	0.365	0.361
Austria	806	0.407	0.399	0.545	0.384	0.329	0.324
Belgium	1,326	0.353	0.397	0.355	0.397	0.305	0.356
Brazil	2,379	0.349	0.382	0.299	0.373	0.282	0.325
Canada	9,742	0.482	0.497	0.237	0.336	0.336	0.360
Chile	1,028	0.321	0.461	0.387	0.517	0.259	0.427
Colombia	277	0.376	0.380	0.387	0.517	0.261	0.283
Denmark	1,548	0.466	0.421	0.446	0.436	0.409	0.383
Finland	1,948	0.348	0.355	0.396	0.383	0.305	0.329
France	7,901	0.379	0.414	0.307	0.348	0.311	0.356
Germany	7,288	0.405	0.399	0.376	0.428	0.332	0.341
Greece	2,550	0.270	0.333	0.159	0.263	0.199	0.261
Hong Kong	2,086	0.407	0.413	0.508	0.533	0.358	0.374
India	26,881	0.335	0.392	0.156	0.217	0.241	0.310
Indonesia	4,734	0.361	0.396	0.330	0.496	0.287	0.397
Ireland	805	0.477	0.470	0.370	0.373	0.354	0.395
Israel	2,631	0.484	0.466	0.355	0.449	0.421	0.410
Italy	3,343	0.382	0.361	0.309	0.285	0.332	0.309
Japan	19,567	0.488	0.537	0.248	0.154	0.364	0.427
Malaysia	12,160	0.288	0.325	0.223	0.235	0.251	0.281
Mexico	889	0.316	0.412	0.337	0.235	0.289	0.408
New Zealand	1,271	0.374	0.447	0.312	0.474	0.284	0.351
Norway	2,190	0.521	0.488	0.550	0.436	0.445	0.419
Pakistan	3,622	0.414	0.464	0.363	0.381	0.354	0.396
Peru	827	0.384	0.514	0.391	0.504	0.347	0.437
Philippines	1,695	0.319	0.299	0.304	0.356	0.269	0.253
Portugal	579	0.333	0.300	0.886	0.566	0.243	0.212
Singapore	7,452	0.376	0.390	0.279	0.368	0.313	0.341
South Africa	2,900	0.391	0.488	0.388	0.428	0.352	0.451
South Korea	3,697	0.597	0.632	0.242	0.261	0.392	0.429
Spain	1,550	0.431	0.384	0.413	0.403	0.353	0.316
Switzerland	2,582	0.346	0.379	0.195	0.336	0.297	0.342
Thailand	6,252	0.365	0.405	0.289	0.240	0.324	0.360
Turkey	3,209	0.409	0.556	0.286	0.455	0.333	0.461
United Kingdom	14,434	0.412	0.433	0.321	0.433	0.304	0.349
United States	55,828	0.429	0.428	0.318	0.449	0.323	0.352
Mean	6304.84	0.392	0.420	0.355	0.385	0.317	0.354
Median	2606.50	0.383	0.412	0.334	0.385	0.320	0.355

Table C2: Variance decomposition of the SoA

This table shows our measure of DFC on a growing number of fixed effects and reports the resulting $R^2(\%)$ for Book (Blev) and Market (Mlev) leverage for the full sample and the DFC firms.

	Full Sample		DFC firms	
	Blev	Mlev	Blev	Mlev
Panel A: Full Sample				
Time FE	0.267	0.294	0.791	0.783
Country FE	25.128	20.909	38.791	27.069
Industry FE	3.863	4.944	9.479	11.484
Firm FE	45.960	50.927	40.227	48.260
Panel B: Advanced Economies				
Time FE	0.474	0.486	2.550	1.298
Country FE	18.941	14.615	31.404	18.449
Industry FE	6.182	6.241	14.032	16.326
Firm FE	46.838	53.827	42.175	53.276
Panel C: Emerging Economies				
Time FE	0.558	0.806	0.266	1.152
Country FE	31.497	28.934	41.851	34.455
Industry FE	5.085	7.480	10.711	13.419
Firm FE	42.363	42.680	34.756	37.062

Table C3: Zero-leverage firms

This table presents the impact of debt in foreign currency on the speed of adjustment when removing zero-leverage firms. The dependent variable is the leverage ratio. ΔBlev (ΔMlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Column (1) shows the SoA with the effect of DFC as the interaction variable, column (2) and (3) includes additional control variables. Control variables are not reported for brevity. Table A (B) presents regression results when target leverage is estimated using book (market) leverage. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	ΔBook Leverage (A)			ΔMarket Leverage (B)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full Sample						
SoA	0.099***	0.132***	0.454***	0.105***	0.133***	0.470***
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.005)
DFC	-0.011***	-0.004***	-0.001	-0.012***	-0.003***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SoA x DFC	-0.057***	-0.037***	-0.080***	-0.043***	-0.029***	-0.065***
	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)	(0.005)
Constant	0.007***	0.014***	0.005	0.006***	0.027***	-0.011**
	(0.000)	(0.001)	(0.006)	(0.000)	(0.001)	(0.005)
Observations	154,766	154,766	154,766	154,766	154,766	154,766
R-squared	0.031	0.072	0.307	0.035	0.158	0.372
Panel B: Advanced Economies						
SoA	0.120***	0.143***	0.464***	0.112***	0.136***	0.449***
	(0.003)	(0.003)	(0.006)	(0.002)	(0.003)	(0.005)
DFC	-0.010***	-0.004***	-0.001	-0.008***	-0.002***	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SoA x DFC	-0.064***	-0.043***	-0.078***	-0.011**	-0.007	-0.023***
	(0.005)	(0.005)	(0.008)	(0.005)	(0.005)	(0.008)
Constant	0.007***	0.016***	-0.001	0.005***	0.032***	-0.011**
	(0.000)	(0.002)	(0.008)	(0.000)	(0.001)	(0.006)
Observations	104,285	104,285	104,285	104,285	104,285	104,285
R-squared	0.041	0.082	0.330	0.043	0.161	0.388
Panel C: Emerging Economies						
SoA	0.077***	0.106***	0.423***	0.092***	0.125***	0.469***
	(0.003)	(0.004)	(0.009)	(0.003)	(0.004)	(0.008)
DFC	-0.010***	-0.005***	-0.005***	-0.013***	-0.004***	-0.003
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
SoA x DFC	-0.038***	-0.015***	-0.039***	-0.047***	-0.022***	-0.041***
	(0.005)	(0.005)	(0.008)	(0.005)	(0.004)	(0.008)
Constant	0.006***	0.014***	0.019**	0.007***	0.025***	-0.012
	(0.000)	(0.002)	(0.009)	(0.000)	(0.002)	(0.009)
Observations	50,463	50,463	50,463	50,463	50,463	50,463
R-squared	0.020	0.050	0.251	0.026	0.163	0.354
Controls						
Firm Controls	No	Yes	Yes	No	Yes	Yes
Country x Year FE	No	Yes	Yes	No	Yes	Yes
Firm FE	No	No	Yes	No	No	Yes

Table C4: Effect of Industry Imports on DFC and leverage adjustment

This table presents the impact of imports on debt in foreign currency and the speed of adjustment. The dependent variable is the leverage ratio. Blev (Mlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Ind_Imports is the quantity of Imports by industry and country by in-sample revenue from the CEPII database. Control variables are not reported for brevity. Column A (B) presents regression results when target leverage is estimated using book (market) leverage. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	Full Sample		Advanced Economies		Emerging Economies	
	ΔBlev (A)	ΔMLev (B)	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)
	(1)	(2)	(3)	(4)	(5)	(6)
SoA	0.451***	0.457***	0.468***	0.444***	0.411***	0.454***
	(0.008)	(0.006)	(0.010)	(0.007)	(0.011)	(0.010)
DFC	-0.003**	-0.003**	-0.003	-0.005***	-0.005**	-0.005*
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
SoA x DFC	-0.076***	-0.051***	-0.082***	-0.027*	-0.032***	-0.023**
	(0.008)	(0.007)	(0.012)	(0.015)	(0.011)	(0.010)
Ind_Imports	0.002	0.000	0.003*	0.001	-0.001	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
SoA x Ind_Imports	0.001	-0.009	0.007	-0.002	-0.011	-0.032**
	(0.010)	(0.009)	(0.014)	(0.012)	(0.015)	(0.013)
DFC x Ind_Imports	-0.004	0.000	-0.005	-0.002	-0.001	0.004
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.005)
SoA x DFC x Ind_Imports	-0.006	0.002	0.005	0.021	-0.011	0.014
	(0.015)	(0.014)	(0.022)	(0.022)	(0.020)	(0.019)
Constant	0.015**	-0.003	0.010	0.001	0.050***	0.009
	(0.007)	(0.005)	(0.009)	(0.006)	(0.012)	(0.011)
Observations	89,621	89,621	60,662	60,662	28,959	28,959
R-squared	0.296	0.358	0.315	0.367	0.246	0.353
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Table C5: Effect of Industry Net Exposure on DFC and leverage adjustment

This table presents the impact of industry trade net exposure on debt in foreign currency and the speed of adjustment. The dependent variable is the leverage ratio. Blev (Mlev) is the difference between the target book (market) leverage and the actual book (market) leverage. SoA is the difference between the target leverage ratio and the actual leverage ratio. DFC is a dummy that equals 1 if a firm has foreign currency debt, 0 otherwise. Ind_Net_Exposure is the quantity of Exports minus Imports by industry and country by in-sample revenue from the CEPII database. Control variables are not reported for brevity. Column A (B) presents regression results when target leverage is estimated using book (market) leverage. P-values reported are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by $*$, $**$, and $***$ respectively.

	Full Sample		Advanced Economies		Emerging Economies	
	ΔBlev (A)	ΔMLev (B)	ΔBlev (A)	ΔMlev (B)	ΔBlev (A)	ΔMlev (B)
	(1)	(2)	(3)	(4)	(5)	(6)
SoA	0.464***	0.470***	0.476***	0.451***	0.412***	0.465***
	(0.010)	(0.007)	(0.011)	(0.009)	(0.015)	(0.013)
DFC	-0.001	-0.001	0.003	-0.003	-0.010***	-0.007**
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
SoA x DFC	-0.105***	-0.069***	-0.107***	-0.033	-0.042***	-0.032**
	(0.011)	(0.009)	(0.016)	(0.022)	(0.015)	(0.013)
Ind_Net_Exposure	-0.002	-0.000	-0.001	-0.001	-0.005*	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)
SoA x Ind_Net_Exposure	0.008	0.008	0.001	0.004	0.027	-0.000
	(0.012)	(0.009)	(0.015)	(0.012)	(0.017)	(0.015)
DFC x Ind_Net_Exposure	-0.003	0.002	-0.012***	-0.003	0.016***	0.016***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.005)	(0.005)
SoA x DFC x Ind_Net_Exposure	0.023	0.003	0.045**	0.024	-0.020	0.009
	(0.016)	(0.015)	(0.023)	(0.027)	(0.023)	(0.022)
Constant	0.016*	0.007	0.010	0.006	0.059***	0.026*
	(0.008)	(0.006)	(0.010)	(0.007)	(0.016)	(0.015)
Observations	71,189	71,189	53,370	53,370	17,819	17,819
R-squared	0.314	0.378	0.324	0.377	0.287	0.395
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

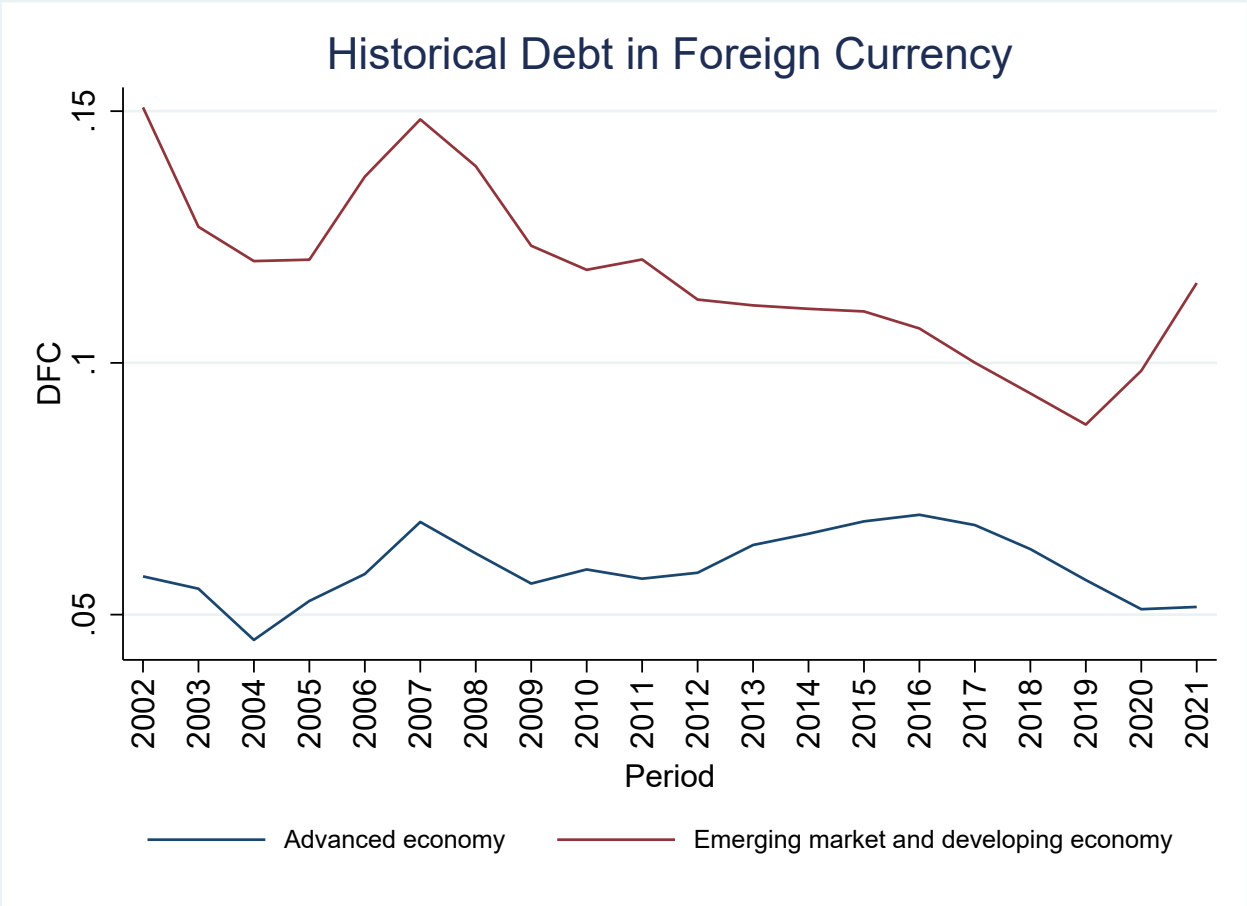

Fig. C1. Historical Debt in Foreign Currency. It is calculated as the mean value of the DFC ratio, which is calculated by dividing the amount of DFC by total debt.

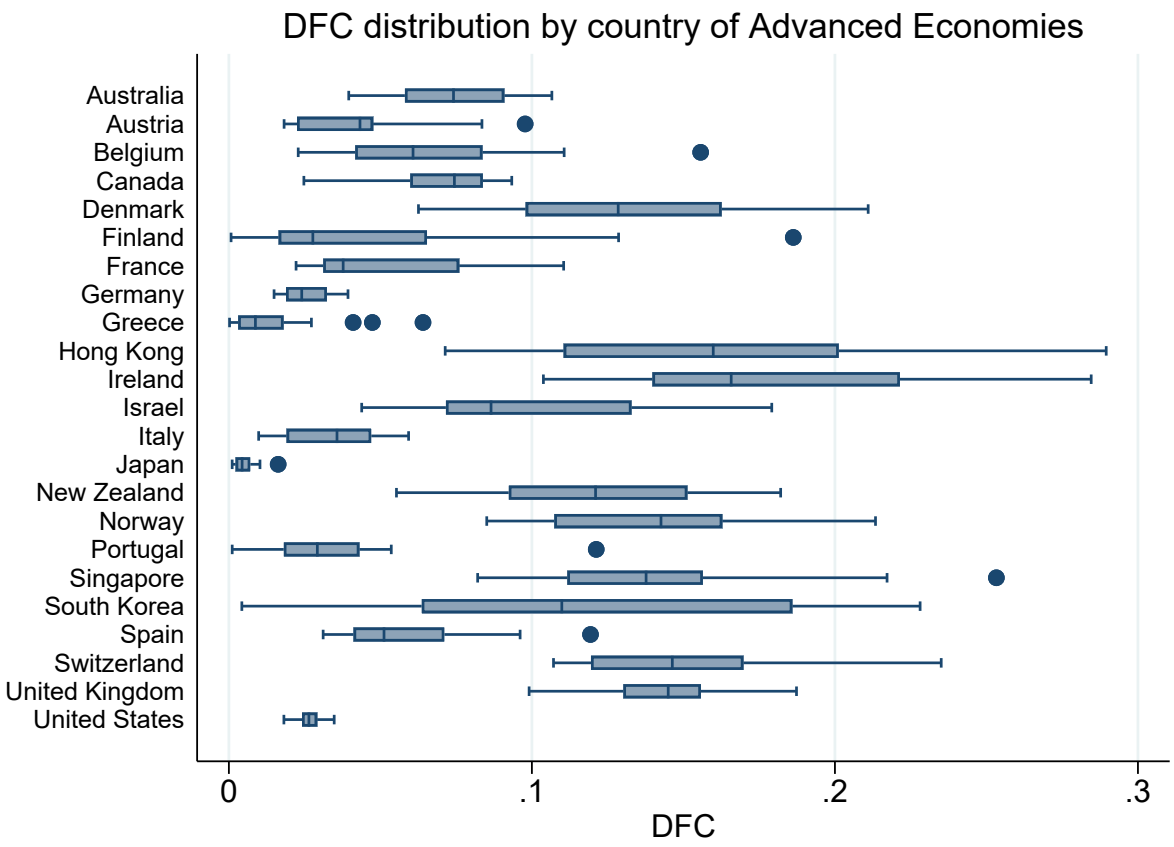

Fig. C2. DFC distribution by country of Advanced Economies. The boxplot illustrates the distribution of DFC among countries classified as Advanced Economies in the IMF's 2021 Economic Outlook over the sample period.

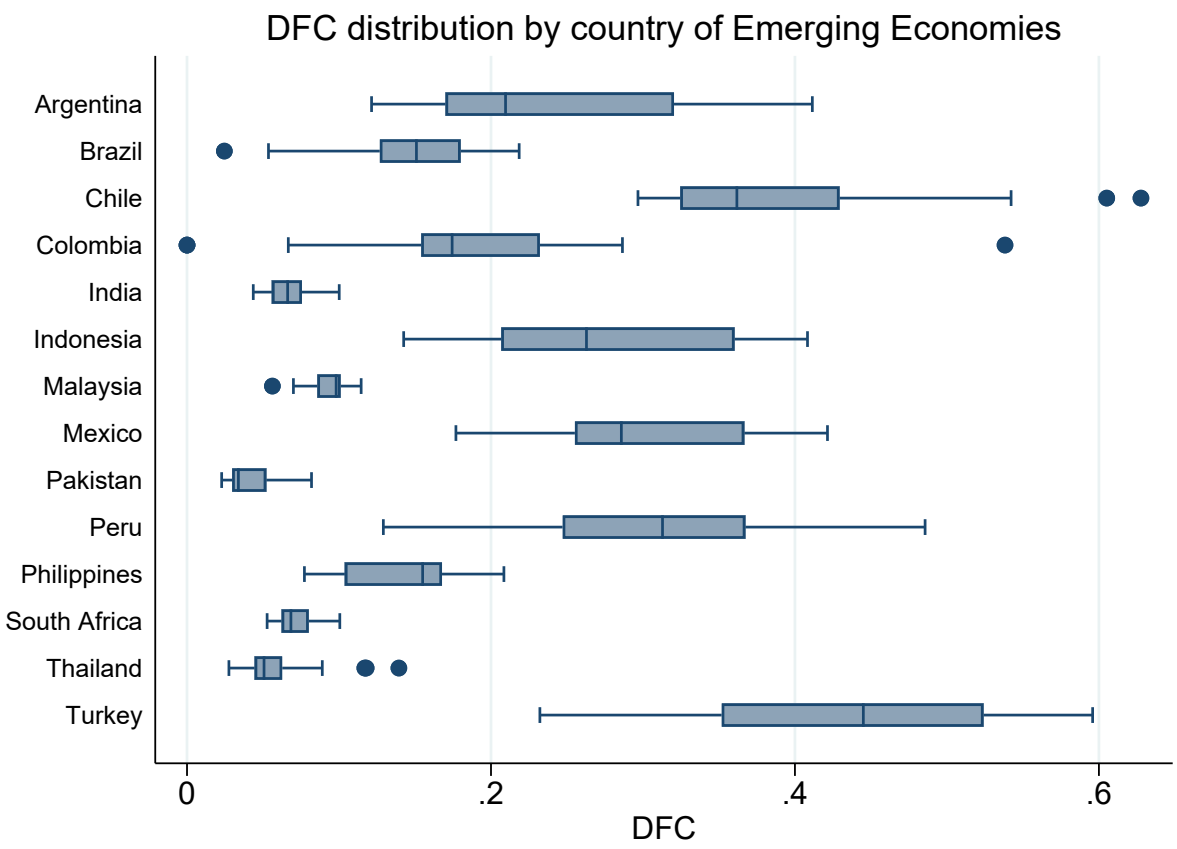

Fig. C3. DFC distribution by country of Emerging Economies. The boxplot illustrates the distribution of DFC among countries classified as Emerging Economies in the IMF's 2021 Economic Outlook over the sample period.

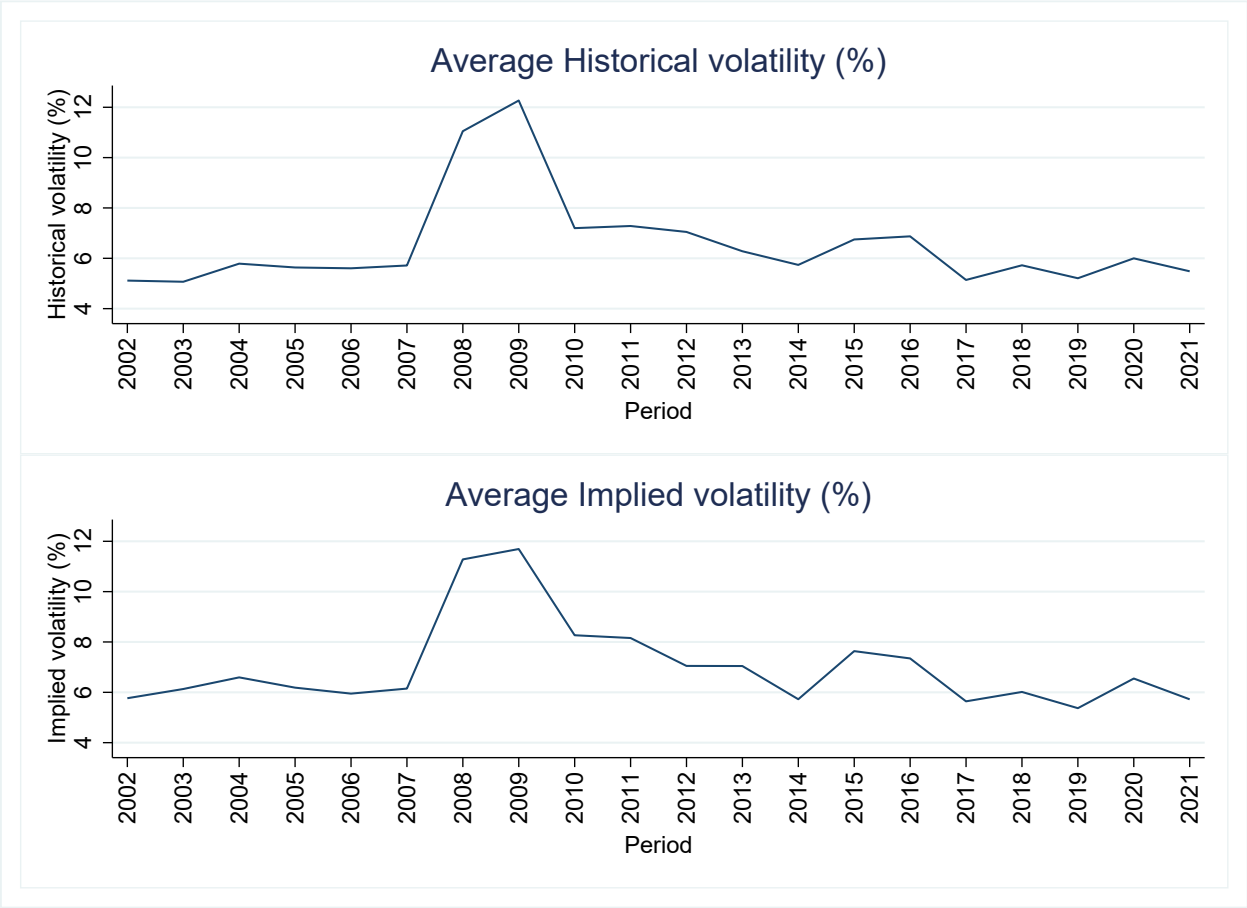

Fig. C4. Historical and implied volatility of currencies from Bloomberg. Historical volatility was computed using the standard deviations of final exchange rates on an annual basis. Implied volatility is derived from the pricing of one-month expiration call options at the end of each year. Both measurements are in annualized terms against the USD.

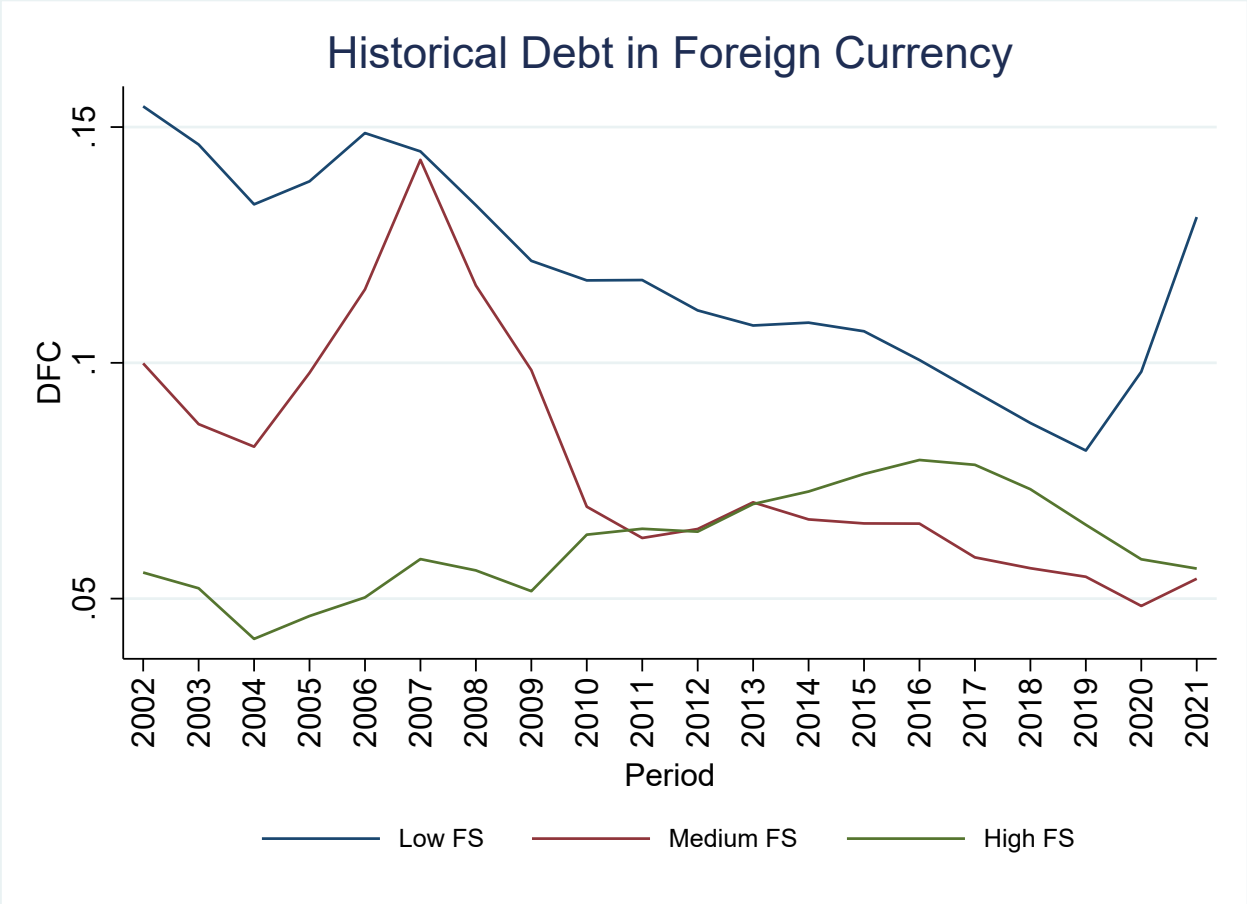

Fig. C5. Historical Debt in Foreign Currency. It is calculated as the mean value of the DFC ratio, which is calculated by dividing the amount of DFC by total debt. The sample split is based on the Global Financial Development Report dataset (Beck et al., 2000, 2009; Čihák et al., 2012).

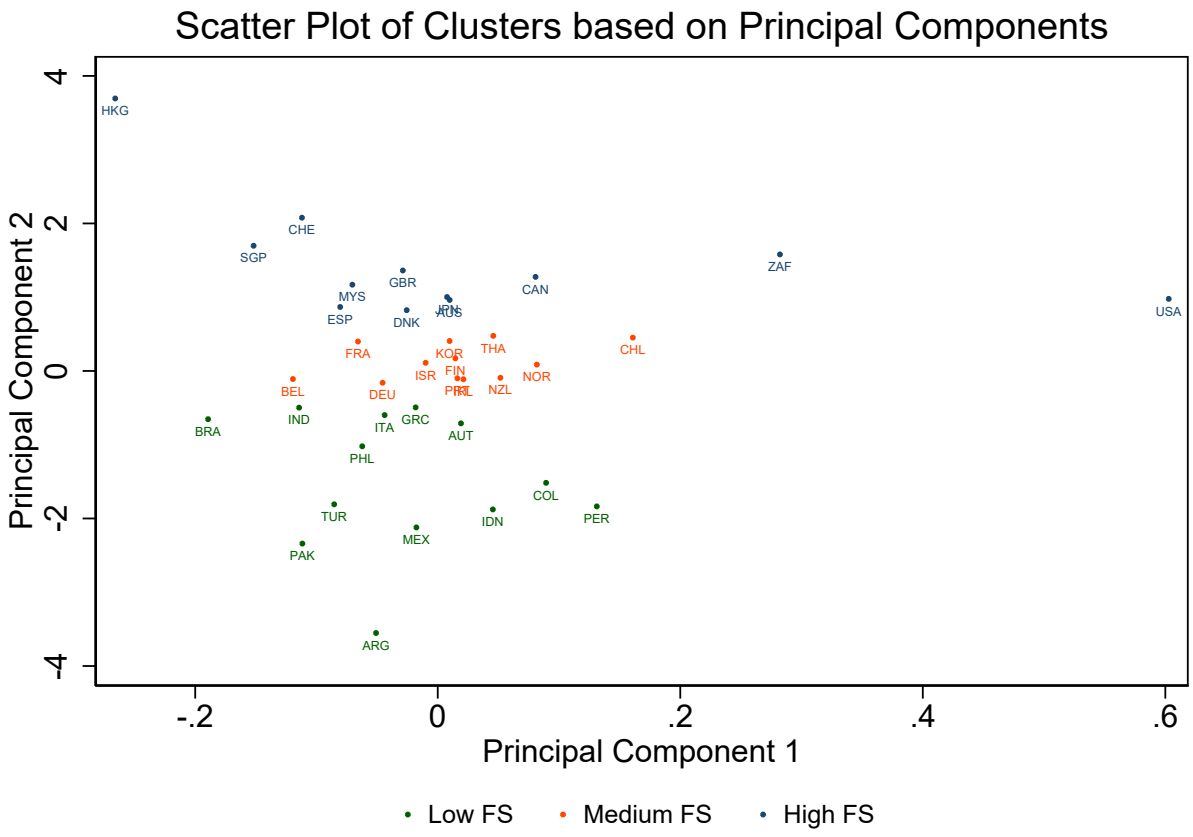

Fig. C6. Country Clustering based on Principal Components of Financial Structure (FS) Score. Clustering of firms based on the quantiles of the first component of the PCA of the average score of financial structure adapted from Beck et al. (2000, 2009); Čihák et al. (2012). The countries here are categorized according to score similarity.