Do the Drivers of Loan Dollarization Differ between CESEE and Latin America? A Meta-Analysis

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In this paper we compare the determinants of loan dollarization in two emerging market regions, namely Central, Eastern and Southeastern Europe (CESEE) and Latin America, through a meta-analysis of 32 studies that provide around 1,200 estimated coefficients for six drivers of foreign currency lending. As a common pattern, we find macroeconomic instability (as expressed by inflation volatility) and banks' funding in foreign currency to play a significant role in explaining loan dollarization in both regions. In contrast, the interest rate differential appears to be a key determinant only in Latin America, while the positive impact of exchange rate volatility on dollarization implies a more prominent role for supply factors in the CESEE region. While the robustness of the results has been verified, our meta-analysis shows that estimates reported in the literature tend to be influenced by study characteristics such as the methodology applied and the data used.

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During the 1980s and 1990s, high levels of inflation, wide interest rate spreads, local currency depreciation and the low credibility of domestic economic policies as well as chronic monetary financing of budget deficits prompted massive portfolio shifts into dollar-denominated assets and liabilities in most Latin American countries (Galindo and Leiderman, 2005). One decade later, a similar process resulting in a buildup of large stocks of financial assets and liabilities in foreign currency was observed in the European transition economies. While such dollarization[2] may help reduce capital flight, curb inflation expectations and induce macroeconomic stabilization, it may also limit the independence of monetary policy and create systemic vulnerabilities in financial and nonfinancial sectors. The potential adverse effects of dollarization are amplified when firms and households hold unhedged liabilities, in particular bank loans, in foreign currency: this exacerbates credit default risk and currency mismatch and thus creates potential threats to financial stability. Moreover, evidence from emerging economies in general and from Latin America and CESEE in particular reveals that, unless addressed, dollarization tends to be a persistent phenomenon. Yet to be able to achieve dedollarization (i.e. reduce foreign currency-denominated assets) policymakers need to be aware of the key underlying drivers and understand above all whether dollarization was induced by demand- or supply-side factors (EBRD, 2010).

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[2] *Dollarization is the (total or partial) replacement of the domestic currency by any foreign currency as a store of value, unit of account or medium of exchange within the domestic economy. Dollarization frequently involves the U.S. dollar, which is widespread in Latin American countries, while the CESEE countries have extensively used the euro and the Swiss franc. In this paper we analyze the dollarization of banks' financial assets, specifically lending to the private nonfinancial sector by banks in the domestic market.*

The literature on dollarization has identified major determinants of foreign currency lending in emerging market economies, reflecting both demand- and supply-side factors and the interaction between them. These factors include the interest rate differential, the inflation rate and exchange rate depreciation; the volatility of inflation and of the exchange rate as well as the ratio between the two variables (the so-called minimum variance portfolio ratio – MVP ratio); and banks' funding in foreign currency.[3] At the same time, empirical studies on both Latin America and CESEE have remained rather inconclusive and the results diverge to some extent depending on the countries analyzed, the time period considered or the estimation method used.

Against this backdrop, this paper aims to first analyze the main drivers of loan dollarization (i.e. foreign currency lending by banks in the domestic market) in CESEE and Latin America, and to establish whether loan dollarization has been a supply- or a demand-driven process. In a second step, we investigate whether and how the drivers of loan dollarization differ between the two regions. Such a comparison should allow us (i) to identify typical patterns and idiosyncratic factors characterizing dollarization; and (ii) to deduce policy lessons for CESEE from the way dollarization and its consequences were handled earlier in Latin American countries. For that purpose, we conduct a metaregression analysis to condense the findings of previous empirical studies and establish the "true effect size" across datasets (Stanley and Jarrel, 1989).

Our findings suggest that loan dollarization was indeed driven by different factors in CESEE and Latin America. In Latin America, unlike in CESEE, the interest rate spread had a positive and significant impact on dollarization whereas exchange rate volatility had a negative impact, which would imply that Latin American dollarization was demand-driven. Hence, a rise in exchange rate volatility would make foreign currency loans less attractive for borrowers. In CESEE in contrast, exchange rate volatility had a positive impact, making risk-averse lenders more willing to supply foreign currency loans in order to match their foreign currency positions and reduce their currency risk. In both regions, loan dollarization was, moreover, heavily driven by macroeconomic instability, as reflected by inflation volatility, and banks' funding in foreign currency.

This paper is structured as follows. Section 1 provides descriptive evidence of financial dollarization, both on the assets and liabilities side in Latin America and CESEE. Section 2 presents a literature review of the determinants of foreign currency lending aimed at identifying the most common explanatory factors at the macroeconomic level. Section 3 describes the meta-analysis framework used to estimate the "true effect size" of the drivers of loan dollarization. Section 4 discusses the metaregression results and checks their robustness. The last section concludes.

[3] *We should underline that the literature has identified region-specific factors which might influence the degree of dollarization. In particular, the EU accession perspective and the euro adoption perspective of the CESEE countries have been shown to play a key role (e.g. Rosenberg and Tirpák, 2008). However, in our study we focus on determinants of foreign currency lending which are common to both regions and have a sufficient number of coefficients.*

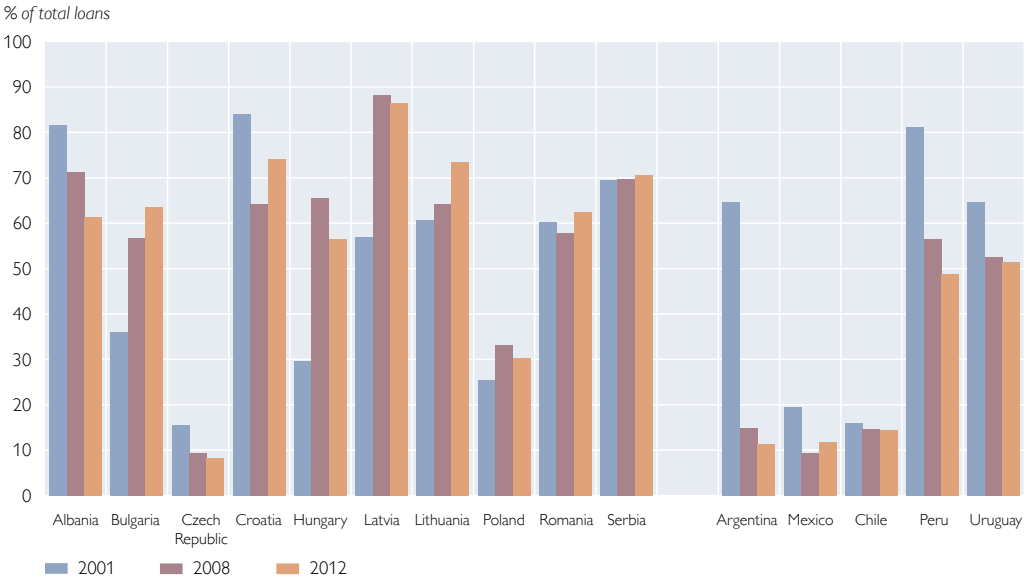
1 Descriptive Evidence on Financial Dollarization in Latin America and CESEE[4]

Although dollarization has been reduced successfully by some countries in both regions,[5] it tends to be a persistent phenomenon and has indeed been rising in some economies. Yet there are some striking differences between the two regions. First, the degree of currency substitution is higher on average in CESEE than in Latin America, both on the assets and the liabilities side (see charts 1 and 2).

In CESEE, 60% of private sector loans and 40% of private sector deposits were denominated in foreign currency in 2012, compared with only 27% and 24%, respectively, in Latin America. The lower dollarization levels in some countries in Latin America are, however, the result of policy or market intervention: In 2001, around 50% of total loans and deposits were denominated in U.S. dollars (or even around 70% in some countries, e.g. Peru and Uruguay). For instance, Argentina officially *pesified* (dedollarized) and indexed foreign currency loans and deposits after the 2001 crisis. Brazil, Chile, Mexico and Colombia imposed restrictions on holding foreign currency loans, introduced financial instruments indexed to exchange rate and inflation developments, or even implemented government policies to dedollarize public sector liabilities.[6] In Latin America, both loan and deposit dollarization hence decreased constantly from 2000 onward and somewhat stabilized

Chart 1

Share of Foreign Currency Loans



Source: National central banks.

Note: The data refer to loans to the private nonfinancial sector and are adjusted for exchange rate developments (using January 2008 exchange rates). Data for Brazil and Colombia are not available.

[4] *In the context of this paper, the CESEE region includes the seven CESEE EU Member States which have not yet adopted the euro (i.e. Bulgaria, the Czech Republic, Croatia, Hungary, Lithuania, Poland and Romania) plus Latvia (which became the 18th euro area member on January 1, 2014) and two (potential) EU candidate countries (i.e. Albania and Serbia). Latin America includes seven countries: Argentina, Brazil, Mexico, Chile, Colombia, Peru and Uruguay.*

[5] *The list of success stories includes Brazil, Chile, Colombia, Mexico and Poland (EBRD, 2010).*

[6] *See Gallego et al. (2010).*

at lower levels during the recent crisis. In contrast, dollarization in CESEE was increasing steadily before the 2008/2009 crisis, fueled by both the EU accession perspective and increasing external funding as well as demand factors (Beckmann, Scheiber and Stix, 2011). The share of foreign currency loans in CESEE continued to increase even after the onset of the 2008/2009 crisis in all countries but the Czech Republic, Croatia and Albania. Indeed, the crisis seems to have pushed up dollarization in some CESEE countries. On average, loan dollarization increased by 13 percentage points in the region as a whole between 2008 and 2012.

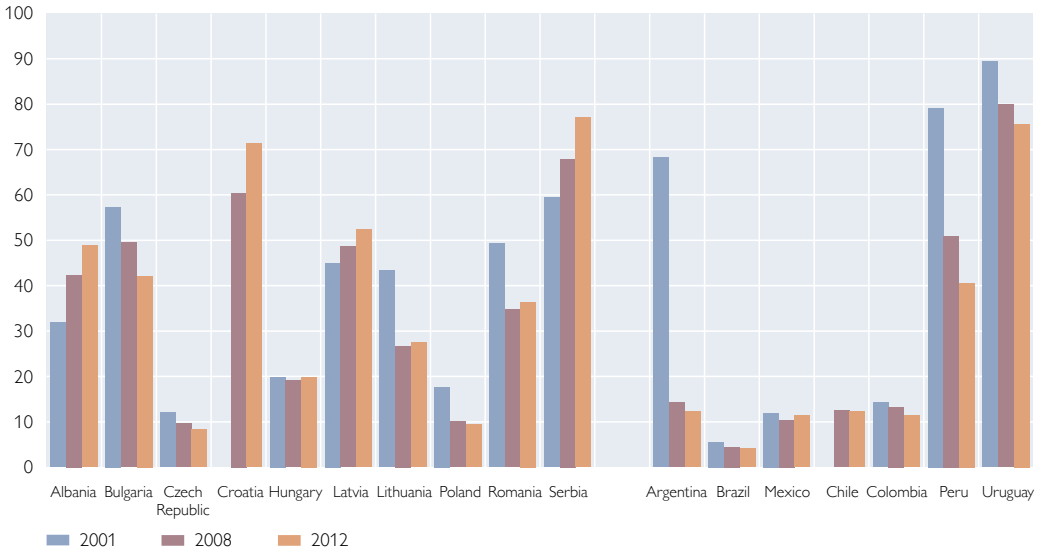
Second, the degree of regional divergence differs as well. In Latin America, the share of foreign currency loans in total loans outstanding in 2012 ranged from 11% (Argentina and Mexico) to around a 50% (Peru and Uruguay), while the respective shares in CESEE ranged from 10% (Czech Republic) to close to 90% (Latvia). Furthermore, in CESEE, the share of foreign currency deposits was as high as 60% to 75% in the majority of the countries analyzed, with only one country (the Czech Republic) exhibiting a share clearly below 15% of total deposits. In contrast, in Latin America, five of the seven countries analyzed registered a ratio below 15%.

Third, regarding potential drivers of loan dollarization, a major difference between the two regions is the degree of currency mismatch in the respective banking systems (i.e. the difference between the level of loans and deposits in foreign currency as a share of GDP; see chart 3[7]). The banking systems in CESEE

Chart 2

Share of Foreign Currency Deposits

% of total deposits



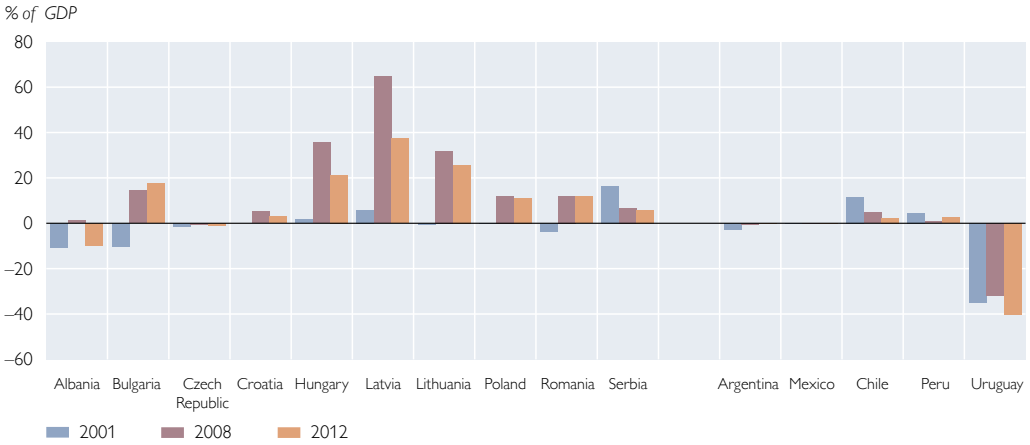
Source: National central banks.

Note: The data refer to deposits made by the private nonfinancial sector and are adjusted for exchange rate developments (using January 2008 exchange rates).

[7] *Yet we do not have data on assets and liabilities different from loans and deposits in foreign currency held by banks. If we account for those "other" assets and liabilities, the currency mismatch may be amplified or reduced. For instance, banks may hedge net short positions in loans-deposits with long positions in other dollar-denominated assets and, therefore, match their foreign currency positions, reducing or at least balancing the indirect exchange rate induced risk.*

Chart 3

Dollarization Mismatch between Foreign Currency Loans and Deposits



Source: National central banks.

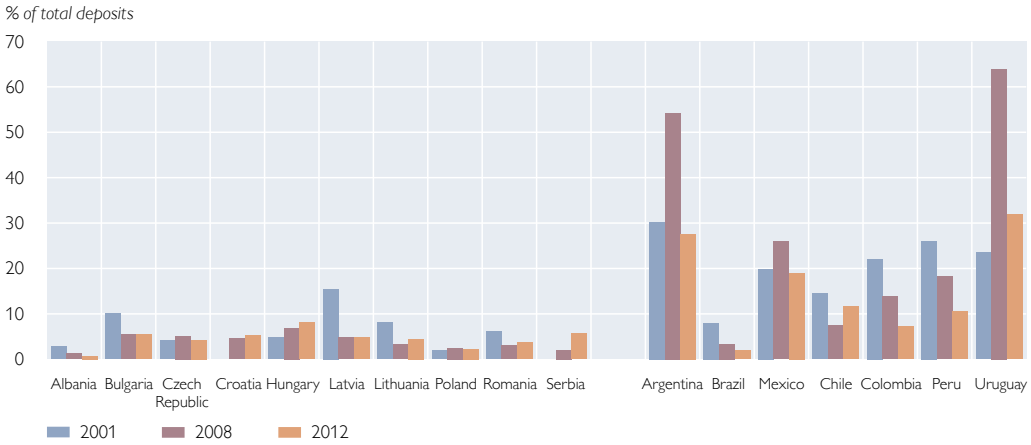
Note: The mismatch is measured as the difference between foreign currency loans and foreign currency deposits as a % of GDP. Data for Brazil and Colombia are not available.

as defined here tend to be dollarized more heavily on the assets side than on the liabilities side. The currency mismatch is high and positive, having evolved over time from 1% of GDP on average in the early 2000s to around 15% in 2008, due to an extraordinary increase of foreign currency loans. From 2008 onwards dollarization decreased strongly as the crisis affected both foreign currency loan demand and supply, especially in countries like Hungary. Only in Albania and the Czech Republic is the sign of the mismatch negative (i.e. foreign currency deposits exceed foreign currency loans). In Latin America in contrast, the cross-country correlation between U.S. dollar loans and U.S. dollar deposits was close to 1 in 2012, following a decline during the 2000s. Within Latin America, Uruguay is an outlier, with a negative currency mismatch of 40% of GDP in 2012, reflecting the absorption of substantial amounts of U.S. dollar deposits from Argentina after the crisis in the early 2000s.

Fourth, the degree of dollarization is also reflected by foreign currency holdings abroad and the issuance of foreign currency debt in international markets. Such offshore dollarization is seen as less damaging than domestic dollarization, since the default risk is transferred to foreign institutions, although it usually reveals deficiencies in the domestic credit markets and distrust in the banking system. Yet for most of the CESEE countries offshore deposits represent only a small fraction of total deposits and have decreased in the sample period. In Latin America, offshore deposits are more relevant but have also decreased from the early 2000s (chart 4). Corporate issuance of foreign currency debt has gained relevance and grown exponentially in both Latin America and CESEE, as the accommodative stance of monetary policy in developed countries has sharply reduced funding costs in international markets for foreign currency loans in domestic markets. The pattern in the two regions is very similar: an increase of corporate issuance in international markets and in foreign currency. In absolute figures, the importance of foreign funding sources remains limited for these

Chart 4

Offshore Deposits



Source: BIS.

economies, though (around 2% of GDP and 5% of total bank credit in both regions).[8]

Finally, the countries in the two regions differ somewhat with respect to exchange rate and inflation rate developments and volatilities as well as with regard to the interest rate differential (i.e. the difference between the price of loans in foreign and in domestic currency).[9] Interestingly, while the interest rate differential (chart 5) has stabilized or decreased in some countries with a high degree of dollarization in both regions (e.g. Peru and Uruguay; Croatia and Albania), it remains at elevated levels of up to 10 percentage points difference in other highly dollarized countries in both regions (e.g. Serbia and Argentina), not least due to the persistently high inflation rates in these countries. Inflation volatility has decreased in all countries under review since 2005 (chart 6), with the exception of Latvia, which nevertheless registered very low inflation rates and even some episodes of deflation in recent years. Going further, although the majority of countries have seen their exchange rates appreciate since 2001, partly explained by the increase in income per capita and related to the Balassa-Samuelson effect, some differences arise in terms of exchange rate volatility, which decreased strongly in CESEE countries and has increased slightly in those Latin American countries with inflation targeting.[10]

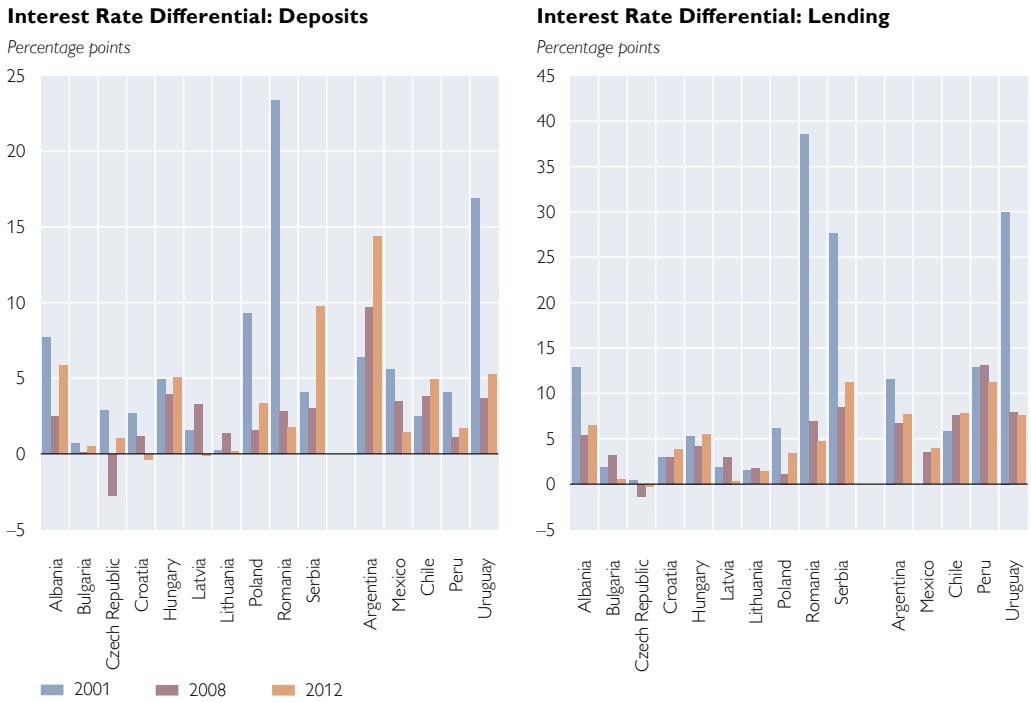
[8] *Data for fixed income issuance come from the Dealogic database and cover all corporate bonds and medium-term notes placed by domestic firms and sovereigns in domestic and international markets.*

[9] *The majority of studies included in section 4 use as a proxy for the interest rate differential a somewhat different calculation, the difference between the domestic interest rate and the U.S. or euro area interest rate, probably as it is difficult to recover long time series data for these differentials, and as some of the domestic markets for foreign currency loans or deposits were developed only from 2000 onwards.*

[10] *Inflation and exchange rate volatility can be calculated in different ways. The papers included in the next section use both rolling standard deviations of inflation rates or volatility extracted using statistical models like GARCH. As we only try to illustrate the recent evolution of volatility, we opt for the easier calculation method.*

Chart 5

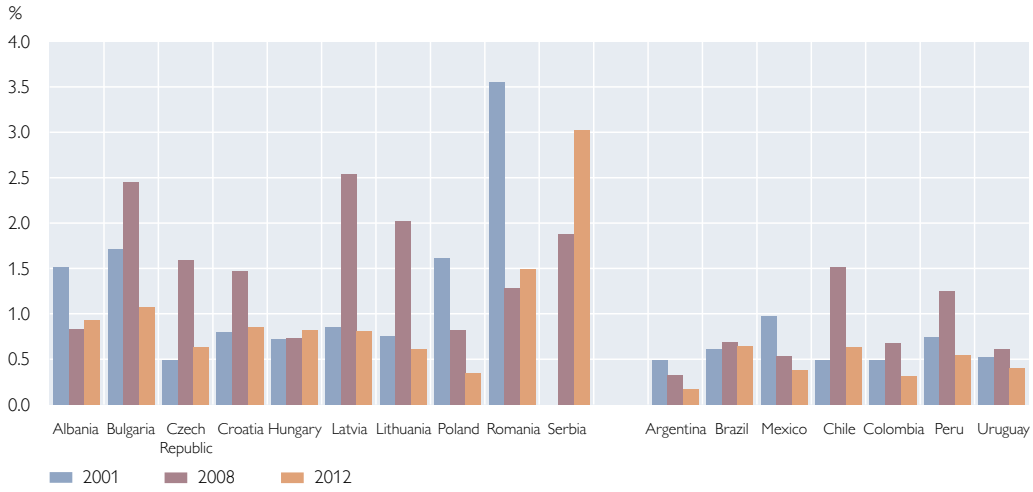
Differential between Interest Rates for Local Currency and Foreign Currency Operations



Source: IMF International Financial Statistics and national central banks.

Chart 6

Inflation Volatility

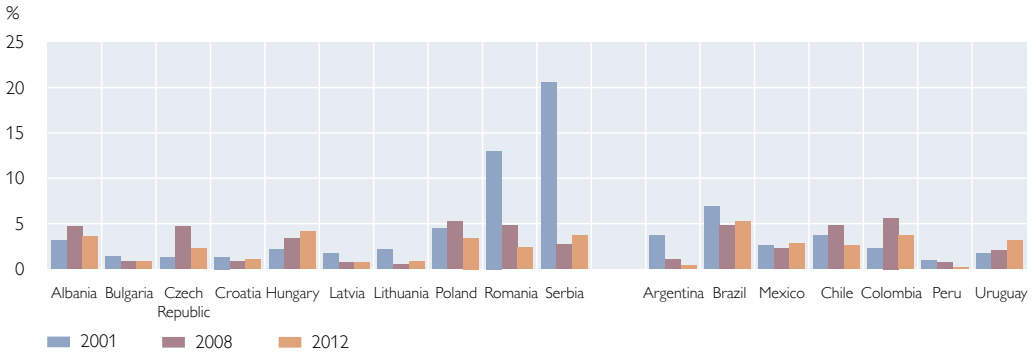


Source: National central banks.

Note: 12-month moving average of CPI inflation standard deviation.

Chart 7

Nominal Effective Exchange Rate Volatility



Source: National central banks.

Note: 12-month moving average of a broad nominal effective exchange rate.

2 Literature Review of Loan Dollarization: Do the Two Regions Differ?

Since dollarization was a widespread phenomenon in Latin America during the 1980s and 1990s, most of the early studies on dollarization focused on this region (e.g. Barajas and Morales, 2003). Although more recently the focus has turned to the CESEE countries, with an increasing number of studies based on survey data, traditionally the majority of studies used aggregate data and therefore focused on macro-level determinants, such as inflation, exchange rate depreciation and their volatilities. These determinants are shown to exert ambiguous effects on foreign currency lending depending on whether they express demand or supply factors. Most studies also included the interest rate differential, which is generally perceived to be more of a demand-side driver of foreign currency loans while indicating supply-side effects at the same time.[11] Moreover, both the empirical and theoretical studies traditionally include predominantly supply-side determinants such as the degree of deposit dollarization.

Regarding supply-side factors, Basso, Calvo-Gonzales and Jurgilas (2011) argue that currency matching plays a key role in the lenders' choice of currency denomination and hence is supposed to exert a positive influence on loan dollarization. Matching willingness is strengthened by supervisory regulation of banks' net foreign positions (see e.g. Luca and Petrova, 2008). For Latin America, Barajas and Morales (2003) find that foreign currency loans are strongly correlated with deposits in foreign currency. Fidrmuc, Hake and Stix (2013) find this correlation to be lower in CESEE, implying a lower relevance of funding in foreign currency compared to the Latin American region, although in some countries that matching behavior is supported by the large share of remittances (e.g. Albania and Serbia), which might also partially explain the size of deposit dollarization in those countries.

The interest rate differential – the explanatory variable used most often in the literature – reflects macroeconomic stability along with the relative price of foreign currency loans. If demand factors were dominant, we would expect a positive

[11] *For example, the interest rate differential has been shown to play a major role in the recent process of funding sources substitution in some Latin American countries, ranging from bank credit in foreign currency in the domestic market to fixed income issuance in foreign currency in international markets.*

effect on loan dollarization: borrowers would take out more foreign currency loans as long as they are cheaper than domestic currency loans. In turn, a higher domestic interest rate would be an incentive for banks to lend in domestic currency. Yet in some cases a positive relation between spreads and dollarization might indicate also a supply-side factor, since banks might be offering cheaper foreign currency loans in an effort to gain market share (Steiner, 2011). The tradeoff between currency risk and real interest rate risk (in the case of lower-than-expected inflation) explains the positive impact of the interest rate differential found in most of the studies on foreign currency lending in Latin America (e.g. Esquivel-Monge, 2007, for Ecuador). Interestingly, the empirical evidence for the CESEE countries is rather mixed. Rosenberg and Tirpák (2009) find that the interest rate differential is a robust determinant of foreign currency loans in the countries that joined the EU in 2004 and 2007 and in Croatia. In contrast, Brown and De Haas (2012), using bank-level data, find that foreign currency lending is negatively correlated with spreads in countries where those spreads declined in relation to the euro. Consequently, according to their interpretation, the macroeconomic stability which led to interest rate declines is a stronger determinant of foreign currency loans than spread advantages.

The impact of inflation and its volatility on foreign currency loans depends on the tradeoff between currency and real interest rate risks. High volatility of domestic inflation would induce more borrowing in foreign currency since the real interest rates would be more stable than domestic rates. Furthermore, higher inflation could induce larger savings in foreign currency, which at the same time positively influences lending in foreign currency (i.e. a supply-side perspective). In addition, even in a low inflation environment, the hysteresis effect may persist and induce borrowing in foreign currency (i.e. demand-side perspective) (Arteta, 2002). Regarding inflation, studies based on aggregate data and survey-based studies generally show a positive effect on loan dollarization (e.g. Zettelmeyer, Nagy and Jeffrey, 2010), while some studies also show a significant negative effect (e.g. Steiner, 2011).

Empirical studies also include (real) exchange rate depreciation and its volatility as determinants of loan dollarization in CESEE and Latin America. The theoretical impact of these variables is ambiguous, as it may affect the behavior of lenders and borrowers differently. Banks may try to shift the exchange rate risk to borrowers, increasing the supply of foreign currency loans, especially when they hold a large amount of foreign currency liabilities. At the same time, borrowers might reject the exchange rate risk and demand fewer foreign currency loans, especially in countries with stable monetary environments. By and large, a negative impact actually reflects the credit default risk of unhedged loans, since depreciation makes servicing loans more costly and risk-averse banks would reduce the supply of foreign currency loans especially if borrowers are not able to hedge against the currency risk. Nevertheless, in some cases corporate borrowers may be willing to accept foreign currency loans as a commitment device, signaling to lenders the firm's quality (and potentially a lower cost of default) and thus having to some extent a counterintuitive positive effect on loan dollarization from the demand side.[12]

[12] *For instance, as shown by Alberola, Molina and Navia (2005) governments have the incentive to announce a fixed exchange rate regime just to regain access to cheaper international financial markets. This could explain the counterintuitive result that fixed exchange rate regimes are not related to stronger fiscal discipline, as the theory of fiscal dominance would imply.*

When turning to empirical evidence, Barajas and Morales (2003) for Latin America and Luca and Petrova (2008) for a set of 21 transition countries infer that exchange rate volatility tends to reduce credit dollarization in the short run. In contrast, Honig (2009) points to a positive impact on loan dollarization in a study including a large sample of emerging market economies. Rosenberg and Tirpák (2009) find that exchange rate volatility has negative but small effects on the share of foreign currency loans in the countries that joined the EU in 2004 and 2007 and Croatia. Furthermore, past exchange rate volatility is not found to play a significant role in explaining loan dollarization, which has been explained by the increase in the perceived stability of the exchange rate due to EU membership, making economic agents more willing to accept the currency risk.

Finally, the studies on CESEE and Latin America differ in a number of ways. First, papers on Latin America usually focus on the effects of institutional frameworks on dollarization and include only some of the "traditional" factors as control variables. For instance, Honig (2009) and Arteta (2002) analyze the effects of the exchange rate regime on currency mismatches, while Barajas and Morales (2003) show how financial integration and domestic market developments affect dollarization. Furthermore Garcia-Escribano (2010) and Garcia-Escribano and Sosa (2011) analyze how policy frameworks affect the process of dedollarization. In CESEE-related empirical studies, we find the institutional dimension of the empirical research replaced to some extent by agents' present or past experiences, not least due to the larger availability of survey-level data (e.g. Brown and De Haas, 2012; Fidrmuc, Hake and Stix, 2013). Second, unlike the studies on Latin American countries, the majority of studies on CESEE countries are based on survey data (either bank-, household- or firm-level), which permits some insights into whether the loan currency was chosen by the borrower or by the lender. Third, the papers on Latin America typically cover the 1990s and the early 2000s, while some of the papers on CESEE include more recent periods, i.e. also the 2008/2009 financial crisis. Fourth, including the MVP ratio[13] as a key determinant of foreign currency loans is very common for studies on CESEE but an exception for studies focused on Latin America, which usually substitute inflation and exchange rate volatilities. Finally, many studies on dollarization in Latin America focus on the liabilities side rather than the assets side of the banking system, which may be due to easier access to data on dollar deposits. At the same time, the dollarization process was believed to have begun with deposits and to have moved to the loans side of the banking portfolio due to official restrictions to net foreign currency positions in some countries. Furthermore, the focus on currency substitution in the studies on Latin America may have been motivated by the region's long history of hyper-inflation, prompting people and banks to rush into U.S. dollars to protect their incomes and assets from inflation.

[13] *The MVP ratio was initially used in portfolio choice theory, i.e. in studying the currency composition of deposits. Only later studies, covering mostly the CESEE region, also used the MVP ratio to analyze the determinants of loan dollarization. Given the lack of observations on the MVP ratio included as an explanatory variable in studies on the Latin American region, we cannot include the MVP ratio in this meta-analysis.*

3 Meta-Analysis Methodology and Data Description

3.1 Meta-Analysis Approach

The majority of empirical studies on the determinants of foreign currency lending in both regions studied in this paper build upon linear regression models of the following type:

$$FCL_{ijt} = \alpha + X_{ijt} + \varepsilon_{ijt} \tag{1}$$

where *FCL* stands for the share (or the change in the share) of foreign currency loans, *X* is a matrix of explanatory variables and ε is an error term. Equation (1) is usually estimated for sectors, indexed by *i*, in one or more countries, indexed by *j*, while *t* is the time period.

Similarly, in microeconomic (survey) studies, which are more common for the CESEE region, the dependent variable is a dummy which measures whether a given borrower (firm or household) has taken out a foreign currency loan. Correspondingly, the following model is applied:

$$P(FCL_{ijt} = 1 \mid X) = F(\alpha + X_{ijt}\beta) \tag{2}$$

where *F(.)* is a nonlinear function, usually the cumulative normal distribution function for probit models or the logistic function for logit models. Similar to Crespo Cuaresma, Fidrmuc and Hake (2011), we justify the inclusion of both micro- and macro-econometric results by the fact that all the reviewed studies report marginal probability effects which are similar to the elasticities reported in a standard ordinary least squares (OLS) regression.

Using the corresponding parameter estimates from 32 studies that deal with the determinants of foreign currency loans in CESEE and Latin America, we estimate metaregression equations to highlight possible differences in the estimated coefficients. To this effect, we split the sample of coefficients into two regional samples[14] and then perform estimations for the CESEE sample, the Latin American sample and the combined sample.

The metaregression equation, which is typically given by

$$\hat{\beta}_{lm} = \mu + D_{lm}\theta + U_{lm} \tag{3}$$

was estimated separately for each of the determinants of foreign currency loans. Thereby, $\hat{\beta}$ is the estimate corresponding to variable *l* in study *m*, and *D* is a matrix containing variables reflecting various characteristics of the study. It is further assumed that *u* is the regression error term, which may have a different distribution for each of the analyzed studies. With the exception of the "observation year" variable, the matrix *D* includes mostly binary variables, which summarize information related to data definitions, data structure, estimation method and included control variables in the collected publication (see table 1).[15]

The year of observation is meant to highlight trends in foreign currency lending and its analysis, such as structural changes (e.g. an increasing role of foreign

[14] *Several studies include both regions (see table 2). This is why the sum of the number of coefficients from the two separate groups exceeds the number of coefficients of the overall sample.*

[15] *While we tried different specifications of the metaregressions, the final set of control variables does not always include all potential control variables, not least due to collinearity. However, a comparison of several approaches shows that by and large the estimated intercept remains unchanged.*

Table 1

Definition of Study-Related Variables Used in the Meta-Analysis

Control variables	Definition
Micro study	Binary dummy: 1 if a study is based on survey data, 0 otherwise.
Fixed effects	Binary dummy: 1 if a study accounts for either country or industry fixed effects, 0 otherwise.
Bias correction	Binary dummy: 1 if a study accounts for either an estimation bias by instrumental estimation or selection correction (instrumental estimators and Heckman selection model), 0 otherwise.
Hedging	Binary dummy: 1 if a study accounts for (household) remittances or (corporate) export activities, 0 otherwise.
Post-crisis	Binary dummy: 1 if a study includes a time period following the outbreak of the recent economic and financial crisis (i.e. after 2008) or earlier crisis periods in Latin America (according to Reinhart and Rogoff, 2009), 0 otherwise.
CIS countries	Binary dummy: 1 if a study includes CIS countries, 0 otherwise.
Latin American countries	Binary dummy: 1 if a study includes Latin American countries, 0 otherwise.
CESEE countries	Binary dummy: 1 if a study includes CESEE countries, 0 otherwise.
EU enlargement	Binary dummy: 1 if a study accounts for the perspective of EU accession or euro adoption, 0 otherwise.
Other countries	Binary dummy: 1 if a study includes other countries (i.e. other than CESEE, CIS and Latin America), 0 otherwise.
FX restrictions included	Binary dummy: 1 if a study accounts for foreign currency restrictions, 0 otherwise.
Pegged FX regime	Binary dummy: 1 if a study accounts for a pegged regime (as opposed to a floating exchange rate regime), 0 otherwise.
Interest rate differential independent variable	Binary dummy: 1 if a study and a specification include the interest rate differential as an independent variable, 0 otherwise.
FX depreciation independent variable	Binary dummy: 1 if a study and a specification include exchange rate depreciation as an independent variable, 0 otherwise.
FX volatility independent variable	Binary dummy: 1 if a study and a specification include exchange rate volatility as an independent variable, 0 otherwise.
Inflation volatility independent variable	Binary dummy: 1 if a study and a specification include inflation volatility as an independent variable, 0 otherwise.
Inflation independent variable	Binary dummy: 1 if a study and a specification include inflation as an independent variable, 0 otherwise.
FX deposits independent variable	Binary dummy: 1 if a study and a specification include foreign currency deposits as an independent variable, 0 otherwise.
Openness	Binary dummy: 1 if a study accounts for the trade openness of a country, 0 otherwise.
Year of observation	Continuous variable measured as the deviation from the mean year of the period of observation.

Source: Authors' compilation.

currency loans) or changes in the generally accepted views on the determinants of foreign currency loans. Related to this, another variable reflects whether a study covers a post-crisis period, i.e. periods following the 2008/2009 crisis or other crisis periods as defined by Reinhart and Rogoff (2009). To account for features of the underlying data, we also distinguish between publications using aggregate data or micro datasets. Through the latter dummy, we also account for potential differences between firm and household data, as they may affect the sign and magnitude of the coefficients of some of the determinants of foreign currency lending (i.e. exchange rate depreciation or exchange rate volatility). In addition, we include several dummies which reflect whether the estimations have accounted for important control variables (such as openness of the economy) which could impact the magnitude and significance of some determinants (e.g. exchange rate volatility). Finally, we also account for the interrelation between the different determinants of foreign currency loans, to establish whether an estimation including one determinant has also accounted for another determinant from our set.

Regarding the methodology applied in the studies, we define dummy variables for models with fixed effects (such as country, region or firm fixed effects) and with selection bias treatment (instrumental variables approach, Heckman two-step procedure, etc.). Further dummies encompass the geographic focus of the paper, to reflect the inclusion of CIS or other countries (e.g. Israel), as well as an EU enlargement variable, which indicates whether a study accounts for the EU accession or euro adoption perspective.[16] Finally, we also consider whether a study accounted for specific regulations on lending in foreign currency, as this could reduce the importance of the other foreign currency determinants. Since not all the regression models reported in the sampled studies include information on regulations on foreign currency lending, our metaregression specifications do not include all these variables for each of the parameters of interest.

To support and verify the robustness of our metaregression results, we estimate equation (3) with two methods. First, we perform a weighted least squares (WLS) estimation, using the precision of each parameter estimate (measured by the inverse of their standard errors or standard deviation) as a weight in the regression. This weighting approach is consistent, for instance, with Knell and Stix (2005) or Crespo Cuaresma, Fidrmuc and Hake (2011, 2013), but its controversy has been acknowledged by various authors (e.g. Krueger, 2003).

Second, we apply the random effect maximum likelihood (REML) approach (see e.g. Thompson and Sharp, 1999) to address the decisive drawback of the WLS methodology, i.e. the fact that it cannot deal with the potential heterogeneity in estimates across studies (i.e the between-studies variance).

In particular, if we assume that the true value of β can only be imperfectly approximated by $\mu + D_{lm}\theta$, so that $\beta_1 = \mu + D_{lm}\theta + \omega_i$, where ω is a normally distributed random variable with zero mean and variance σ_ω^2 equal to the standard error reported for β in individual studies, then (3) can be written as

$$\hat{\beta}_{lm} = \mu + D_{lm}\theta + \omega_i + u_{lm} \tag{4}$$

Thereby, it is assumed that ω and u are uncorrelated. Hence, this specification is able to account for both between-study variance (given by σ_ω^2) and the individual variance of the estimate reflecting the relative precision across the observed values of $\hat{\beta}$ (Crespo Cuaresma, Fidrmuc and Hake, 2013).

3.2 Metadata Set and Descriptive Statistics

For our meta-analysis we use estimates from 32 empirical papers on foreign currency loans in CESEE and Latin America.[17] We cover the main factors that according to the literature explain loan dollarization. From the seven determinants discussed by Crespo Cuaresma, Fidrmuc and Hake (2011) we have to drop one (i.e. MVP) due to the surprisingly few times it was included in studies on loan dollarization in Latin America. Likewise we had to ignore the choice of exchange

[16] *The EU accession perspective and the euro adoption perspective were included only in the estimations for all coefficients and for the coefficients from studies on the CESEE countries.*

[17] *We used various sources of information in the period from February 2011 to January 2013 (e.g. the EconLit Database) to search for papers investigating the determinants of foreign currency loans with the only condition of including either the CESEE countries or Latin American countries. Several papers, exclusively investigating the CESEE region, were published first as working papers and then as journal articles. Both versions were surveyed and included in the metaregressions unless the journal article is completely identical to the working paper version.*

Table 2

Surveyed Studies

Studies	Period	Countries	Data sample	Dependent variable	Determinants included
Arteta (2005)	1975/1990–2000	92 countries	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential, inflation, exchange rate depreciation
Barajas and Morales (2003)	1985–2011	Latin America	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential, FX deposits
Basso, Calvo-Gonzales and Jurgilas (2007, 2011)	2000–2006	24 CESEE and CIS countries	Macro-level data	Share of FX loans to the private sector and change in the share of FX loans	Interest rate differential, MVP
Brown, Ongena and Yesin (2009, 2011)	2002–2005	CESEE and CIS countries	Firm survey data	Dummy: FX loan (yes/no)	Interest rate differential, inflation volatility, exchange rate volatility, FX deposits
Brown, Kirschenmann and Ongena (2010)	2003–2007	Bulgaria	Firm survey data	Dummy: FX loan (yes/no)	Interest rate differential, inflation volatility
Brown and De Haas (2010, 2012)	2001, 2004	20 CESEE and CIS countries	Bank survey data	Share of FX loans in loans to the private sector	Interest rate differential, inflation volatility, exchange rate volatility
Brzoza-Brzezina, Chmielewski and Niedźwiedźinska (2010)	1997–2008	4 CESEE countries	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential
Csajbók, Hudecz and Tamási (2010)	1999–2008	CESEE EU countries	Macro-level data	Share of FX loans in loans to the household sector	Interest rate differential, exchange rate volatility
Esquivel-Monge (2007)	1993–2007	Costa Rica	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential, exchange rate depreciation, inflation volatility
Fidrmuc, Hake and Stix (2011, 2013)	2007–2010	9 CESEE countries	Household survey data	Dummy: FX loan (yes/no)	Interest rate differential, inflation volatility, exchange rate volatility, MVP
Galiani, Levy Yeyati and Schargrodky (2003)	1993–2001	Argentina	Firm-level data	Dollar-to-total debt ratio	Exchange rate depreciation
Garcia-Escribano (2010)	2001–2009	Peru	Macro-level data	Change in loan dollarization	Interest rate differential, inflation, exchange rate volatility, exchange rate depreciation
Haiss and Rainer (2012)	1999–2007	13 CESEE countries	Firm-level and household-level data	Share of U.S. dollar credit in total credit	Interest rate differential, inflation, FX deposits
Honig (2009)	1988–2000	90 countries	Macro-level data	Share of U.S. dollar credit in total credit	Exchange rate volatility, exchange rate depreciation, inflation, inflation volatility, MVP

Source: Authors' compilation.

rate regime, or the degree of financial integration and domestic market development. Those variables are only included in a few specific studies, yielding only an insufficient number of observations. Therefore, although proven to be relevant, they are excluded from our analysis. Yet ultimately, this exercise provides us with nearly 1,200 estimates, most of which include the interest rate differential (see table 2).

Table 2 continued

Surveyed Studies

Studies	Period	Countries	Data sample	Dependent variable	Determinants included
Kamil and Rai (2010)	1999–2008	Latin America and Caribbean	Bank-level data	Change in loan dollarization	Interest rate differential, exchange rate depreciation
Lane and Shambaugh (2009)	1996–2004	117 countries	Macro-level data	FX exposure	Exchange rate volatility, inflation volatility
Luca and Petrova (2008)	1990–2003	21 CESEE and CIS countries	Macro-level data	Ratio of FX loans in loans to the corporate sector	Interest rate differential, exchange rate depreciation, FX deposits
Melvin and Ladman (1991)	1980–1987	Bolivia	Bank-level data	Dummy: FX loan (yes/no)	Inflation
Mora (2012)	1998–2003	Mexico	Firm-level data	Change in loan dollarization	Interest rate differential, exchange rate depreciation, FX deposits
Neanidis (2010)	1991–2010	24 CESEE and CIS countries	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential, exchange rate volatility, exchange rate depreciation, inflation, FX deposits
Neanidis and Savva (2009)	1993–2006	CESEE and CIS countries	Macro-level data	Change in loan dollarization	Interest rate differential, exchange rate depreciation, change in inflation rate, MVP, FX deposits
Peiers and Wrase (1997)	1980–1987	Bolivia	Firm-level data	Dummy: FX loan (yes/no)	Interest rate differential, exchange rate volatility, exchange rate depreciation, inflation rate volatility
Rosenberg and Tirpák (2008)	1999–2007	CESEE EU countries, Croatia	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential
Rosenberg and Tirpák (2009)	1999–2007	CESEE EU countries, Croatia	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential, exchange rate volatility, FX deposits
Steiner (2009, 2011)	1996–2007	CESEE EU countries, Croatia	Macro-level data	Share of FX loans in loans to the private sector	Interest rate differential, exchange rate depreciation, inflation, FX deposits
Uzun (2005)	1990–2001	Latin America, Turkey	Firm-level data	Dollar-to-total debt ratio	Interest rate differential, exchange rate depreciation, inflation
Zettelmeyer, Nagy and Jeffrey (2010)	2000–2008; 2002–2005	CESEE, CIS; Latin American countries	Macro-level data, firm survey-level data	Dummy: FX loan (yes/no); share of FX loans in loans to the private sector	Interest rate differential, exchange rate depreciation, inflation, FX deposits

Source: Authors' compilation.

The coefficients estimated for the explanatory variables included in the studies highlight several remarkable differences between the two regions (table 3). First, the coefficient estimated for the interest rate differential, while surprisingly close to zero for CESEE on average at only 0.009, is significantly different for Latin

Table 3

Metastatistics

Variable	CESEE countries						Latin American countries						T-test
	Number of observations	Mean	Standard deviation	Min	Max	Share of significant coefficients	Number of observations	Mean	Standard deviation	Min	Max	Share of significant coefficients	
Interest rate differential	275	0.009	1.122	–4.005	4.142	51.6	109	0.714	1.731	–2.8	9.3	45.3	–5.87***
Exchange rate volatility	91	–0.48	1.023	–4	1.198	34.6	61	0.217	0.994	–2.53	3.45	36.1	–3.67***
Exchange rate depreciation	117	0.193	0.664	–2	1.31	70.5	89	–0.102	0.415	–0.972	1.04	40.7	3.52***
Inflation	87	–0.037	0.115	–0.347	0.119	32.4	78	–0.238	1.989	–9.7	5.7	30.3	–0.81
Inflation volatility	44	0.924	4.451	–10.01	18.6	45.5	55	4.208	8.134	–4.65	25	72.7	–2.40**
FX deposits	77	0.406	0.435	–1	2	70.5	30	0.189	0.454	–0.576	0.965	40.6	3.52***

Source: Authors' calculations.

*Note: The t-test establishes the difference between the means of the impact of the respective determinant in the two groups of coefficients. *(**)[***] stands for significance at the 10% (5%) [1%] level.*

America at 0.714. Second, apart from the means for inflation, the means of the coefficients differ significantly between the two samples. Third, there are substantial within and between variations for all variables in the two samples. Fourth, the share of significant coefficients is above 50% for exchange rate depreciation, foreign currency deposits as well as the interest rate differential in the CESEE sample, but only for inflation volatility in the Latin American country. Finally, inflation is the only variable for which the *t*-test, which accounts for the differences between the mean coefficients of the two country groups, fails to reject the null hypothesis (i.e. the means are equal).

4 Metaresults: The Determinants of Foreign Currency Loans

Another purpose of the meta-analysis is to clearly identify the adjusted ("true") effect of the individual determinants of foreign currency loans. Tables 4 to 9 present the results of the metaregression analysis (shown by the intercepts of equations 3 and 4) for the six most common determinants of foreign currency lending, as established with the REML approach and cross-checked with the WLS approach. Our preferred estimation method is the REML approach since it considers both the between and within studies variation of the coefficients, as the WLS approach primarily focuses on the within studies variation. For each determinant, we first perform the estimation for the set of coefficients including both regions, Latin America and CESEE, and then we run two separate regional estimations.

As the *interest rate differential* is the determinant with the largest number of coefficients (358), we presume that it will deliver the most reliable metaresults (table 4). Interestingly, we find a positive and significant coefficient only for the Latin American region, which we interpret as a predominantly demand-driven phenomenon. In contrast, the coefficient for the CESEE sample is not statistically significant, thus confirming results from a similar analysis (i.e. Crespo Cuaresma, Fidrmuc and Hake, 2011) that the interest rate differentials do not appear to play a

major role in the dollarization of loans in that region. This result is confirmed by both methods applied and the relatively low coefficient of determination (R^2) in the metaregression for the CESEE region. In fact, this result may be an indication that some indirect supply-side effects may be also in place. In the Latin American case, the coefficient actually became more relevant in recent years, as reflected by the positive sign of the dummy variable "year of observation." This finding appears to be intuitive: once high inflation abated and countries at the same time regained

Table 4

Metaregression Estimates: Interest Rate Differential

	Random effect maximum likelihood (REML)			Weighted least squares (WLS)		
	All countries	CESEE countries	Latin American countries	All countries	CESEE countries	Latin American countries
Intercept	1.748***	0.163	2.981***	0.584**	0.192	1.525***
	(0.178)	(0.122)	(1.244)	(0.276)	(0.101)	(0.273)
FX volatility independent variable	0.191**	–0.211	–0.016	–0.277	–0.732***	–0.003
	(0.095)	(0.145)	(0.154)	(0.191)	(0.058)	(0.073)
FX depreciation independent variable	0.637***	0.078	0.725***	0.570***	0.121	–0.003
	(0.105)	(0.108)	(0.229)	(0.200)	(0.199)	(0.018)
Inflation independent variable	–0.397***	0.144	1.197***	–0.272*	–0.400**	1.992**
	(0.112)	(0.110)	(0.318)	(0.153)	(0.167)	(0.842)
Inflation volatility independent variable	0.395***	0.880***	0.318**	–0.257	0.527***	0.021
	(0.113)	(0.299)	(0.152)	(0.153)	(0.099)	(0.067)
FX deposits independent variable	–0.346***	–0.096	–0.222	0.131	–0.027	0.152
	(0.090)	(0.087)	(0.212)	(0.086)	(0.027)	(0.245)
EU enlargement	0.362***	0.332***		0.249**	0.103	
	(0.109)	(0.105)		(0.105)	(0.091)	
Openness	–0.449***	–0.185	–1.913***	–0.576*	–0.430*	–2.227***
	(0.115)	(0.145)	(0.220)	(0.292)	(0.280)	(0.245)
FX restriction included	–0.470***	0.864***	–3.226***	–0.347**	–0.129***	–0.395
	(0.118)	(0.206)	(0.574)	(0.164)	(0.088)	(0.457)
Pegged FX regime	0.848***	–0.305***	–2.307***	0.183	–0.174	0.000
	(0.173)	(0.099)	(0.325)	(0.171)	(0.292)	(0.000)
Year of observation	–0.025	–0.347***	–0.089**	–0.009	–0.435***	0.113
	(0.017)	(0.057)	(0.036)	(0.025)	(0.030)	(0.082)
Post-crisis period	1.135***	1.092***	2.362***	–0.395	–0.369*	
	(0.234)	(0.332)	(0.706)	(0.250)	(0.190)	
Micro study	–1.401***	–1.607***	–2.131***	–0.238	–0.046	–0.241
	(0.110)	(0.224)	(0.226)	(0.180)	(0.101)	(0.377)
Fixed effects	–0.793***	0.811	0.232	–0.359	0.151**	0.012
	(0.102)	(0.093)	(0.198)	(0.252)	(0.056)	(0.012)
Bias correction	–0.528***	–0.038	–1.198***	0.104	0.199***	–1.398*
	(0.105)	(0.085)	(0.230)	(0.171)	(0.048)	(0.606)
CIS countries	–0.581***	–0.291**		–0.066	–0.053	–0.226
	(0.207)	(0.131)		(0.124)	(0.102)	(0.165)
Latin American countries	–0.817**	–1.342***		0.313	–1.205***	
	(0.320)	(0.241)		(0.290)	(0.276)	
CESEE countries	–0.739***			0.748***		
	(0.184)			(0.343)		
Other countries	–0.199*	–0.062		0.237	0.029	–0.840
	(0.119)	(0.079)		(0.167)	(0.093)	(1.804)
Observations	358	275	109	358	275	109
R^2	0.713	0.268	0.514	0.245	0.288	0.957

Source: Authors' calculations.

*Note: *(**)[***] stands for significance at the 10% (5%) [1%] level. Robust standard errors clustered by study in brackets. The total number of coefficients of "All countries" results from the coefficients from studies including either Latin American countries or CESEE countries or both.*

access to international markets, the demand-side considerations become more relevant for determining the proportion of foreign loans in private agents' liabilities. Interestingly, including the post-crisis period reinforces the positive impact of the interest rate differential, while the negative coefficient of "openness" implies that it might be a proxy for access to fixed income in international markets or other sources of international financing.

Table 5

Metaregression Estimates: Exchange Rate Depreciation

	Random effect maximum likelihood (REML)			Weighted least squares (WLS)		
	All countries	CESEE countries	Latin American countries	All countries	CESEE countries	Latin American countries
Intercept	–1.123**	–0.258	–0.707*	–0.770**	–0.095	–0.527***
	(–0.389)	(–0.286)	(–0.397)	(–0.266)	(–0.312)	(–0.012)
Interest rate differential independent variable	0.104			0.109	0.002**	
	(0.174)			(0.024)	(0.001)	
FX volatility independent variable	0.338**	–0.780**	–0.320***	–0.005	–0.703	
	(0.138)	(0.354)	(0.061)	(0.191)	(0.601)	
Inflation independent variable	0.394***	–0.771**	0.372***	0.151***	–0.715	0.321***
	(0.148)	(0.263)	(0.081)	(0.003)	(0.640)	(0.000)
FX deposits independent variable	0.438***	0.434***		0.630***	0.056*	
	(0.123)	(0.149)		(0.161)	(0.268)	
EU enlargement	–0.295*	0.355		–0.325	0.784**	
	(0.171)	(0.327)		(0.450)	(0.307)	
Openness	0.530***	1.019***	–0.689***	0.684***		
	(0.180)	(0.336)	(0.214)	(0.186)		
FX restrictions included	–0.213	0.250	0.399	–0.736**	–0.918	0.386***
	(0.287)	(0.864)	(0.365)	(0.338)	(1.020)	(0.019)
Pegged FX regime	0.561***	–0.250	–0.506	0.736**	0.918	–0.475***
	(0.293)	(0.754)	(0.362)	(0.338)	(1.020)	(0.004)
Year of observation	–0.034	0.103	0.003			
	(0.021)	(0.071)	(0.007)			
Post-crisis period	1.101***	–0.454	–0.355***	–0.343***	0.000	–0.343***
	(0.335)	(0.434)	(0.056)	(0.022)	(0.000)	(0.008)
Micro study	–0.282	–1.314**	0.338***	–0.143	–1.815**	0.325***
	(0.204)	(0.594)	(0.057)	(0.521)	(0.630)	(0.008)
Firm data	1.222***	0.962**		0.541	1.019**	0.000
	(0.206)	(0.434)		(0.346)	(0.370)	(0.000)
Bias correction	–0.242**	–0.593***	0.230***	–0.286	–0.631	0.243***
	(0.111)	(0.157)	(0.083)	(0.350)	(0.441)	(0.019)
Other countries	1.148**	–1.549**		–0.649*	0.000	0.000
	(0.529)	(0.707)		(0.355)	(0.000)	(0.000)
CIS countries	–0.695**	0.494	–0.619*	–0.359	0.283	–0.607***
	(0.323)	(0.682)	(0.365)	(0.364)	(0.474)	(0.004)
Latin American countries	–1.307***	0.786		–1.556***	–0.448	
	(0.422)	(0.514)		(0.384)	(0.803)	
CESEE countries	0.579			0.505		
	(0.428)			(0.333)		
Oil-exporting countries	0.284	0.016	0.571**	0.116	0.004***	0.614***
	(0.262)	(0.400)	(0.249)	(0.131)	(0.000)	(0.004)
Observations	166	117	89	166	117	89
R-squared	0.624	0.673	0.96	0.982	0.742	0.433

Source: Authors' calculations.

*Note: *(**)[***] stands for significance at the 10% (5%) [1%] level. Robust standard errors clustered by study in brackets. The total number of coefficients of "All countries" results from the coefficients from studies including either Latin American countries or CESEE countries or both.*

Both theoretical and empirical evidence implies that *exchange rate depreciation* should have a negative impact on both demand and supply of foreign currency loans, since it reflects the credit default risk of unhedged loans. Yet a potential positive impact could be explained by the expected stability of the repayments. The results from the metaregression in table 5 confirm that this effect is significant and negative for Latin America, but not statistically significant for the CESEE sample of coefficients. In addition, exchange rate depreciation was more relevant

Table 6

Metaregression Estimates: Exchange Rate Volatility

	Random effect maximum likelihood (REML)			Weighted least squares (WLS)		
	All countries	CESEE countries	Latin American countries	All countries	CESEE countries	Latin American countries
Intercept	–1.073**	1.223**	–0.474*	–0.872***	1.351***	–0.926***
	(0.532)	(0.555)	(0.269)	(0.175)	(0.007)	(0.004)
Interest rate differential independent variable	0.023	–0.008	1.319***	0.005	–0.008	1.594***
	(0.050)	(0.006)	(0.104)	(0.016)	(0.000)	(0.007)
FX depreciation independent variable	–1.259***	–1.133		–1.211***	–1.136***	
	(0.289)	(0.943)		(0.150)	(0.003)	
Inflation independent variable	–0.271**	–0.125	–1.104***	–0.113	–0.086***	–0.957***
	(0.104)	(0.293)	(0.110)	(0.158)	(0.002)	(0.001)
Inflation volatility independent variable	0.300*	0.134	1.742***	0.421**	0.136***	1.858***
	(0.177)	(0.497)	(0.162)	(0.151)	(0.012)	(0.014)
FX deposits independent variable	0.300	–0.004		0.010	–0.003***	
	(0.038)	(0.003)		(0.150)	(0.000)	
EU enlargement	–0.479***	0.220		–1.049**	–6.403***	
	(0.165)	(0.323)		(0.391)	(1.762)	
Openness	–0.200	–0.064		0.195	–0.225***	–0.966***
	(0.111)	(0.497)		(0.123)	(0.005)	(0.003)
FX restrictions included	0.282	–0.003		1.569**	–0.003***	0.000
	(0.534)	(0.904)		(0.632)	(0.000)	(0.000)
Pegged FX regime	–0.536***	–0.127		–0.587*	–0.090***	
	(0.188)	(0.995)		(0.307)	(0.002)	
Year of observation	–0.137***	–0.124	–0.171***	–0.045	1.498**	–0.091**
	(0.019)	(0.078)	(0.018)	(0.035)	(0.455)	(0.035)
Post-crisis period	–0.212*	–2.750***	–0.617***	–0.029	0.000	–0.101
	(0.122)	(1.089)	(0.154)	(0.184)	(0.000)	(0.063)
Micro study	0.649***	1.478***	0.422***	1.250***	3.546***	–0.253***
	(0.143)	(0.556)	(0.144)	(0.335)	(0.838)	(0.006)
Fixed effects	0.005	–0.045	0.134	0.008	–0.156	0.066
	(0.084)	(0.061)	(0.112)	(0.027)	(0.188)	(0.037)
Bias correction	0.371**	0.046*	0.709***	0.073	–13.898**	0.464
	(0.158)	(0.028)	(0.132)	(0.121)	(4.036)	(0.338)
FX restrictions included	1.013***	–0.003		1.569**	–0.003***	0.000
	(0.222)	(0.904)		(0.632)	(0.000)	(0.000)
Latin American countries	1.420***	2.878***		1.818***	0.562	
	(0.519)	(0.839)		(0.595)	(0.414)	
CESEE countries	0.785***		–1.186***	0.623***		0.056
	(0.136)		(0.105)	(0.197)		(0.746)
Other countries	–0.363***	–2.704***		0.041	–2.830***	0.758***
	(0.133)	(0.813)		(0.195)	(0.008)	(0.011)
Observations	113	52	61	113	52	61
R-squared	0.991	0.998	0.975	0.81	0.647	0.885

Source: Authors' calculations.

*Note: *(**)[***] stands for significance at the 10% (5%) [1%] level. Robust standard errors clustered by study in brackets. The total number of coefficients of "All countries" results from the coefficients from studies including either Latin American countries or CESEE countries or both.*

before the 2008/2009 crisis (as shown by the "pre-crisis" dummy), as the majority of the currencies in Latin America has shown an appreciating trend since early 2009. The effect of exchange rate depreciation is reduced by a pegged exchange rate regime, as it generates incentives to increase loans (and deposits) in domestic currency as pegging (apparently) reduces uncertainty about the exchange rate developments. Finally, being a commodity exporter reduces the effect of the depreciation through higher access to hard foreign currency; foreign exchange restrictions have the same effect, as expected.

The results in table 6 confirm the negative effect of *exchange rate volatility* in Latin America, implying that a less volatile exchange rate induces borrowers to take out more loans in U.S. dollars if the interest rate spreads are large enough. This could also be related to the search for macroeconomic stability, and could also be masking the effects of inflation, as the majority of countries in the region, which used to suffer from hyperdepreciation and hyperinflation, today pursue inflation targets with a floating exchange rate. The negative coefficient for the year of observation also points to a higher effect of exchange rate volatility in the past. In contrast, this coefficient is positive for the CESEE sample. In other words, supply-side factors could be more relevant for explaining dollarization in that region, since risk-averse lenders might be more willing to supply foreign currency loans in order to match their foreign currency positions and reduce currency risk, i.e. the prevalence of indirect exchange rate risk.

Some studies test for the validity of *inflation rate volatility* (e.g. Zettelmeyer, Nagy and Jeffrey, 2010; Brown and De Haas, 2012; Esquivel-Monge, 2007) on top of including the *inflation rate*. Our metaregressions (tables 7 and 8) show that inflation and inflation volatility have the expected positive sign. Moreover, the latter has a very high coefficient, pointing to a strong relevance in both regions due to the long history of hyperinflation. Interestingly, we find higher inflation to boost foreign currency loans in Latin America but not in CESEE, implying that it is not the inflation rate *per se* but its volatility that matters. In the case of the Latin American countries, the coefficient for inflation could also mask the increase of foreign currency deposits in parallel with the increase in prices offsetting the loss of value of the domestic currency. Moreover, both variables became less relevant as determinants of foreign currency loans in recent years (signs and significance of time trend and post-crisis variables), and are less relevant in countries with pegged exchange rate regimes and exchange rate restrictions. This result seems intuitive against the historical background of the Latin American countries, where strong money creation led to quick exchange rate depreciation, and hence to episodes of hyperinflation. Thus, pegged exchange rate regimes and foreign exchange rate restrictions were used to reduce exchange rate uncertainty and short-circuit the process described above, although they sometimes ended in hyperdepreciation and hyperinflation when fiscal consolidation was not implemented timely.

Supply-side determinants are often proxied for by the *share of foreign currency deposits in total deposits* (see table 9).[18] In particular, banks with high levels of foreign currency deposits shift currency risk towards their customers (i.e. indirect currency risk). As regards the metaresults, foreign currency deposits are a relevant

[18] *However, it should be pointed out that hedging at the micro level is also possible, with borrowers also aiming to match their balance sheets.*

Table 7

Metaregression Estimates: Inflation

	Random effect maximum likelihood (REML)			Weighted least squares (WLS)		
	All countries	CESEE countries	Latin American countries	All countries	CESEE countries	Latin American countries
Intercept	2.133***	0.107	8.738***	1.412*	1.083	6.928***
	–0.36	(2.798)	(1.639)	(0.551)	(0.008)	(0.007)
Interest rate differential independent variable	3.747**		0.187***	0.952		
	(1.231)		(0.108)	(0.693)		
FX depreciation independent variable	–8.293***	–0.036	2.701*	–3.594***		
	(2.132)	(1.780)	(1.566)	(1.127)		
FX volatility independent variable	3.436***	–0.060			–0.059***	
	(1.300)	(2.965)			(0.000)	
Inflation volatility independent variable	0.037***		0.033	0.033	0.032***	
	(0.007)		(0.033)	(0.033)	(0.000)	
FX deposits independent variable	0.000	0.000			0.000	
	(0.000)	(0.000)			(0.000)	
FX restrictions included	0.530		–5.367***	–0.418	0.000	–11.245***
	(0.355)		(0.452)	(0.475)	(0.000)	(0.007)
Pegged FX regime	–1.296***	–0.033***	–0.191***	0.343	–0.038***	–2.762***
	(0.237)	(0.008)	(0.016)	(0.450)	(0.007)	(0.003)
Year of observation	–0.187***	–0.030***	–0.009***	–0.013**	–0.038***	–0.008***
	(0.029)	(0.007)	(0.000)	(0.005)	(0.000)	(0.000)
Micro study	0.784***		0.378	0.994*	0.000	–2.100***
	(0.164)		(0.299)	(0.524)	(0.000)	(0.001)
Fixed effects	0.083	0.000	–0.000	0.000	–0.003	–0.000
	(0.085)	(0.005)	(0.000)	(0.000)	(0.005)	(0.000)
Bias correction	0.119	0.041**	–0.183***	0.472	0.010	–2.737***
	(0.114)	(0.020)	(0.042)	(0.410)	(0.063)	(0.000)
Post-crisis period	0.955***		–0.319	0.807	0.000	0.000
	(0.227)		(0.300)	(0.497)	(0.000)	(0.000)
CIS countries	0.748	0.039	–0.452	–0.919	0.052***	2.012***
	(0.529)	(0.853)	(0.300)	(0.536)	(0.000)	(0.002)
Latin American countries	–2.14***			–2.017***	2.694***	
	(0.228)			(0.512)	(0.041)	
CESEE countries	–8.794***		–0.888*			0.452***
	(1.395)		(0.508)			(0.002)
Other countries	1.079*			1.795***	0.000	0.645***
	(0.520)			(0.367)	(0.000)	(0.003)
Observations	111	87	78	111	87	78
R-squared	0.901	0.899	0.891	0.997	0.738	0.999

Source: Authors' calculations.

*Note: *(**)[***] stands for significance at the 10% (5%) [1%] level. Robust standard errors clustered by study in brackets. The sample is based on the set of estimates which are presented as preferred estimates or baseline estimates in the respective papers.*

determinant of loan dollarization in both regions, yet with an intercept pointing to an almost parity relation in Latin America[19] while the coefficient is much lower in the CESEE region. In the Latin American countries this result could be impaired by the fact that most banks tend to use domestic funding to increase their loans. In other words, banks rely more on the increase of deposits than on leverage to expand their loan portfolio, resulting in a loan-to-deposit ratio of close to 1 after the banking crises suffered by the region in the early 1990s. Interestingly, the relevance of foreign currency deposits decreased during the sample period, as

[19] *Results have to be interpreted with caution as the number of observations is too low.*

Table 8

Metaregression Estimates: Inflation Volatility

	Random effect maximum likelihood (REML)			Weighted least squares (WLS)		
	All countries	CESEE countries	Latin American countries	All countries	CESEE countries	Latin American countries
Intercept	7.062***	8.878*	21.273***	4.954**	12.702***	21.288***
	(2.395)	(5.194)	(3.129)	(1.950)	(0.068)	(0.916)
Interest rate differential independent variable	–1.010	–0.986	–1.011**	–0.608	–1.250***	–0.632
	(1.451)	(1.122)	(0.543)	(0.874)	(0.039)	(0.923)
FX depreciation independent variable	–3.522***	12.188***	–10.624***			
	(1.772)	(3.878)	(2.748)			
FX volatility independent variable	–0.984	–0.984	3.436			–5.609
	(4.498)	(4.500)	(6.583)			(6.332)
Inflation independent variable	2.948**	–9.604**	–14.938***			–23.582***
	(1.178)	(4.768)	(3.427)			(0.593)
FX deposits independent variable	0.009	0.008		0.008***		
	(0.103)	(2.075		(0.000)		
Openness	–2.156		6.352***	–19.617	0.000	4.044***
	(2.408)		(1.505)	(15.401)	(0.000)	(0.416)
EU enlargement	–0.749	–6.504***		10.582	–5.826***	
	(1.833)	(0.649)		(34.568)	(0.001)	
FX restrictions included	–9.810***	–9.608***				0.000
	(1.817)	(4.590)				(0.000)
Year of observation	–0.201	–2.170***	1.630***	1.137	–1.944***	1.475***
	(0.211)	(0.217)	(0.225)	(1.082)	(0.000)	(0.234)
Micro study	–7.897***		4.458***	–18.355	0.000	1.893***
	(2.902)		(1.331)	(19.003)	(0.000)	(0.179)
Fixed effects	–2.766**	4.157	0.013	0.316	3.255	0.042
	(1.322)	(5.246)	(0.021)	(0.210)	(.)	(0.103)
Post-crisis period	5.483***		–6.236***	0.807	0.000	0.000
	(1.799)		(0.934)	(0.497)	(0.000)	(0.000)
Bias correction				–10.115	0.000	
				(13.111)	(0.000)	
Latin American countries		–15.054***			–16.677***	
		(2.254)			(0.106)	
CESEE countries	–8.500***			–7.638		
	(0.426)			(8.144)		
CIS countries	3.845**	–4.315***		–2.445***		
	(1.764)	(0.435)		(0.294)		
Observations	99	44	55	99	44	55
R-squared	1.00	0.99	0.99	0.702	0.695	0.703

Source: Authors' calculations.

*Note: *(**)[***] stands for significance at the 10% (5%) [1%] level. Robust standard errors clustered by study in brackets. The sample is based on the set of estimates which are presented as preferred estimates or baseline estimates in the respective papers.*

most countries started to regulate banks' net exchange rate open positions. Finally, openness increases the effect of foreign currency deposits, as this variable could be considered as a proxy of access to international financial markets.

As regards the impact of further control variables, we found variables related to methodology to predominantly have significant effects. As there is a general agreement among authors that estimation methods should address the endogeneity problem, our meta-analysis shows that the coefficients from studies that treated endogeneity are often associated with weaker general results, which also holds true for estimations based on micro (survey)-level data. In contrast, estimations

Table 9

Metaregression Estimates: Foreign Currency Deposits

	Random effect maximum likelihood (REML)			Weighted least squares (WLS)		
	All countries	CESEE countries	Latin American countries	All countries	CESEE countries	Latin American countries
Intercept	0.571***	0.408***	0.904***	0.549*	0.099***	0.839***
	–0.214	(0.089)	(0.020)	–0.631	(0.040)	(0.000)
Interest rate differential independent variable	–0.113	0.696***		–0.189	0.565***	
	–0.117	–0.161		–0.565	–0.179	
FX depreciation independent variable	–0.806***	–0.625***		–0.809**	–0.713***	
	(0.096)	(0.083)		(0.374)	(0.090)	
FX volatility independent variable	0.227*	0.789***		0.112	0.504*	
	(0.125)	(0.123)		(0.331)	(0.160)	
Inflation independent variable	0.193*	–0.074***		0.209	–0.165***	
	(0.082)	(0.069)		(0.225)	(0.048)	
Inflation volatility independent variable	0.247*					
	(0.126)					
EU enlargement	0.104	–0.569***		–0.896***	–0.898***	
	(0.109)	(0.103)		(0.003)	(0.000)	
Openness	0.731***	1.419***	1.140***	2.261***	1.722***	1.074***
	(0.281)	(0.161)	(0.021)	(0.708)	(0.057)	(0.000)
FX restrictions included	0.576***	0.747***		–3.234***	0.000	0.000
	(0.118)	(0.092)		(0.556)	(0.000)	(0.000)
Pegged FX regime	–1.468***	–1.887***		–1.297***	–1.777***	0.000
	(0.185)	(0.156)		(0.344)	(0.077)	(0.000)
Year of observation	–0.109***	–0.179***	–0.009**	–0.095	–0.174***	–0.020***
	(0.018)	(0.022)	(0.004)	(0.067)	(0.007)	(0.000)
Micro study	0.266	–1.155***	0.236***	1.862***	–1.167***	0.238***
	(0.204)	(0.136)	(0.002)	(0.536)	(0.062)	(0.000)
Fixed effects	–0.029	–0.005	–0.001	0.009	–0.009	0.000***
	(0.072)	(0.062)	(0.002)	(0.011)	(0.033)	(0.000)
Bias correction	0.312***	0.081		0.728	0.042	0.000
	(0.106)	(0.077)		(0.536)	(0.025)	(0.000)
Post-crisis period	–0.327***			–0.011	0.000	0.000
	(0.091)			(0.017)	(0.000)	(0.000)
CIS countries	0.972***	1.088***		1.012***	0.993***	0.000
	(0.138)	(0.103)		(0.035)	(0.054)	(0.000)
CESEE countries	–2.541***			1.801***		
	(0.367)			(0.341)		
Other countries	–1.181***			0.203	0.634***	0.000
	(0.285)			(0.415)	(0.032)	(0.000)
Observations	107	77	30	107	77	30
R-squared	0.975	0.834	1.000	0.994	0.999	0.997

Source: Authors' calculations.

*Note: *(**)[***] stands for significance at the 10% (5%) [1%] level. Robust standard errors clustered by study in brackets. The sample is based on the set of estimates which are presented as preferred estimates or baseline estimates in the respective papers.*

with fixed effects broadly do not make a difference for the coefficients of the respective determinant.

Meta-analyses usually test for publication selection bias, which occurs when the published literature is systematically unrepresentative of the sample of available studies as authors follow their preferences for statistically significant and theoretically sound results (Stanley and Doucouliagos, 2012). To test the potential presence of a publication selection bias, we constructed a funnel diagram, which is a scatter

diagram with the horizontal scale measuring the effect size and the vertical scale measuring the standard error (or precision). In the absence of publication selection bias, a plot of effects against their errors should be symmetric around the weighted mean. Furthermore, we performed Egger's test, which is a linear test for asymmetry, performing a linear regression of the intervention effect estimates on their standard errors, while using the inverse variance as weights. Again, in the absence of publication selection bias, the estimated size of the coefficient should not be correlated with its standard error, i.e. the null hypothesis should be rejected (Egger et al., 1997). Both the funnel plot analysis and Egger's test (results are available from the authors upon request) reject the presence of a publication selection bias for all variables with the exception of inflation and inflation volatility being caused by few outliers in the two determinants. Moreover, these biases are shown to be relatively small. According to Havranek and Irsova (2011) and Doucouliagos and Stanley (2008) the asymmetry is important if the coefficients of the publication bias are statistically significant and larger than one in absolute value. As this is not the case for these two determinants, we do not discuss the publication selection bias further in this paper.

5 Conclusions and Policy Implications

Our meta-analysis shows that different dollarization drivers have been at work to different extents in Latin America and CESEE. A common pattern is that macroeconomic instability (as expressed by inflation volatility) and banks' funding in foreign currency are key drivers of loan dollarization. In CESEE, the latter result may reflect the major role of foreign-owned banks in the region's domestic banking system, i.e. of institutions with easy access to wholesale and parent bank funding in foreign currency. In Latin American countries, meanwhile, foreign banks, which are also dominant in some countries like Mexico, were established as subsidiaries rather than branches, and as such rely more on traditional funding (deposits) than on wholesale funding.

Regarding differences, the interest rate differential plays a significant and increasingly positive role for foreign currency lending only in Latin America, following achievement of macro stability. In contrast, and in line with other studies (i.e. Crespo Cuaresma, Fidrmuc and Hake, 2011), interest rate differentials do not influence the currency selection of loans in CESEE. From this perspective, borrowers take an excessive risk when taking out foreign currency loans, underestimating the danger of exchange rate depreciation.

Furthermore, exchange rate depreciation and exchange rate volatility exert a negative impact on foreign currency loans in Latin America, pointing to a mostly demand-driven effect (i.e. lower volatility induces households and firms to take more foreign currency loans). In CESEE, however, the exchange rate movements do not play a clear-cut role. On the one hand, exchange rate depreciation does not robustly influence foreign currency loans. On the other hand and contrary to the results for Latin America, exchange rate volatility induces more lending in foreign currency, implying thus predominant supply-driven effects, with banks shifting the exchange rate risk to borrowers.

These findings and in particular the differences between the two regions should be taken into account for designing effective policies for reducing dollarization. Generally, when promoting sound monetary and fiscal policies to

gain macroeconomic stability, dedollarization usually emerges as an endogenous outcome (Galindo and Leiderman, 2005). Nevertheless, that process may be too slow[20] and not always successful. For instance, anecdotal evidence for some countries suggests that macroeconomic stabilization might reduce money supply and deposit dollarization, but at the same time induce an increase in liabilities dollarization if, for example, a country reaches higher ratings and corporates find it cheaper to fund themselves in foreign currency on international markets than in local currency via domestic banks.

Policies targeted at promoting macroeconomic stability should be complemented by specific dedollarization measures, geared to whether supply- or demand-driving factors are prevalent. In particular, in countries where dollarization is mainly driven by demand-side factors, policies could try to discourage foreign currency holdings in a market-driven fashion, for instance through the development of domestic capital markets in local currency, the introduction of a derivative market to hedge against exchange rate risk, or the extensive use of financial instruments indexed to inflation. In this sense, as a first step, changing the composition of public sector debt toward indexed instruments may induce inertia in the behavior of the private sector and facilitate the introduction of domestic nominal nonindexed instruments once price stability is on track. As a case in point, Brazil, Chile, Uruguay and Bolivia have pursued such policies, with some very positive results, whereas Peru focused on developing nominal bonds, with promising results. In contrast, if dollarization is considered to be predominantly driven by supply factors, other complementary measures focused on prudential rules, such as banking sector regulation to impose a ceiling on the net foreign currency positions of commercial banks, could be taken into account. Moreover, imposing special reserve requirements on foreign currency assets and liabilities may curb the expansion of foreign currency loans and, consequently, of currency mismatches in the nonfinancial private sector. Brazil and Peru are maybe the most prominent examples of public sector-induced dedollarization and the intensive use of reserve requirements to dedollarize the economy. In the extreme, past experience has proven that the "de jure" prohibitions to hold liabilities or assets in foreign currency may be successful (e.g. Brazil and Colombia). Yet at the other extreme, the Argentinean experience (of forced convertibility to domestic currency) in the early 2000s has also shown that those policies are flawed with risks, in particular if a country has not been able to consolidate a credible policy framework.

[20] *For example, Peru has slashed to half the share of foreign currency deposits, but this process lasted ten years, from 2003 to 2013, while hyperinflation periods ended in 1993.*

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