

# Households' Exposure to Foreign Currency Loans in CESEE EU Member States and Croatia

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*Most Central, Eastern and Southeastern European (CESEE) countries saw a substantial rise in foreign currency lending to households during the last decade. This involved risks to macro-financial stability, in particular because most of these borrowers were unhedged. This paper provides evidence on eleven CESEE countries regarding (1) the extent of foreign currency lending to households from 1995 to 2009, (2) the supply and demand factors at work in the period before the crisis and (3) the regulatory responses to address the situation. Panel data estimates covering the period from 1996 to 2007 reveal that, on the demand side, foreign currency borrowing was attractive because interest rates for foreign currency loans were lower than those on domestic currency loans, and private sector consumption as well as housing prices were on the rise. Mitigating factors on the supply side were higher interest margins on domestic currency loans than on foreign currency loans and banking sector reforms. Regulatory measures account at least partly for the different patterns of currency structures according to descriptive evidence.*

*JEL classification: C23, E41, F31, G19, P20*

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## 1 Introduction

The catching-up process of emerging economies is usually accompanied by credit growth; however, not every size and kind of credit expansion is beneficial. This paper focuses on foreign currency lending to households, which has become widespread in many Central, Eastern and Southeastern European (CESEE) countries. The household market segment is of particular interest: Households are typically not hedged against a weakening of the local currency relative to the loan currency, which increases the risk of loan defaults given unfavorable developments. International institutions (e.g. IMF, EBRD) and the OeNB had drawn attention to the risks involved in this type of lending well before the financial crisis and had called for a constant monitoring of the growing share of foreign currency loans in total domestic lending (OeNB, 2005).

It is important to understand the driving forces behind the developments in foreign currency lending in order to take well-targeted regulatory and supervisory measures in this area. While the earliest publications on the determinants of foreign currency lending to households focused on Austria, a large number of empirical analyses covering the CESEE region followed.<sup>2</sup> Some studies use bank survey data and focus on foreign currency lending to firms (e.g. Brown, Kirschenmann and Ongena, 2009), whereas other empirical papers draw on

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<sup>2</sup> Publications with a focus on Austria: Epstein and Tzanninis (2005) and Beer, Ongena and Peter (2008); publications with a focus on the CESEE region: Basso, Calvo-Gonzalez and Jurgilas (2007), Dvorsky, Scheiber and Stix (2008), Luca and Petrova (2008), Rosenberg and Tirpak (2008), Brown, Kirschenmann and Ongena (2009), Haiss, Paulhart and Rainer (2009), Neanidis and Savva (2009), Bakker and Gulde (2010), Brzoza-Brzezina, Chmielewski and Niedźwiedzińska (2010), Csajbók, Hudecz and Tamási (2010), and Zettelmeyer, Nagy and Jeffrey (2010).

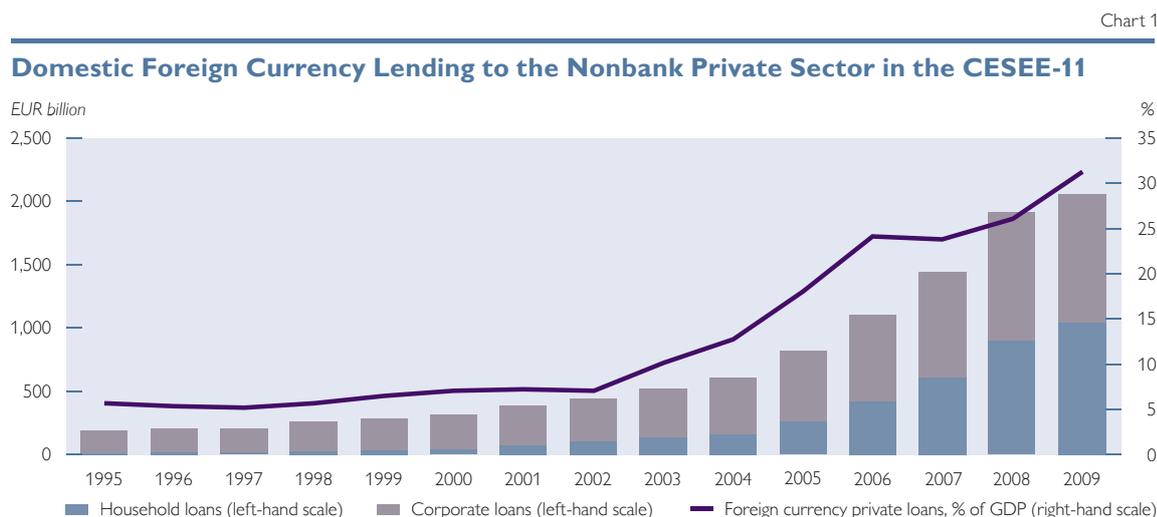
macroeconomic data (e.g. Luca and Petrova, 2008) and consider foreign currency borrowing by households (e.g. Csajbók, Hudecz and Tamási, 2010).

This paper contributes to the empirical research by explicitly concentrating on loans to households and providing additional evidence of supply- and demand-side factors related to the popularity of this type of loan in the years leading up to the financial crisis at the macroeconomic level. Moreover, it provides a detailed overview of regulatory attempts to limit risks arising from this development in eleven CESEE countries (CESEE-11<sup>3</sup>) and explicitly refers to their impact on the supply of, and demand for, foreign currency loans to households.

The remainder of the paper is structured as follows: Section 2 provides stylized facts on foreign currency lending to households in the CESEE-11. Section 3 presents the mechanisms underlying the estimating equation as described in the literature and indicates the data and the estimation method used. Section 4 summarizes the results and contains robustness checks, while section 5 outlines the regulatory and supervisory measures taken to tackle the issue with different speed and intensity in the CESEE-11. Section 6 concludes.

## 2 Stylized Facts: Diverse Picture of Foreign Currency Lending in the CESEE-11

While currency substitution of loans in the CESEE-11 as a whole had increased only slightly during the late 1990s, this section provides evidence that it has gained considerable momentum since then. In most of the region, foreign currency loans are typically denominated in euro, except in Hungary and Poland, where Swiss francs play an important role (Beckmann and Stix, 2010). Indexation of domestic currency loans to a foreign currency has been widespread in Croatia, but not in



<sup>3</sup> The country sample includes the ten CESEE EU Member States – the Czech Republic (CZ), Estonia (EE), Hungary (HU), Latvia (LV), Lithuania (LT), Poland (PL), Slovakia (SK), Slovenia (SI), Bulgaria (BG) and Romania (RO) – as well as Croatia (HR), which was added to the sample as it is likely to join the EU in the near future.

the other countries under review. In some CESEE-11 countries (e.g. Bulgaria), this practice is even prohibited.<sup>4</sup>

To capture the size of the foreign currency loan market in the CESEE-11, chart 1 shows the aggregated total volume of foreign currency loans to the nonbank private sector<sup>5</sup> in nominal terms and as a share of GDP. The data reflect two phenomena: overall credit growth and increasing currency substitution. The ratio of foreign currency loans to GDP came to 6% in 1995 and increased to 31% by 2009 (chart 1). This rise was particularly pronounced from 2002 to 2006 and again from 2007 to 2009, but in 2009, it was largely attributable to the contraction of GDP in the face of the Great Recession. Aggregate developments were mainly driven by high growth of foreign currency lending in Estonia, Latvia, Lithuania, Hungary, Poland, Bulgaria and Romania. The rise in foreign currency lending to the household sector was much more pronounced than that of such loans to the corporate sector: The share of household loans in total foreign currency loans to the nonbank private sector soared from 8% in 1995 to 51% in 2009. In most countries, mortgage loans account for the bulk of loans to households, which implies that the respective households may be doubly exposed, namely to unfavorable developments in both exchange rates and housing prices.

Besides the rise of currency substitution in the market segment of household loans in many countries of the region, chart 2 also shows considerable country differences in the timing and pace of developments. For the CESEE-11 region as a

Chart 2

### Foreign Currency Lending to Households in the CESEE-11

% of total household loans, at current exchange rates



Source: National central banks, OeNB.

<sup>4</sup> Foreign currency-indexed loans are normally registered as domestic currency loans. This can lead to an underestimation of the full significance of instruments denominated in, or indexed to, a foreign currency (Backé and Walko, 2006). In Croatia, where foreign currency-indexed loans account for a large share of total loans, they are explicitly reported in the statistics of the Croatian National Bank.

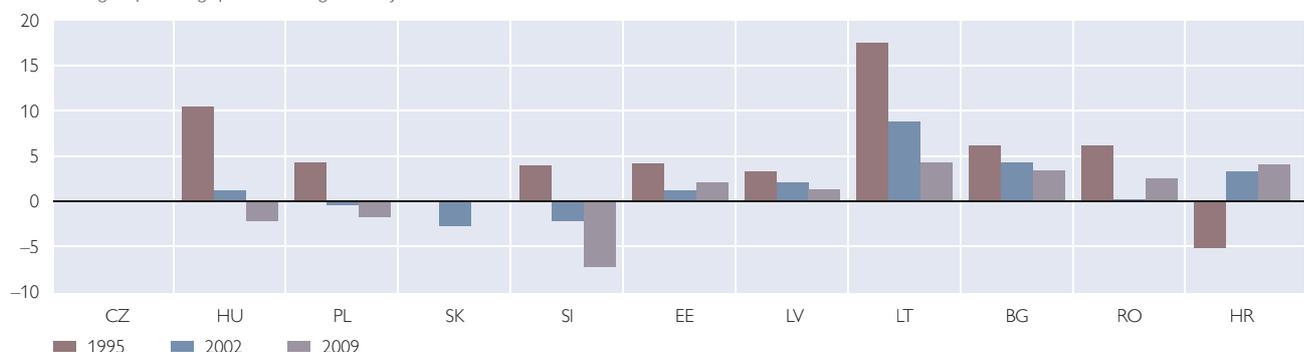
<sup>5</sup> This sector includes households and nonprofit institutions serving households as well as nonfinancial corporations.

whole, the share of foreign currency lending in total household loans, as based on nominal data, increased from 4% in 1995 to 60% in 2009. This increase in nominal terms is not only attributable to the granting of new loans, but also to exchange rate movements. The latter indicate increasing risks in terms of rising repayment burdens for households. A look at the individual countries shows that, in the Czech Republic and Slovakia, the share of foreign currency lending in total lending to households remained low. In the Czech Republic, the differential between interest rates for domestic and foreign currency loans remained very small throughout most of the sample period, which can be ascribed to the low level of households' foreign currency indebtedness. By contrast, Croatia, Latvia, Estonia, Hungary and Lithuania recorded high shares of foreign currency loans in total loans to households in 2009. In Croatia, the share of loans denominated in, or indexed to, a foreign currency was high throughout the sample period, as indexation of deposits and loans became widespread in the wake of the hyperinflation period of the early 1990s. In addition, households received sizeable income from tourism, which is often denominated in foreign currency and provides some natural hedge. The share of loans denominated in, or indexed to, a foreign currency decreased slightly over the review period, but is still very elevated. In the remaining countries, foreign currency lending to households increased to different degrees. It is noteworthy that the popularity of foreign currency loans to households in Hungary rose considerably only after the conditions for housing loan subsidies had tightened and the extent of the subsidy had been linked to the reference treasury bond yield in 2003-04. When people had to pay higher interest for housing loans denominated in domestic currency than for foreign currency loans, the latter became more attractive (OECD, 2010). Slovenia experienced a sudden jump in foreign currency lending to households (from 4% in 2004 to 43% in 2006) in the run-up to the euro introduction in 2007 (Banka Slovenije, 2006), while in Slovakia, the respective rise before the adoption of the single currency in 2009 was also notable but less pronounced.

Chart 3

### Recent Trends in the Relative Share of Foreign Currency Loans to CESEE-11 Households

Annual change in percentage points, exchange-rate adjusted



Source: National central banks, OeNB.

Note: Annual change in percentage points refers to the share of foreign currency loans in total loans to households at constant exchange rates as of January 1, 2008, adjusted for changes in the exchange rate of the local currency against the euro or the Swiss franc. Due to a lack of detailed information, the data for Croatia on euro loans include all foreign currency loans, and the adjustment is made using the EUR/HRK exchange rate.

The most recent developments in foreign currency loans to households in the CESEE-11 are depicted in chart 3, which provides data on the year-on-year change in the share of foreign currency lending in total household loans. The exchange rate adjustment is particularly relevant for the most recent period, as the financial crisis led to substantial exchange rate swings in CESEE countries with flexible exchange rates. The chart shows that, in some countries, the share of foreign currency loans to households rose even after correction for exchange rate changes, while it declined in others (in Slovakia mostly due to the euro introduction).

In the CESEE-11 region as a whole, the rise in the share of foreign currency loans in the household sector has moderated considerably and growth has declined during the course of the financial crisis, but it has not fully leveled off. Beckmann and Stix (2010) present additional results based on survey data, which show that the number of households planning to take out foreign currency loans declined during the crisis, but most recently seems to be rising again in some countries (e.g. Croatia and Romania). Thus, foreign currency lending to households remains a key feature of financial intermediation in the CESEE-11 region.

### 3 Derivation of the Econometric Model and Empirical Specification

#### 3.1 Supply- and Demand-Side Determinants of Foreign Currency Lending

The aim of this section is to simultaneously identify the relationship between supply- and demand-side factors and foreign currency loan developments in the CESEE-11. In order to formulate the estimation equation, it is necessary to recapitulate the mechanisms underlying the supply of, and demand for, foreign currency loans to households based on the literature on credit growth and currency substitution.

On the supply side, we have to consider how banks finance their foreign currency loan business. In early transition, banks basically financed loans with domestic deposits (Weller, 2000). Therefore, the empirical analysis of this paper tests whether there is a positive relationship between foreign currency deposits and loans.

Since the early 2000s, external funding sources have become increasingly important for financing rapid credit growth in many CESEE-11, as local currency funding in terms of domestic currency savings was insufficient (Walko, 2008; Lahnsteiner, 2010). Therefore, the margin between interbank rates and lending rates can be assumed to be an alternative and important supply-side factor determining the currency denomination of loans. When interbank rates abroad are lower than the costs of refinancing in the domestic interbank market, banks in transition economies have an incentive to seek financing abroad and to grant foreign currency loans to their customers, as they have to keep their net open foreign currency positions below a certain limit (Basso, Calvo-Gonzales and Jurgilas, 2007). However, when interest margins on domestic currency loans are higher than those on foreign currency loans, this is assumed to serve as a disincentive to foreign currency lending to households.

The role of ownership in refinancing (domestic versus foreign and private versus state ownership) must be considered as well, given that different types of ownership may matter for banks' access to funding from abroad. Foreign banks' subsidiaries, for instance, can turn to their parent banks for funding. Bakker and Gulde (2010) find that foreign banks accounted for a substantial share of the

growth in foreign currency lending to households. Residential deposits were not sufficient for funding domestic currency loans. During the financial crisis, parent banks continued to support their subsidiaries, and parent bank funding was even more stable than wholesale refinancing (Lahnsteiner, 2010). In addition, parent banks promote a more diversified range of lending products, because they have more experience and know-how in risk management compared to domestic banks (De Haas and Naaborg, 2006).

In most CESEE-11 countries, the banking sector is dominated by foreign ownership. The rising numbers of foreign entrants and financial sector consolidation have further fostered competition and, at the same time, have increased concentration in the banking market due to mergers and acquisitions among parent banks (e.g. the takeover of Bank Austria by the Italian UniCredit Group; Drakos, 2003). Therefore, banking concentration might be positively related to currency substitution of loans, too. In addition to these explanatory factors, increasing quality in banking sector regulation and banking sector reforms, and thus regulatory restrictions on foreign currency loan markets, might dampen foreign currency lending.

On the demand side, income or consumption should enter empirical testing, following Brown, Kirschenmann and Ongena (2009). For example, Calvo and Vegh (1999) find that strong increases in consumption are related to credit booms. A positive relationship can be assumed, as increasing consumption and expectations of rising future income might imply that households are very optimistic about future developments in general. In turn, households might underestimate the risks of unfavorable exchange rate movements and thus of foreign currency borrowing.

As highlighted in section 2, foreign currency loans were mainly used for house purchases and consumption. The findings of Égert, Backé and Zumer (2006) further show a robust positive correlation of large increases in housing prices with total private loans. Therefore, rising housing prices may add to a rise in foreign currency borrowing by households and will be tested as an additional variable of interest.

In addition to factors that are explicitly related to the supply of, or demand for, foreign currency loans to households, several variables are supposed to be related to both supply and demand, such as the interest rate. Households will be induced to take out a loan denominated in foreign currency as long as interest rates on such loans are below the price of domestic currency loans.<sup>6</sup> In transition economies, interest rates on domestic currency loans tend to be higher than those on foreign currency loans, which can be attributed to higher key interest rates compared to mature economies, also reflecting expectations of macroeconomic volatility. The theory of supply suggests that a higher price (interest rate) on domestic currency loans should serve as an incentive for banks to lend in domestic currency. But a positive relationship might indicate that banks are inclined to promote the new “cheaper” product in order to gain market share, despite possible risks that borrowers might default. Basso, Calvo-Gonzalez and Jurgilas (2007) present first evidence on supply and demand factors driving up the share of foreign currency

<sup>6</sup> In general, compared with domestic currency loans, higher additional fees are charged on foreign currency loans, thus adding to the cost of such loans. As no specific data are available on these administrative fees charged by banks in the CESEE-11, the analysis in this paper sticks to interest rates only.

lending in total private loans in 24 CESEE countries from 2000 to 2006. Their estimations show that the interest differential is an important explanatory variable.

The exchange rate regime and the exchange rate itself are important factors that work both on the supply and the demand side. As the loan has to be repaid in foreign currency, the borrower bears the exchange rate risk. Therefore, borrowers who are sufficiently risk-averse and do not have any income in foreign currency should be less inclined to take out a foreign currency loan, if the domestic currency depreciates or is very volatile (ECB, 2006).<sup>7</sup> On the supply side, banks which can be assumed to be risk-averse might also be less willing to lend in foreign currency, as the default risk of borrowers will increase if they are not hedged against exchange rate changes. As concerns differences in exchange rate regimes, one may expect that in the presence of credible fixed exchange rate regimes, the supply of, and demand for, foreign currency loans will increase; the empirical literature on this issue is not clear-cut, however. Anticipation of a future accession to the euro area might also play an important role in the decision of CESEE-11 households to take out euro loans.

High and rising inflation is related to uncertainty about the ability of borrowers to repay their loans. Domestic inflation is therefore expected to be negatively related to borrowing denominated in domestic currency (Eller, Frömmel and Srzentic, 2010). But it can be expected to be positively related to foreign currency loans to households in the CESEE-11, because these loans can be seen as more stable products concerning the price than domestic currency loans.

It should be noted that the determinants set out in this subsection often relate to some “deeper” underlying factors. For example, the interest rate differential between domestic and foreign currency loans is linked to expected macroeconomic volatility, exchange rate depreciation and, possibly, a low level of domestic currency savings, and thus to the availability of local currency funding.<sup>8</sup>

### 3.2 Specification of the Econometric Model

In general, supply and demand have to be viewed in a simultaneous equations context, because the observed volumes and interest rates of foreign currency loans are determined by the equilibrium condition that supply equals demand. The two structural equations can be written in the following way: quantity (the share of foreign currency loans in total loans to households) as a function of price (lending interest rate on domestic currency loans minus that on foreign currency loans), additional exogenous regressors related to supply and demand, and disturbance terms. The joint determination of quantity and price and the associated endogeneity call for identification of the simultaneous equations system.

<sup>7</sup> *If the nominal exchange rate remained stable, an appreciation of the real effective exchange rate could induce an increase in the repayment amount. Besides the mere development of nominal and real exchange rates, the volatility of exchange rate movements could also be of importance. Basso, Calvo-Gonzales and Jurgilas (2007) analyze the relationship of the relative volatility of real exchange rates, inflation and foreign currency lending to the private sector in CESEE. I decided to use the nominal exchange rate, assuming that households take economic decisions primarily based on nominal figures.*

<sup>8</sup> *I am grateful to one of the two anonymous referees for bringing up this point.*

The reduced-form specification estimating the determinants of foreign currency lending to households derived from such a system of simultaneous equations<sup>9</sup> is:

$$\begin{aligned} \ln(\text{fx-loans})_{it} = & \beta_{0,it} + \beta_1 \ln(\text{fx-depos})_{it} + \beta_2 \ln(\text{i-margin})_{it} + \beta_3 \ln(\text{consum})_{it} + \\ & + \beta_4 \ln(\text{i-diff})_{i(t-1)} + \beta_5 \ln(\text{exr})_{it} + X_{it} + \mu_i + \tau_t + \omega_{it} \end{aligned} \quad (1)$$

where  $i=1, \dots, N$  is the country index and  $t=1, \dots, T$  the time index,  $\beta$  represents the parameters,  $\mu_i$  are country-fixed effects,  $\tau_t$  is a deterministic linear trend and  $\omega_{it}$  is the disturbance term. In line with Luca and Petrova (2008), the dependent variable is specified as the share of foreign currency loans in total household loans (*fx-loans*). On the supply side, the share of foreign currency deposits in total household deposits (*fx-depos*) and the difference between the interest margins on domestic and foreign currency loans (*i-margin*) enter the equation specification, while private domestic consumption to GDP (*consum*)<sup>10</sup> is related to the demand side. The price, proxied by the differential between interest rates for domestic and foreign currency loans (*i-diff*) enters the reduced-form specification with a lag, following Basso, Calvo-Gonzales and Jurgilas (2007), to avoid problems of endogeneity because price and quantity are jointly determined in specifications considering supply and demand. Besides *i-diff*, also the exchange rate (*exr*) is related to both supply and demand. These five explanatory variables are tested as basic determinants of foreign currency lending to households given the discussion in section 3.1, and therefore enter each estimation equation. The variables enter the equations in logarithmic form to account for potentially nonlinear relationships in the data, such as between *i-diff* and *fx-loans*. Table 1 summarizes the variables and expected signs of the reduced-form estimations, which are based on the relationships identified in section 3.1.

The following variables of interest ( $X$ ) also enter the equation: a dummy controlling for a surge in foreign currency loans in Hungary and Slovenia (*dummy\_HU,SI*), foreign ownership in banking (*fsfdi*), a proxy for banking sector concentration based on the total assets of the three largest banks as a share of the total assets of all commercial banks (*bconcentration*), an index for banking sector reform (*banking-reform*), a housing price index (*housing*), a dummy for EU membership (*dummy\_EU*) to proxy expectations of future euro area accession, and inflation (*infl*). Table 2 presents descriptive statistics on the variables employed in the subsequent estimations (the number of observations refers to annual data from 1996 to 2007 for a total of eleven countries).

In view of the short time series available for the CESEE-11, and given that this analysis aims at detecting common supply- and demand-side factors despite cross-

<sup>9</sup> More details on the simultaneous equations system and related estimation specifications and techniques can be found in Steiner (2009).

<sup>10</sup> Besides consumption, I tested households' disposable income and their expected income (proxied by the concept of adaptive expectations) as alternative explanatory variables. The results further support a positive relationship between higher expected income and foreign currency borrowing by households (see Steiner, 2009, for details).

Table 1

### Identification and Expected Signs of the Reduced-Form Parameters

Expected sign / variable	Definition	Related to supply or demand	Source
fx-loans	Share of foreign currency loans in total household loans		National central banks
fx-depos	Share of foreign currency deposits in total household deposits	S	National central banks
i-margin	Interest margin between domestic and foreign currency loans ( $i\text{-margin} = m_{dc} - m_{fx}$ with $m_{dc} = i_{dc} - ibr_{dc}$ , $m_{fx} = i_{fx} - ibr_{EUR}$ and $ibr$ referring to the 3-month interbank rate)	S	National central banks
consum	Private domestic consumption as a share of GDP	D	AMECO and IMF
i-diff	Interest rate differential between domestic and foreign currency loans ( $i_{dc} - i_{fx}$ )	S&D	National central banks
exr	Average nominal exchange rate (units of national currency per EUR)	S&D	IMF
dummy_HU,SI	Dummy with a value of 1 controlling for the strong increase in <i>fx-loans</i> over 2005–2007 in HU and SI	S&D	Author's compilation
fsfdi	Financial sector FDI as a share of GDP	S	EBRD
bconcentration	Share of the three largest banks in total bank assets	S	Beck et al. (2000), updated dataset
bankingreform	Index of banking sector reform	S	EBRD
housing	Index of housing prices (1995=100)	D	Euromonitor
dummy_EU	Dummy with a value of 1 after EU accession and 0 otherwise	S&D	Author's compilation
infl	Annual change of the consumer price index	S&D	IMF

Source: Author's compilation.

Table 2

### Descriptive Statistics

	Mean	Median	Maximum	Minimum	Standard deviation
fx-loans	28.642	17.241	96.804	0.007	30.513
fx-depos	35.916	28.981	98.166	3.484	24.584
i-margin	-5.846	-1.861	15.634	-149.646	16.809
consum	60.433	58.929	75.894	47.769	6.351
i-diff	1.535	1.525	30.37	-20.214	5.395
exr	51.511	7.406	264.26	0.088	85.726
fsfdi	5.603	4.106	38.089	0.001	5.89
bconcentration	0.675	0.647	1	0.38	0.152
bankingreform	3.348	3.33	4	2	0.454
housing	873.727	209	7.458	100	1,737.283
infl	8.542	5.65	59.1	-1.18	10.147

Source: Author's calculations.

Note: Based on 132 observations.

country differences in foreign currency lending to households over time, panel data analysis is applied. The feasible general least squares (FGLS) estimator with country-fixed effects and contemporaneous covariances (cross-section SUR) is used to estimate the reduced-form parameters of supply and demand simultane-

ously, as it shows the best fit.<sup>11</sup> This estimator should be applied if the residuals are both cross-sectional heteroscedastic and contemporaneously correlated. Basso, Calvo-Gonzales and Jurgilas (2007) also apply the FGLS estimator with panel heteroscedasticity and panel-specific autocorrelation in their estimations of the determinants of developments in foreign currency lending to households and firms in the CESEE-11. Country-fixed effects are included because there are persistent cross-country differences in the development of foreign currency loan markets. This should, for instance, account for differences in the households' perception of the risk inherent in such loans on the demand side or for differences in banks' marketing strategies on the supply side. These factors are difficult, or rather impossible, to measure, they remain persistent over time and vary across countries. Fixed country effects can account for these differences. In order to control for a trending behavior of the examined series, a deterministic linear trend ( $\tau_t$ ) is included in the regression specifications.<sup>12</sup>

#### 4 Empirical Results

Table 3 shows the results of the relationship between supply- and demand-side factors and developments in foreign currency lending in the CESEE-11 in the period from 1996 to 2007 (i.e. before the crisis). Column 1 presents the baseline regression, and columns 2 to 7 show the results of level estimations using the explanatory factors identified in section 3. In addition, several robustness checks were conducted, which show that the results are sensitive to the chosen empirical proxy for specific variables. Instances when the use of different proxies produced different results are discussed in the following.

On the supply side, the results do not show a robust impact of the share of foreign currency deposits (*fx-depos*), and its coefficients are rather small. When controlling for a sudden and strong increase in foreign currency lending in Hungary and Slovenia in 2005 (using a shift dummy with a value of 1 in these two countries in 2005–07, denoted by *dummy\_HU,SI*), the effect of the dummy remains relatively small compared to the other coefficients, and *fx-depos* shows mostly the expected positive sign. However, there are also specifications where *fx-depos* has a significant negative impact. This can be explained by the steady decrease of foreign currency deposits as a percentage of total household deposits over time (while at the same time, external sources of financing have become more important, see also section 3). When conducting experiments with a broader foreign currency deposit base that includes not only household deposits but also firm deposits to get a closer measure of foreign currency funds available for the bank to feed foreign currency lending, the results remain qualitatively unchanged.

<sup>11</sup> The application of the ordinary least squares (OLS) estimator, both with cross-country fixed effects and robust variance specification, did not produce efficient results, as there are signs of autocorrelated and heteroscedastic residuals. In addition, the OLS estimation did not really deliver robust results, as the sign and significance of the estimated coefficients changed from one specification to the other. Therefore, another option of dealing with nonsphericalness of the disturbances is applied: the FGLS estimator, as described above.

<sup>12</sup> In light of the comparatively high  $R^2$  in all regressions, tests for cointegration or the existence of unit roots were conducted for all variables. As there was no clear evidence of cointegration and unit roots, a model specified in levels including the linear deterministic trend is estimated.

Table 3

**Reduced-Form Estimations for the CESEE-11, 1996–2007**

Explanatory variables	Dependent variable: $\ln(\text{fx-loans})_{it}$						
	Baseline	$\ln(\text{fsfdi})$	$\ln(\text{bconcentration})$	bankingreform	$\ln(\text{housing})$	dummy_EU	infl
Constant	-32.282 (-18.643) ***	-36.537 (-27.858) ***	-36.575 (-44.659) ***	-28.467 (-12.996) ***	-32.772 (-19.832) ***	-28.813 (-98.867) ***	-33.394 (-17.431) ***
$\ln(\text{fx-depos})_{it}$	0.001 (-0.0157)	-0.095 (-1.702) *	0.068 (1.788) **	0.106 (-11.989)	0.0138 (0.173)	-0.792 (-29.740) ***	-0.018 (-0.261)
$\ln(i\text{-margin})_{it}$	-0.251 (-10.930) ***	-0.300 (-15.179) ***	-0.285 (-31.658) ***	-0.215 (-7.431) ***	-0.262 (-11.179) ***	-0.371 (-67.915) ***	-0.275 (-13.003) ***
$\ln(\text{consum})_{it}$	7.792 (19.746) ***	9.054 (27.745) ***	8.836 (49.195) ***	7.306 (13.994) ***	7.688 (20.153) ***	7.335 (100.069) ***	8.386 (18.980) ***
$\ln(i\text{-diff})_{i(t-1)}$	0.327 (7.328) ***	0.230 (6.478) ***	0.320 (13.362) ***	0.129 (1.870) *	0.340 (7.394) ***	0.586 (70.821) ***	0.359 (11.039) ***
$\ln(\text{exr})_{it}$	-0.423 (4.184) ***	0.174 (2.007) **	0.486 (4.940) ***	0.426 (4.893) ***	0.082 (0.601)	0.824 (23.059) ***	0.039 (0.353)
dummy_HU,SI <sub>it</sub>	2.959 (12.468) ***	3.312 (14.067) ***	2.941 (17.648) ***	2.814 (9.965) ***	3.053 (12.485) ***		2.939 (11.377) ***
trend <sub>it</sub>	0.180 (34.565) ***	0.130 (22.028) ***	0.180 (36.700) ***	0.248 (28.000) ***	0.156 (19.778) ***	0.193 (70.780) ***	0.159 (32.477) ***
$\ln(\text{fsfdi})_{it}$		0.241 (6.559) ***					
$\ln(\text{bconcentration})_{it}$			0.910 (18.568) ***				
bankingreform <sub>it</sub>				-0.768 (-11.703) ***			
$\ln(\text{housing})_{it}$					0.317 (3.216) ***		
dummy_EU <sub>it</sub>						0.113 (16.050) ***	
infl <sub>it</sub>							-0.026 (-8.701) ***
Number of observations	132	132	132	132	132	132	132
Adjusted R <sup>2</sup>	0.989	0.994	0.996	0.987	0.989	0.998	0.990
F-Value	705.533 ***	1,232.708 ***	1,918.286 ***	532.802 ***	641.582 ***	5,133.387 ***	760.073 ***

Source: Author's calculations.

Note: Static variable-intercept panel data model. FGLS (cross-section SUR) with country-fixed effects including a linear trend. t-statistics are in parentheses. Asterisks indicate the significance of the coefficients at the 10% (\*), 5%(\*\*) and 1%(\*\*\*) levels. The Hausman test on fixed effects confirms the reported estimation results at the 5% level. The Jarque-Bera test confirms normal distribution of the residuals. The time span ranges from 1996 to 2007.

When interest margins on domestic loans are higher than those on foreign currency loans (*i-margin*), banks have an incentive to strengthen their business in domestic currency. For instance, an increase in *i-margin* by 1% leads to a decline by 0.25% in the share of foreign currency loans to total loans to households (*fx-loans*) in the baseline regression. In addition, different proxy variables are tested: the difference between the interest spread on domestic and foreign currency loans (with the spread referring to the lending rate minus the deposit rate). One would expect banks to increase domestic lending with higher interest spreads in the domestic currency business. The results show the expected negative sign for higher interest spreads on loans denominated in foreign currency.

The results of the positive relationship between foreign ownership in banking (*fsfdi*) and foreign currency lending to households depend on the proxy used for foreign ownership. Using the share of foreign-owned assets in total banking assets as an alternative proxy produces results that are not significant and even have a negative sign.

The analysis results also provide further evidence that rising concentration in banking (*bconcentration*) leads to more foreign currency lending to households. Regulatory restrictions might cause the negative relationship between the index of banking sector reform (*bankingreform*) and the share of foreign currency loans in total lending to households. Constructing a more detailed indicator of regulatory measures targeting foreign currency loans would help gain further insights into the relationship.<sup>13</sup>

On the demand side, the coefficient of consumption per GDP (*consum*) contributes the most to explaining developments in foreign currency lending to households in the CESEE-11 (see table 3). An increase in this coefficient by 1% leads to a rise by 7% in the share of foreign currency loans to total loans to households (*fx-loans*) in the baseline regression. Housing prices (*housing*) are considered as an additional variable of interest. The estimated coefficient shows the expected positive relationship.

The following results were obtained for factors related to both supply and demand: The differential between interest rates for domestic and foreign currency loans (*i-diff*) with a lag of one year enters the equation with a positive sign, which is supportive of the demand-side view, i.e. when interest rates on foreign currency loans are lower than those on domestic currency loans, foreign currency borrowing becomes more attractive to households. Moreover, from the supply-side point of view, the positive sign of the parameter suggests that banks also aim at maximizing their market share in transition economies and therefore promote the seemingly “cheaper” loan product.

In the baseline regression, an exchange rate depreciation is negatively related to the share of foreign currency lending in total lending to households. The estimated positive relationship between the exchange rate variable (*exr*)<sup>14</sup> and the share of foreign currency lending in other estimation specifications is, at first glance, counterintuitive. While this might indicate a mere mathematical effect, as the calculation of the foreign currency loan share is based on nominal values, the currency depreciation observed in some countries during the first two-thirds of the sample period and slowly growing foreign currency loan shares might offset

<sup>13</sup> The empirical research presented in this paper uses a panel data setting, which would not allow drawing country-specific conclusions about the effectiveness of these measures. In addition, the direction of causality is important and would call for the inclusion of lags, which would limit the degrees of freedom. An index with only little variation over time would be correlated with the country-fixed effects applied in the estimations. For these reasons, detailed future research on the effectiveness of regulatory measures at the country level using data with higher frequency over time would be warranted.

<sup>14</sup> As an alternative specification, I introduced an exchange rate regime dummy to control for periods of fixed exchange rate regimes. This dummy has a value of 1 in periods of fixed exchange rate regimes and 0 otherwise (following Markiewicz, 2006, and Mooslechner, 2008). However, the results are subject to the classification of de-jure versus de-facto exchange rate regimes. In addition, the dummy variable is correlated with the country-fixed effects included in the estimation specification, as there is only little variation in the dummy variable over time for some countries (e.g. Estonia and Latvia). Therefore, the impact of exchange rates is estimated only by using the average nominal exchange rate.

the negative impact of appreciation on foreign currency borrowing in the last years of the sample period, and thus result in the estimated positive relationship.

The impact of EU membership (*dummy\_EU*)<sup>15</sup> on foreign currency lending is positive and significant. Inflation (*infl*) turns out to be negatively related to foreign currency lending to households, but the reduced-form parameter is very small. The trend included in all estimation specifications is positive and significant.

To sum up, the development of foreign currency lending to households can be traced back to a mixture of demand and supply factors, highlighting the necessity that regulation addresses both sides. Important factors on the demand side are private consumption and housing prices, while on the supply side, it is the difference between the interest margins on domestic and foreign currency loans, the progress in banking sector reform as well as banking sector concentration. The interest rate differential, the years of EU membership and inflation turned out to be significant factors covering both demand- and supply-side aspects, whereas the results for the foreign currency deposit base, foreign ownership in banking and the exchange rate are not that robust.

## 5 Measures Taken to Contain Currency Substitution of Loans in the CESEE-11

Foreign currency borrowing can endanger financial stability, especially if it is concentrated in particular loan market segments (e.g. households), and if borrowers are not hedged, which is largely the case for households in the CESEE-11 (but also other countries where foreign currency lending to households has been observed). As laid out in section 2, the accumulation of large stocks of foreign currency loans in many CESEE-11 countries had begun well before the financial crisis. The policy response to this development has not been uniform in the region. Some countries took regulatory and supervisory measures to limit the excessive exposure to this type of loan already in the 1990s, while others were more reluctant to do so. At the current juncture, the challenge is to ensure the implementation of a regulatory framework that will prevent excessive borrowing in foreign currency by unhedged households in the future, in particular once the CESEE-11 economies take off and credit demand revives after the crisis. Policy options range from monetary policy to administrative measures and should address both supply and demand in order to be effective.

On the supply side, key prudential measures can either target credit growth in general or foreign currency lending in particular. The toolkit in this area includes (1) tightening the requirements on foreign currency liquidity and on capital adequacy, (2) using higher risk weights according to the currency denomination of loans, and (3) tightening the rules on loan concentration. Prudential measures directly targeting the supply of foreign currency loans have been implemented in several CESEE-11 before (or during) the crisis, in particular in Croatia, but also Poland, Romania and Bulgaria. Hungary also followed suit, but only more recently. The debate on further steps in this area is still on in several countries. Plans to ban foreign currency lending to unhedged borrowers and raise risk weighting on foreign currency mortgages from 75% to 100% are being discussed in Poland to

<sup>15</sup> To proxy also expectations of a future euro area accession, *dummy\_HU,SI* also controls for expectations of euro adoption in Slovenia in 2007 and shows a positive sign.

limit risks stemming from both housing loans and foreign currency loans (IMF, 2010). Croatia, which had implemented a wide range of policy measures targeting foreign currency loans, opted for a relaxation of minimum reserve requirements and the easing of foreign currency liquidity regulations (to alleviate the government's financing needs), thus facilitating banks' access to foreign funding when the financial crisis struck (Gardò, 2010). While these measures targeted the public sector's borrowing needs, they might also have had an effect on foreign currency lending to households.

Supervisory measures included improving reporting and disclosure rules, conducting periodic stress tests of banks' balance sheets, strengthening off- and on-site inspections, and establishing an increased dialogue with home supervisors of foreign banks. In the CESEE-11, banking supervision has improved substantially since the beginning of the 1990s, which also contributed to strengthening trust in the local banking markets. Still, continued stress testing and monitoring of banks' capabilities and practices in the field of credit risk assessment remain key priorities for supervisors – particularly in the case of banks with substantial foreign currency lending. Other important measures are making headway toward higher transparency and more detailed disclosure of banking data, especially sectoral data on currency denomination or indexation as well as information about potential discrepancies between loan classification and the ultimate use of these loans (see Walko, 2008). Periodic surveys of banks' and borrowers' foreign exchange exposure can also be helpful to ensure that foreign currency lending to households remains under control and to identify indirect exchange rate risks for banks (e.g. Stix, 2008). Measures aimed at promoting a better understanding of risks, such as training of bank staff or moral suasion, can also have an effect on the supply of foreign currency loans. In addition, the establishment and increasing efficiency of credit registers can help dampen excessive foreign currency lending by improving market discipline and providing adequate reporting information to the supervisory bodies.

Majority foreign ownership in banking can make it more difficult to effectively implement prudential and supervisory measures targeting foreign currency lending. For example, local subsidiaries may shift part of their loan portfolio to the parent bank as a reaction to measures which try to limit the volume of foreign currency lending (this happened e.g. in Bulgaria and Romania in the mid-2000s). Parent bank supervisors should also help contain foreign currency lending by subsidiaries. For example, the EBRD points out that the Swedish supervisory authorities insisted that Swedish banks' subsidiaries abroad (in particular in the Baltic countries) tighten their lending standards in 2007 (EBRD, 2008). However, with hindsight, this case can also be seen as an instructive example of belated action, given that the foreign currency lending boom had already started years earlier in the Baltic countries and that it had gone very far by 2007, also compared to other CESEE countries. In January 2009, the “Vienna Initiative Plus” was established to strengthen cooperation and cross-border coordination of regulation and supervision in order to meet financial and economic challenges in CESEE (Nitsche, 2010).

The empirical estimations in section 4 also revealed the importance of demand. Public awareness campaigns, particularly among households, and other tools to warn borrowers of the risks entailed in foreign currency loans should promote a

better understanding of these risks and thus dampen excessive demand for such loans. Above all Romania and Poland took decisive measures in this field. The OECD most recently recommended promoting financial literacy programs for all age groups and especially for vulnerable groups, such as the elderly and the less educated (OECD, 2010). In addition, increased transparency of loan contracts is key to enhancing borrowers' understanding of the costs and risks involved. For example, in Hungary, a code of conduct was signed in 2009 to limit instances where banks can transfer increased loan costs to households (OECD, 2010). Poland introduced "Recommendation S" in 2006, which aimed at improving the banks' practices concerning credit exposure. Banks had to provide customers with sufficient and better information to raise awareness of the risks associated with foreign currency lending.

Besides these soft policy tools, also fiscal measures (such as abolishing or reducing existing incentives for foreign currency loans) can dampen demand for such financial products. Prudential measures that directly target demand include explicitly linking loan-to-value and payment-to-income ratios to foreign currency borrowing by households. Poland imposed an obligation on banks to require higher creditworthiness of customers applying for foreign currency housing loans than of those applying for zloty loans of an equivalent amount. As a result, banks offer their customers lower amounts of loans in foreign currencies than in zloty, so that the customers have a "buffer" in case of zloty depreciation and increased principal and interest installments. Hungary introduced different loan-to-value ratios and payment-to-income ratios according to currency denomination (forint, euro or other foreign currency) for household loans in 2010.

In addition to these instruments that directly target demand, several supply-related measures have an indirect impact on demand and vice versa. For example, market and financial institutional development in a credible macroeconomic environment are important instruments to strengthen the options banks have in terms of domestic refinancing and hedging, and to increase households' trust in the domestic banking system. The EBRD indicates that these measures are important for expanding the sources of domestic funding available and making it easier to price domestic currency loans at longer maturities (EBRD, 2009). Indeed, developing local currency capital markets would be an important measure for medium-sized CESEE countries with floating exchange rate regimes that do not intend to adopt the euro in the near future. The cost-benefit equation, however, appears to be less obvious for very small CESEE EU Member States with hard pegs.

Administrative measures, such as direct credit controls or limits on the availability of this type of loan for households, also impact both supply and demand. Such measures were temporarily implemented e.g. in Croatia in 2003 and in Romania from 2005 to 2006. More recently, in August 2010, mortgage-backed foreign currency lending was banned altogether in Hungary. Before that, in the last quarter of 2008, leading Hungarian commercial banks had made a voluntary commitment to reduce or stop lending in foreign currencies other than the euro. In the first half of 2010, currency-specific limits on loan-to-value and payment-to-income ratios had been introduced. However, EU membership and, in particular, participation in the internal market might limit the use of such administrative measures.

Monetary policy can use interest rate and exchange rate policies to impact foreign currency loan markets and address the related risks. Both the interest rate and the exchange rate are significant demand- and supply-side variables and thus have an impact on both. If, however, currency substitution of loans (and deposits) is already at a high level, the effects monetary policy can achieve are limited, as it can only impact the domestic interest rate, and foreign funding may be available at low rates in open capital account regimes (Brzoza-Brzezina, Chmielewski and Niedźwiedzińska, 2010). As concerns exchange rate policy, increased exchange rate flexibility and, with it, volatility might increase direct exchange rate risk and thus the risk of default of foreign currency debtors who are not hedged against the exchange rate risk (Backé, Ritzberger-Grünwald and Stix, 2007).

Besides Croatia and Poland, Romania is another country where the combined impact of prudential, supervisory and administrative measures targeting supply and demand helped to dampen foreign currency lending at least temporarily (namely in 2006). In Romania, monthly debt service payments were not allowed to exceed 40% of the borrower's net monthly income. The exposure of a credit institution to foreign currency loans granted to natural and legal persons had to be below 300% of the bank's own funds or of the endowment capital of foreign branches of banks. These measures were combined with other measures, such as raising reserve requirements for liabilities denominated in foreign currency from 30% to 35% in the fourth quarter of 2005 and to 40% in 2006 (Standard and Poor's, 2008). Loan classification was refined, too. However, several of these measures were discontinued when Romania entered the EU in 2007.

Future research should empirically analyze the effectiveness of regulatory measures that target the supply of, and demand for, foreign currency loans to households at the country level. As laid out earlier, regulatory restrictions might be responsible for the negative relationship between the index of banking sector reform and foreign currency lending to households shown in table 3. However, the panel data setting presented in this paper does not allow drawing country-specific conclusions.

## 6 Summary and Conclusions

Foreign currency lending to households surged in many CESEE-11 countries during the last decade, which induced several international institutions, supervisory bodies and central banks (including the OeNB) to advise caution. The financial crisis revealed the risks involved in foreign currency borrowing by households, thus providing a window of opportunity to strengthen prudential regulation and supervision of this loan market segment.

This paper contributes to the empirical research by providing evidence at the macroeconomic level that developments of foreign currency lending to households in the CESEE-11 in the period 1996 to 2007 were driven by a variety of demand and supply factors. Important factors on the supply side are the difference between the interest margins (lending rate minus interbank interest rate) on domestic and foreign currency loans, the quality of banking sector regulation (and thus regulatory restrictions on foreign currency loan markets), and banking sector concentration. On the demand side, private consumption and housing prices are significantly related to foreign currency lending to households. Important factors for both supply and demand are the interest rate differential, EU membership, and infla-

tion. The results for the foreign currency deposit base, foreign ownership in banking and the exchange rate are not that robust.

In view of these results, it seems only logical that regulation and other policy measures should target both the supply and the demand side of foreign currency lending to households. This paper contributes to the literature by discussing these measures in detail and by explicitly referring to their impact on supply and demand. Before the financial crisis, some CESEE-11 countries had taken a range of measures to limit foreign currency lending to households, while other countries had been less active in this field.

Measures that primarily target demand include soft policy tools, such as awareness campaigns, but also prudential measures. Eligibility requirements for foreign currency loans, for example in terms of stricter loan-to-value and payment-to-income ratios depending on the loan denomination, were implemented and should prove particularly effective if applicable to both banks and nonbank financial intermediaries. In particular, Croatia, Poland and, more recently, Hungary have been active in this respect in view of the large foreign currency exposure of household loans. Bulgaria and Romania at least temporarily applied similar prudential measures. On the supply side, special emphasis was put on higher risk weights and capital adequacy rules related to foreign currency loans, as well as supervisory measures. Administrative measures targeting both supply and demand, such as bans on foreign currency lending to households, are more difficult to implement but were temporarily applied, too. Given the possible conflict of such measures with internal market rules, this was mostly before EU accession, though. Most recently, an increase in risk weighting on foreign currency mortgages has been discussed, for example in Poland. The EBRD has called for stricter regulation of foreign currency loans since 2009, a call that has received further support from the "Vienna Initiative Plus" (Nitsche, 2010). However, governments have to consider that overregulation can be counterproductive as long as macroeconomic stability is (still) a concern and local currency funding is not available (Zettelmeyer, Nagy and Jeffrey, 2010). In its most recent Transition Report, the EBRD (2010) calls for a deepening of local currency capital markets to foster domestic sources not only for corporate but also for bank financing.

Although growth of these loans has declined in the wake of the financial crisis, the remaining stock of foreign currency loans to households, and thus their exposure to vulnerabilities, remains large in some CESEE-11 countries. Therefore, it is important to put in place a framework that will promote new household borrowing in domestic currency or at least limit excessive exposure of unhedged borrowers. Measures should address the quantity and the quality of loans to correct existing vulnerabilities and avoid new ones. Other factors that will have an effect on future developments are the degree of openness of the capital account, the set of monetary instruments, the effectiveness of monetary transmission channels and regulatory implementation, fiscal incentives and regulatory loopholes. Given the variety of demand and supply factors that drive foreign currency lending to households, individual measures will not be enough to help keep such lending below reasonable limits. Rather, a mix of policy and regulatory measures is called for, and it should be put in place before the CESEE-11 economies take off again in terms of faster economic growth and financial sector development.

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