



European Bank
for Reconstruction and Development

Foreign currency lending in emerging Europe: bank-level evidence

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Summary

Based on survey data from 193 banks in 20 countries we provide the first bank-level analysis of the determinants of foreign currency (FX) lending in emerging Europe. We find that FX lending by all banks, regardless of their ownership structure, is strongly determined by the macroeconomic environment. We find no evidence of foreign banks 'pushing' FX loans indiscriminately because of easier access to wholesale funding in foreign currency. In fact, while foreign banks do lend more in FX to corporate clients, they do not do so to retail clients. We also find that after a take-over by a foreign bank, the acquired bank does not increase its FX lending any faster than a bank which remains in domestic hands.

Keywords: foreign currency lending, currency mismatch, foreign banks, financial stability

JEL Classification Number: D82, G15, G21

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This is a preliminary version of a paper prepared for the 54th Panel Meeting of *Economic Policy*, April 2011. We would like to thank Asel Isakova for helpful statistical assistance and Olena Havrylchyk, Maria Soledad Martinez Peria, Alexander Popov, Marta Serra Garcia, Karolin Kirschenmann, Aaron Tornell, Paul Wachtel, Frank Westermann, Jeromin Zettelmeyer and participants at the EBRD Research Seminar and the XIX International Tor Vergata Conference on Money, Banking and Finance for their useful comments.

The working paper series has been produced to stimulate debate on the economic transformation of central and eastern Europe and the CIS. Views presented are those of the authors and not necessarily of the EBRD or the SNB.

1. Introduction

Unhedged foreign currency (FX) borrowing is seen as a major threat to financial stability in eastern Europe. More than 70 per cent of all private sector loans in Estonia, Latvia and Serbia are currently denominated in (or linked to) a foreign currency. The share of FX loans also exceeds that of domestic currency loans in Bulgaria, Hungary and Romania (EBRD, 2010). FX borrowing throughout the region is dominated by retail loans – household mortgages and small business loans – to clients which typically have their income and assets in local currency. It is therefore not surprising that national authorities have taken measures to discourage such loans. Supervisors in Hungary, Latvia and Poland for instance have pushed banks to disclose the exchange rate risks of FX loans to clients and to tighten the eligibility criteria for such loans. In countries like Croatia, Kazakhstan and Romania stronger provisioning requirements were also imposed on FX compared to local currency loans. Ukraine even completely banned FX lending to households in late 2008.

The call for policies to curb FX lending in eastern Europe has intensified in recent months. In June 2010 the European Central Bank (ECB) stated that national efforts to rein in FX lending have had little impact and called for coordinated efforts, including among regulators from the home countries of banks which own subsidiaries in eastern Europe (ECB, 2010). In this line of thinking FX lending is largely supply-driven, with FX funding of banks, often by their parent banks, at the heart of the problem. To the extent that FX lending does not reflect macroeconomic uncertainty and related underlying vulnerabilities, regulation may help to counterbalance distortions – such as banks and borrowers that disregard the negative externalities of FX loans in terms of increasing the risk of a systemic crisis (see Ranciere et al., 2010).

Surprisingly, the widespread view that FX lending in eastern Europe is driven by funding of banks in FX has not yet been substantiated by empirical analysis. Comparisons of aggregate cross-country data document higher shares of FX lending in countries where banks have larger cross-border liabilities (Bakker and Gulde, 2010; Basso et al., 2007). However, whether cross-border liabilities are causing or being caused by FX loans is hard to establish from such aggregate data. Recent loan-level evidence for Bulgaria suggests that FX lending is at least partly driven by customer deposits in FX, while wholesale funding in FX is a result rather than a cause of FX lending (Brown et al., 2010). It is unclear whether this result applies to a broad set of banks across the transition region.

In this paper we use bank-level data to help clarify what is driving FX lending in Eastern Europe and to assess the appropriateness of the current policy response. Our main data source is the EBRD Banking Environment and Performance Survey (BEPS) conducted in 2005 and covering 220 foreign-owned and domestic-owned banks in 20 transition countries. The BEPS questionnaire elicits detailed information on the loan and deposit structure of each bank in 2001 and 2004, as well as its risks management procedures and its assessment of creditor rights and banking regulations in its country of operation. We match our data from BEPS with financial statement data provided by Bureau van Dijk's BankScope database, as well as with country-level indicators of the interest rate differential on foreign versus local currency funds, real exchange rate volatility, inflation volatility and the type of exchange rate regime.

The countries and observation period covered by our data are particularly interesting for studying FX lending dynamics. During this period foreign currency lending to corporate clients was already widespread in eastern Europe. For the banks in our sample the mean share of the corporate loan portfolio denominated in FX was 41 per cent in 2001 and 44 per cent in

2004. During this three-year period we do, however, observe an increase in FX lending by some banks, while others substantially reduced their FX lending. Furthermore, FX lending to households increased substantially across eastern Europe during our observation period. Considering the banks in our sample, we find that the share of FX loans in their household loan portfolio increased from 28 per cent in 2001 to 38 per cent in 2004. Our data allow us to investigate to what extent these developments in FX lending to corporate and household clients are related to changes in the ownership of banks, to changes in their funding structure, or to changes in macroeconomic conditions.

Our results contradict the view that foreign-owned banks are driving FX lending throughout eastern Europe as a result of their easier access to cross-border wholesale funding. As a matter of fact we do not find robust evidence that wholesale funding had a causal effect on FX lending for any type of bank over the 2001-04 period. Although we find that foreign banks do lend more in FX to corporate clients, they do not do so to households. Further, banks which are taken over by foreigners do not increase their FX lending faster than domestic banks which are not taken over. Lastly, we find no evidence of multinational banks using their internal capital market to actively push FX lending throughout their subsidiary networks towards some 'target' level of FX lending. By contrast, we do find evidence for 'contagion' of FX lending within countries: banks with low levels of FX lending in 2001 – compared to the country average – increase their FX lending more strongly over the subsequent three years. But this holds for domestic and foreign banks alike.

Our results indicate that macroeconomic stability is a key determinant of FX lending in the transition economies. In line with recent evidence by Brown et al. (2009) we find that interest rate differentials are not positively related to FX lending. On the contrary, we find that banks in countries that saw a sharp decline in interest rate differentials in relation to the euro between 2001 and 2004 expanded their FX lending the most during this period. This suggests that the (expected) macroeconomic stability which led to interest rate declines is a stronger determinant of FX lending than interest rate advantages. This conjecture is supported by the finding that real exchange rate volatility does discourage FX lending. As an indirect indicator of the importance of macroeconomic stability we also find that FX deposits by customers, which are arguably driven by macroeconomic conditions, appear to be a very strong determinant of FX lending.

Our results provide important insights for policy makers into the drivers of FX lending in eastern Europe. In particular, they suggest that credible macroeconomic policies which encourage depositors to save in local currency may be more important than regulatory proposals to limit the wholesale funding of banks. As suggested recently by Zettelmeyer et al. (2010), while abundant foreign funding may have aggravated FX lending, in many countries the underlying cause was the lack of credible macroeconomic policies.

The rest of the paper is organised as follows. Section 2 relates our study to the existing theoretical and empirical literature on FX lending. Section 3 then describes our data and Section 4 presents our results. Section 5 sets out our policy conclusions.

2. Literature and hypotheses

In this section we review existing theoretical and empirical studies on the currency denomination of bank loans, establishing the hypotheses for our empirical analysis and clarifying our contribution to the literature.

2.1 Theory

From a theoretical perspective, foreign currency lending by a bank will first of all be influenced by *monetary conditions*. On the demand side firms and households will be more likely to request FX loans when interest differentials are high and real exchange rate volatility is low (see for example Brown et al., 2009). Luca and Petrova (2008) examine a model of credit dollarisation in which risk-averse banks and firms choose an optimal portfolio of foreign currency and local currency loans. In line with other portfolio-choice models of foreign currency debt (Ize and Levy-Yeyati, 2003) they predict that banks will offer more foreign currency loans when the volatility of domestic inflation is high and the volatility of the real exchange rate is low. Thus, in countries where the monetary authority has not established a credible reputation for pursuing price stability this could imply that banks prefer to make loans in foreign currency. This tendency may be stronger for long-term than for short-term loans as long-term monetary policy may be particularly unpredictable.

Second, FX lending may be a function of the *composition of a bank's clientele*. Goswami and Shrikande (2001) show how firms may use foreign currency debt as a hedging instrument for the exchange rate exposure of their revenues.¹ They assume that the uncovered interest rate parity holds² and therefore interest rate differentials do not motivate foreign currency borrowing in their model. However, a wide body of evidence suggests that this parity does not hold for many currencies (see for instance Froot and Thaler (1990) or Isard (2006)). Cowan (2006) and Brown et al. (2009) consider firms' choices of loan currency in models where the cost of foreign currency debt is lower than the cost of local currency debt. Cowan (2006) shows that firms will be more likely to choose foreign currency debt the higher the interest rate differential, the larger their share of income in foreign currency and the lower their distress costs in case of default. The incentive to take foreign currency loans is weaker when the volatility of the exchange rate is higher, as this increases the default risk on unhedged loans. Brown et al. (2009) show that not only firms with foreign currency income, but also firms with high income in local currency (compared to their debt service burden) will be more likely to choose foreign currency loans, as their probability to default due to exchange rate movements is lower. They also examine the impact of bank-firm information asymmetries on loan currency choice, showing that when lenders are imperfectly informed about the currency or level of firm revenue, local currency borrowers may be more likely to choose foreign currency loans.³ While focused on commercial loans, the models of Cowan (2006) and Brown et al. (2009) are also relevant for FX lending to households. They predict

¹ Economic exposure to foreign currency can also be managed with foreign exchange derivatives. See Brown (2001) and Mian (1996) for a broad discussion of corporate hedging instruments.

² This means that the differences in the nominal interest rates between currencies are cancelled out by the changes in their exchange rate so that the costs of foreign and local currency borrowing are identical.

³ Banks may not be able to verify the income sources of small firms which do not keep detailed and audited financial records (Berger and Udell, 1998). This information asymmetry may be particularly pressing in countries with weak corporate governance (Brown et al., 2009) and a strong presence of foreign banks which have less knowledge about local firms (Detragiache et al., 2008).

that households with assets denominated in foreign currency, such as real estate in many countries, as well as households with FX income or high income to debt service levels will be more likely to borrow in foreign currency.

Third, the share of foreign currency assets held by a bank will also be related to the *currency structure of its liabilities*. Banks are typically limited by prudential regulation in the foreign currency exposure they can take. In a country with underdeveloped derivative markets for foreign currency exchange this regulation implies that banks' supply of loans in foreign currency will be partly determined by their liabilities in these currencies. Basso et al. (2007) suggest that banks' supply of foreign currency loans will depend on their own access to foreign currency debt through financial markets or from parent banks abroad. Similarly, Luca and Petrova (2008) argue that increases in banks' access to foreign currency deposits will lead them to offer more foreign currency loans.⁴

2.2 Empirical evidence

Cross-country comparisons of aggregate credit document a strong role for *monetary conditions* in explaining the use of foreign currency in developing and transition economies. Most recently, Luca and Petrova (2008) analyse the aggregate share of foreign currency loans for 21 transition countries of eastern Europe and the former Soviet Union between 1990 and 2003. They find that the aggregate share of foreign currency loans is positively related to interest rate differentials and domestic monetary volatility, and negatively related to the volatility of the exchange rate. Earlier work by Arteta (2002) on a broad sample of low-income countries as well as Barajas and Morales (2003) on Latin America confirms the hypothesis that higher exchange rate volatility reduces aggregate credit dollarisation. Firm-level studies find more mixed results concerning the impact of monetary conditions on the currency composition of firm debt. Keloharju and Niskanen (2001) as well as Allayannis et al. (2003) find that the use of foreign currency debt by corporate firms is strongly related to interest rate differentials. Brown et al. (2009) by contrast find only a weak impact of interest rate differentials and no impact of exchange rate volatility on the use of foreign currency loans among small firms in transition economies.

A broad set of studies confirm that the use of FX debt is related to *borrower characteristics*, in particular borrower income structure. Large firms have been shown to match loan currencies to those of their sales in the US (Kedia and Mozumdar, 2003), Europe (Keloharju and Niskanen, 2001), Latin America (Martinez and Werner [2002], Gelos [2003], and Benavente et al. [2003]) and East Asia (Allayannis et al., 2003). More recent evidence suggests that the use of a foreign rather than a local currency loan by retail clients is also strongly related to borrower characteristics. Brown et al. (2009) examine the currency denomination of the most recent loan received by 3,105 small firms in 24 transition countries. They find strong evidence that the choice of an FX loan is related to foreign currency cash flow. In contrast, they find only weak evidence that FX borrowing is affected by firm-level distress costs or financial opaqueness. Brown et al. (2010) analyse requested and granted loan currencies using credit-file data for over 100,000 loans to small firms in Bulgaria. They show that firms with revenue in foreign currency, lower leverage and lower distress costs are more likely to ask for an FX loan, and are more likely to receive such a loan. Beer et al. (2010) examine survey data covering over 2,500 Austrian households and find that those households

⁴ For a discussion of deposit dollarisation see De Nicolo et al. (2005).

with higher wealth, higher income and better education are more likely to have foreign currency (CHF) rather than local currency (EUR) mortgages.

Lastly, recent research for eastern Europe provides mixed evidence on the role of *bank funding* as a driver of FX lending. Basso et al. (2007) examine aggregate credit dollarisation for 24 transition countries for the period 2000–06. They find that countries in which banks have a higher share of foreign funding display a higher share of FX loans. Luca and Petrova (2008) by contrast find no robust relation between aggregate lending in FX across transition countries and aggregate foreign liabilities of banks. They do, however, find a strong relation between aggregate levels of deposit “dollarisation” and FX lending. Brown et al. (2010) provide loan-level evidence that FX lending is driven by customer funding of banks in FX, rather than wholesale funding in FX.

This paper contributes to the empirical literature on FX debt by examining how banks’ FX lending is impacted by their macroeconomic environment as well as their ownership, client and funding structure. We use our dataset to test three main hypotheses:

1. *low exchange rate volatility, high inflation volatility, and large interest rate differentials* have a positive impact on a bank’s proportion of FX loans
2. *foreign ownership* has a positive impact on a bank’s proportion of FX loans
3. *access to FX denominated wholesale and deposit funding* has a positive impact on a bank’s proportion of FX loans.

By testing these hypotheses with bank-level loan portfolio data, our paper complements recent cross-country studies of aggregate FX lending (Luca and Petrova (2008) and Basso et al. (2007)). It also complements the firm-level studies by Brown et al. (2009) and Brown et al. (2010) by providing micro-evidence on FX lending to both firms and households.

3. Data

3.1 The Banking Environment and Performance Survey (BEPS)

Our main data source is the EBRD Banking Environment and Performance Survey (BEPS) conducted in 2005 across 20 transition countries. The BEPS questionnaire elicits detailed information on the loan and deposit structure, including the currency denomination, of a large number of banks in 2001 and 2004. Information was also collected on banks' risk management practices and their own assessment of creditor rights and banking regulation. BEPS also provides detailed information on bank ownership, which allows us to differentiate between three ownership categories: banks with a majority of domestic ownership; newly created foreign banks (greenfields); and privatised banks with a majority of foreign ownership (takeovers).

From the 1,976 banks operating in the transition region in 2005 the EBRD approached the 419 banks which were covered by Bureau van Dijk's BankScope database. These banks represent more than three quarters of all banking assets in the transition region. Of these banks 220 agreed to participate in the BEPS survey. There are only small differences between banks that agreed to participate in BEPS and those that declined. De Haas et al. (2010) provide a detailed description of the BEPS survey and how it provides a representative picture of the underlying banking population in emerging Europe in terms of bank size and bank ownership. Both in BankScope and in BEPS seven per cent of the banks are state-owned and while in BankScope 47 per cent of all banks are foreign owned, in BEPS 55 per cent are foreign owned. Lastly, while in BankScope 45 per cent of all banks are private domestic banks, 38 per cent of all banks in BEPS belong to this category. There is only a weak relationship between bank size and inclusion in BEPS.

The dataset we use in this paper excludes 27 banks for which information on the currency composition of loans was not available. We thus have a sample of 193 banks from 20 countries, of which 98 are domestic banks (private or state-owned), 44 greenfield foreign banks and 51 are foreign banks that are the result of a take-over of a former domestic bank.⁵ Table 1 shows the geographical distribution of these banks over the transition region. The sample is fairly evenly distributed over the three main sub-regions: central Europe and the Baltic countries, south eastern Europe, and the Commonwealth of Independent States (CIS). In terms of ownership, our sample also reflects that the banking sector in the CIS has seen less foreign direct investment (FDI) compared to the more Western parts of the transition region.

⁵ We merge private domestic banks and state-owned banks in the category domestic banks. A separate analysis of these two categories yields similar qualitative results.

Table 1: Bank ownership by country

The table reports the number of banks in our sample by country and ownership type. Greenfield banks are foreign banks established from scratch, whereas takeover banks are foreign banks that are the result of a takeover of a domestic bank by a foreign strategic investor. Acquired banks are takeover banks that were acquired in 2000, 2001, or 2002. Source: BEPS.

	Total	Foreign greenfield	Foreign takeover	Domestic	Acquired (2000-02)
<i>Central Europe & Baltics (CEB)</i>	62	15	26	21	15
Czech Republic	7	0	4	3	3
Estonia	5	0	4	1	1
Hungary	3	3	0	0	0
Latvia	16	1	6	9	2
Lithuania	5	0	3	2	2
Poland	13	7	4	2	3
Slovak Republic	6	3	3	0	2
Slovenia	7	1	2	4	2
<i>South Eastern Europe (SEE)</i>	72	22	22	28	13
Albania	4	3	1		1
Bosnia	11	3	4	4	2
Bulgaria	11	3	6	2	5
Croatia	11	4	1	6	1
Macedonia	6	0	2	4	2
Romania	11	5	5	1	2
Serbia	18	4	3	11	0
<i>Commonwealth of Independent States (CIS)</i>	59	7	3	49	0
Belarus	9	1	2	6	0
Kazakhstan	7	0	0	7	0
Moldova	8	0	1	7	0
Russia	27	3	0	24	0
Ukraine	8	3	0	5	0
Total	193	44	51	98	(28)

From the BEPS we yield two indicators of bank-level foreign currency lending as our dependent variables: *FX loans corporates* is the share of a bank's outstanding loan portfolio to firms which is denominated in foreign currency. Likewise, *FX loans households* is the share of the outstanding loan portfolio to households denominated in foreign currency.

Chart 1: FX lending in 2001 and 2004

This figure plots for the variables *FX loans corporates* and *FX loans households* their 2001 values against their 2004 values. Source: BEPS.

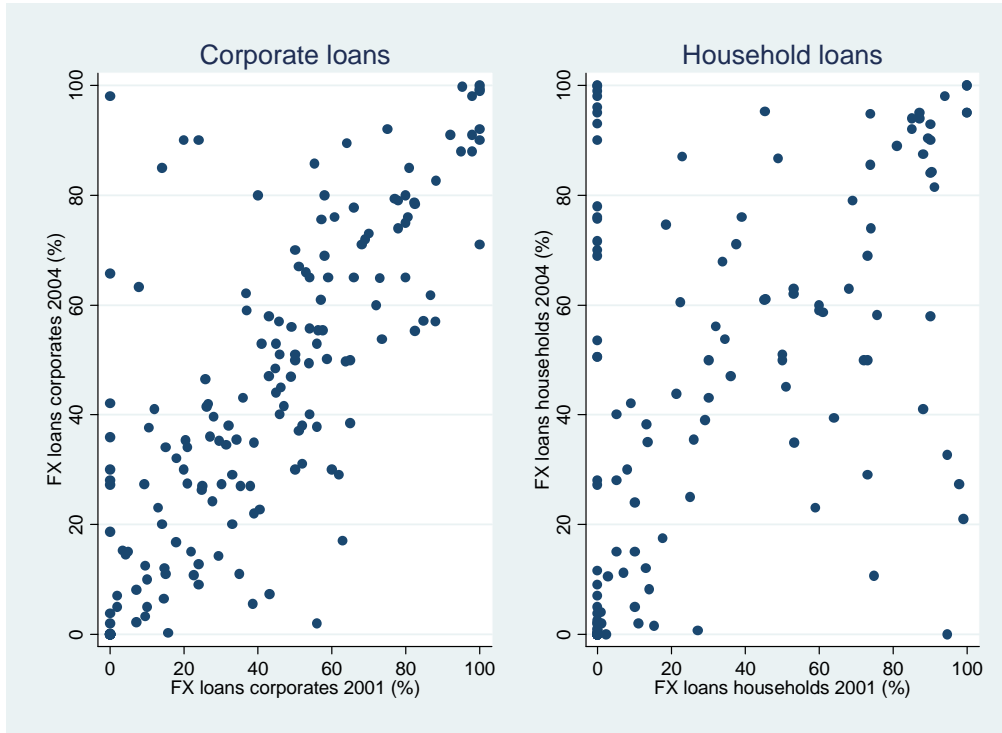


Chart 1 depicts the 2001 and 2004 values for these dependent variables for the 193 banks in our dataset. The chart shows quite a strong correlation between the 2001 and 2004 proportion of corporate lending in FX. By contrast, during this period many banks experienced stronger changes in the currency denomination of their household loan portfolio. Overall, the share of FX loans to households in our sample increased from 28 per cent in 2001 to 38 per cent in 2004. However, as Chart 1 shows, these averages mask substantial heterogeneity in the development of household lending across banks.

3.2 Explanatory variables

Table 2 provides a description and the source of all variables we use in our empirical analysis. We construct bank ownership dummies that indicate whether a bank is a *foreign greenfield* bank, a *foreign takeover* bank, or a *domestic* bank in 2004. Information to construct these dummies is taken from BEPS and where needed supplemented with information from banks' websites. We also create a dummy *foreign acquired* that indicates takeover banks that were acquired in the year 2000, 2001 or 2002. Finally, we create a variable *foreign held* which is 1 for all banks that were foreign-owned throughout 2000-04 and 0 for all banks which were domestically owned throughout this period.

Table 2: Variable descriptions

This table presents definitions and sources of all variables used in our empirical analysis. BEPS is the EBRD Bank Environment and Performance Survey conducted in 2005. BankScope is Bureau van Dijk's BankScope database of bank balance sheet and income statement data. EBRD-TR is the EBRD Transition Report 2004. IMF-IFS are the International Financial Statistics provided by the International Monetary Fund. IMF-AREAR is the annual report on Exchange Arrangements and Exchange Restrictions by the International Monetary Fund.

Variable name	Periodicity	Description	Source
<i>Bank-level data (# banks = 193)</i>			
FX loans corporates	2001, 2004	Share of FX loans in all loans to corporations (%)	BEPS
FX loans households	2001, 2004	Share of FX loans in all loans to households (%)	BEPS
Foreign greenfield	2004	1= bank is a newly established 'greenfield' foreign bank, 0= otherwise	BEPS, websites
Foreign takeover	2004	1= bank is a foreign bank resulting from a take-over, 0= otherwise	BEPS, websites
Domestic	2004	1= bank is domestically owned, 0=otherwise	BEPS, websites
Foreign held	2000-2004	1= if bank was foreign owned from 2000-2004, 0= bank was domestically owned from 2000-2004	BEPS, websites
Foreign acquired	2000-2004	1= domestic bank was acquired by a foreign investor in 2000, 2001 or 2002, 0= otherwise	BEPS, websites
Assets	2001, 2004	Total assets (in log USD)	BankScope
Loan size	2001, 2004	Average loan size to corporations (Log USD)	BEPS
Mortgage loans	2001, 2004	Share of mortgage loans in all loans to households (%)	BEPS
Wholesale funding	2001, 2004	Non-customer liabilities as a share of total bank liabilities (in %)	BankScope
FX deposits	2001, 2004	Share of FX denominated customer deposits in all customer deposits (%)	BEPS
Internal ratings	2001, 2004	Internal ratings are used for credit risk assessment (yes=1, no=0)	BEPS
<i>Country-level data (# countries = 20)</i>			
Interest rate differential	2001-2004	Domestic Tbill or money market rate minus Eurepo rate (in % p.a.)	IMF-IFS
Peg	2001-2004	Domestic currency is pegged to the USD or Euro.	IMF-AREAR
Exchange rate volatility	2001-2004	Variance of monthly changes in the real exchange rate versus the Euro	IMF-IFS
Inflation volatility	2001-2004	Variance of monthly changes in the consumer price index	IMF-IFS

In addition to these ownership variables, we yield several other bank-level variables from BEPS and BankScope. *Assets* measures total bank assets in log USD and is taken from BankScope. It can be seen as an indicator of both client-structure and bank-funding. On the one hand, larger banks are more likely to serve large firms, which may have a higher demand for FX debt. On the other hand, larger banks may have better access to cross-border wholesale funding. Second, we use BEPS to create additional indicators of the customer structure of each bank. *Loan size* (measured in log US Dollars) captures the average loan size to corporate clients, while *mortgage loans* is the share of loans to households to finance housing.

We also employ two indicators of the funding structure of a bank. *Wholesale funding* is taken from BankScope and captures non-customer liabilities as a share of total liabilities. Given that local currency interbank and debt markets are relatively underdeveloped in much of the transition region, we assume that the majority of non-customer liabilities of banks are denominated in foreign currency. Our second indicator of bank funding, *FX deposits*, is taken from BEPS and captures the share of customer deposits which are FX denominated.

Finally, we use BEPS to create the dummy variable *internal ratings*, which indicates whether a bank used an internal ratings based approach for the measurement of credit risk in 2001 and/or 2004. We employ this variable as an indicator of how sophisticated each bank is in its operations.

In our empirical analysis we alternatively employ country fixed effects and country-level explanatory variables to account for cross-country variation in macroeconomic conditions. Our country-level explanatory variables are taken from the EBRD *Transition report 2010: Recovery and reform*, the IMF International Financial Statistics, and the IMF Annual Report on Exchange Arrangements and Exchange Restrictions. *Interest rate differential* is the difference between reference interest rates on the domestic currency and the euro. *Peg* is a dummy variable that indicates whether the local currency is pegged to either the euro or the US dollar. *Exchange rate volatility* captures the variation of month-on-month changes in the real exchange rate of the domestic currency to the euro. *Inflation volatility* captures the variation of month-on-month changes in the consumer price index.

3.3 Descriptive statistics

Table 3 provides descriptive statistics for all our variables. Panel A reports summary statistics for the full sample as well as means by bank-ownership, while Panel B shows summary statistics for our country-level variables. Table A1 in the Annex provides a matrix of pairwise correlations. Table 3 shows that in 2004, 44 per cent of all corporate lending and 38 per cent of all household lending by the banks in our sample was denominated in FX. Differences in the share of FX lending are substantial across banks, with some banks displaying no FX loans while other banks have their entire loan portfolio in FX. Between 2001 and 2004 there was an average increase of 3 and 10 percentage points, respectively, in the proportion of corporate and household loans denominated in FX.

The table confirms that foreign banks lend more in FX. However, there is a marked difference in lending to firms and households. For corporate clients we see that in 2004 both greenfield and takeover foreign banks display a higher share of FX lending than domestic banks. Interestingly, FX lending by takeover banks converges to that of greenfield banks between 2001 and 2004, while FX lending by domestic banks to firms did not increase. For household loans we find that the share of FX lending increased strongly for all ownership

types. In contrast to corporate lending, we also find that in 2004 the share of household loans in FX is similar for foreign takeover banks and domestic banks and that both bank types display a lower level of FX loans than foreign greenfield banks.⁶

Table 3: Descriptive statistics

This table provides summary statistics for the 2004 values and 2004-2001 differences of our bank-level and country-level variables. Table 2 provides variable definitions and sources.

Panel A. Bank-level variables

This panel provides summary statistics for the full sample as well as conditional means for sub-samples by bank ownership.

Variable name	Obs	Full sample summary statistics				Means by bank-ownership		
		Mean	Std. Dev.	Min	Max	Greenfield	Takeover	Domestic
<i>Bank-level variables: 2004</i>								
FX loans corporates	179	44.0	28.9	0	100	51.3	50.4	37.6
FX loans households	174	38.0	36.1	0	100	45.7	36.1	35.5
Assets	187	20.0	1.6	16.1	24.1	20.1	20.7	19.7
Loan size	166	13.4	3.7	6.6	29.3	14.2	13.9	12.7
Mortgage loans	163	32.5	28.6	0	100	44.6	45.6	19.4
Wholesale funding	187	31.9	22.2	1	99	44.0	28.6	27.8
FX deposits	176	41.7	23.6	0	99	43.0	37.2	43.4
Internal ratings	178	0.80	0.40	0	1	0.80	0.84	0.78
<i>Bank-level variables: 2004-2001 differences</i>								
FX loans corporates	166	2.5	20.4	-54	98	0.7	10.0	-0.1
FX loans households	158	9.8	32.4	-95	100	11.5	9.6	9.2
Assets	155	1.0	0.5	-0.7	2.9	1.1	1.0	1.0
Loan size	138	0.6	0.9	-2.0	5.8	0.4	0.7	0.7
Mortgage loans	137	7.2	23.7	-99	75	12.9	4.4	6.0
Wholesale funding	155	3.0	15.3	-42	50	4.5	5.4	0.9
FX deposits	167	-4.1	16.0	-52	62	-3.4	-2.1	-5.5

Panel B. Country-level variables

Variable name	Obs	Mean	Std. Dev.	Min	Max
<i>Country-level variables: 2001-2004 averages</i>					
Interest differential	20	6.9	9.2	0.4	37.4
Peg	20	0.5	0.5	0.0	1.0
Exchange rate volatility	20	6.5	4.2	0.7	16.5
Inflation volatility	20	0.7	0.6	0.1	2.2
<i>Country-level variables: 2004-2001 differences</i>					
Interest differential	20	-4.5	9.6	-38.3	3.8
Peg	19	0.1	0.2	0.0	1.0
Exchange rate volatility	18	0.9	3.9	-5.6	10.5
Inflation volatility	19	-0.5	1.6	-7	1

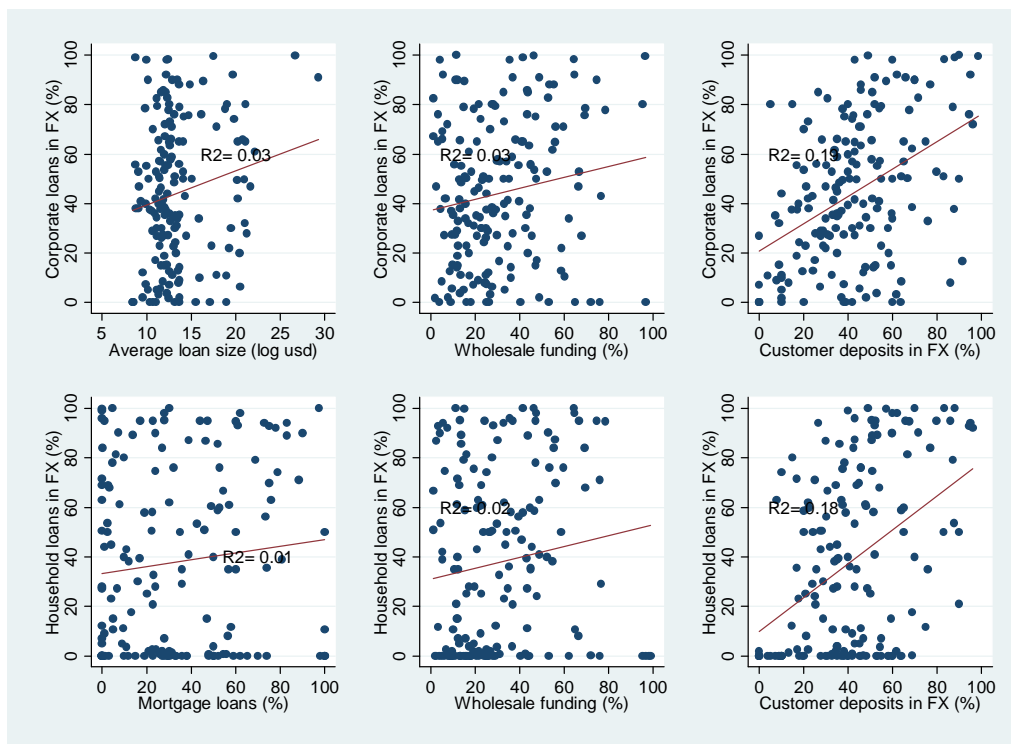
Banks' total asset size and their average loan size to corporate borrowers are very similar across bank ownership types. Interestingly, compared to domestic banks, foreign banks allocate more than twice as much of their household loan portfolio to real estate loans (see also De Haas et al., 2010). In terms of funding structure, on average about 40 per cent of all bank deposits are denominated in FX. This holds for all bank types, indicating that the "euroisation" of deposits is mostly driven by the macroeconomic environment. Greenfield foreign banks rely much more on wholesale funding compared to foreign takeover banks or

⁶ Degryse et al. (2009), using a dataset on Polish banks, also find that in particular greenfield foreign banks provide more FX loans than domestic banks.

domestic banks. Lastly, about 80 per cent of all banks used an internal ratings based approach to assess credit risk in 2004.

Chart 2: FX lending, loan type and bank funding in 2004

This figure plots for 2004 *FX loans corporates* against *Loan size*, *Wholesale funding* and *FX deposits*. It further plots *FX loans households* against *Mortgage loans*, *Wholesale funding* and *FX deposits*. Source: BEPS.



Are the differences in FX lending in Table 3 due to bank ownership alone, or are they related to variation in the client and funding structure of banks? The scatter plots in Chart 2 provide some first insights into this issue. The chart shows no apparent relationship between average loan size and lending to corporates in FX, or between a bank's focus on mortgage lending and its FX lending to households. It seems that banks are lending in FX to small, medium-sized and large firms alike, and provide households with both FX consumer and mortgage debt. The chart further shows no apparent bivariate relationship between the proportion of wholesale funding and FX lending. By contrast, the last set of plots suggests that banks with a large share of FX denominated customer deposits lend more in FX. In line with this, Table A1 in the Annex shows that whereas the pair-wise correlation between wholesale funding and corporate and household FX lending is only 0.16 ($p = 0.04$) and 0.13 ($p = 0.09$), respectively, the correlations between the proportion of FX deposits and both types of FX lending are 0.44 ($p = 0.00$) and 0.43 ($p = 0.00$). This is in line with the earlier mentioned findings by Brown et al. (2010) on the importance of FX deposits for FX lending. The next section looks into these relationships in more detail.

4. Multivariate results

4.1 Cross-sectional variation in FX lending

Table 4 provides a cross-sectional analysis of banks' FX lending to corporate clients (Panel A) and households (Panel B) in 2004. In line with the hypotheses developed in Section 2, we analyse the impact of both bank-level characteristics – ownership, client and funding structure – and macroeconomic determinants. The first column in each panel displays a parsimonious OLS (ordinary least squares) specification in which the proportion of FX lending is explained by bank ownership. We then add bank-specific indicators of client and funding structure (Columns 2-3), macroeconomic variables (Columns 4-5), and interaction terms between ownership dummies and the macro-variables (Column 6). All regressions include country fixed effects, except those in Columns (4-5) where we analyse the impact of (country-level) macroeconomic uncertainty.⁷

In both panels, Column (3) replicates Column (2) while instrumenting for *wholesale funding* with *internal rating*. We instrument *wholesale funding* to mitigate endogeneity concerns, since the proportion of FX lending may impact a bank's wholesale funding strategy. In contrast, we expect that our other funding measure, the proportion of deposits in FX, is exogenous and mainly driven by the external, macroeconomic environment. The variable *internal ratings* indicates whether the bank used an internal ratings based approach in 2004. Banks that use such an approach risk tend to be relatively sophisticated and may be in a better position to attract wholesale funding. In line with this conjecture, Table A1 shows that *internal rating* is quite strongly correlated with *wholesale funding* but not with actual FX lending, making it a potentially strong instrument.

Table 4 displays three key findings: First, foreign ownership tends to be associated with more FX lending to firms but not to households. Column (1) in Panel A shows that when we ignore other determinants, greenfield foreign banks lend 17 percentage points more in FX than domestic banks. In sharp contrast, Panel B shows that bank ownership does not impact FX lending to households. Why do foreign banks lend more in FX to firms but not to households? One reason may be that households are a relatively homogenous borrower group whereas firms are more diverse. Foreign banks may serve a different set of corporate clients which have a higher demand for FX loans, for instance because they are larger and better diversified or because they have FX revenues that need to be hedged. Although Panel A shows that a bank's client structure in terms of loan size is unrelated to the share of corporate loans in FX, foreign banks' higher corporate FX lending may still be explained by omitted client variables, such as revenue structure, loan maturity and ability to provide collateral.

Our second main finding is that the currency composition of deposits is a strong and robust determinant of FX lending, both to firms and to retail clients. A 10 per cent higher proportion of deposits that is denominated in FX is associated with a 5 to 6 per cent higher proportion of FX lending. This result is not driven by between-country variation in FX deposits – we include country fixed effects – but rather by variation within countries in the amount of FX deposits that a particular bank receives. The strong impact of FX denominated customer deposits confirms recent findings by Brown et al. (2010) as well as Luca and Petrova (2008).

⁷ Since some banks provide no FX loans at all, we also ran models where we first estimate a probit regression and then a conditional OLS. This yields similar results to the unconditional OLS results reported in Table 4.

In line with this research, as well as with the graphical evidence in Chart 2, we also find no impact of a bank's wholesale funding on its proportion of FX lending.⁸

Table 4: FX lending in 2004

Panel A. Lending to corporations

In this panel the dependent variable is *FX loans corporates* in 2004. Models (1-2, 4-6) report OLS estimates. Model (3) reports IV estimates in which *wholesale funding* in 2004 is instrumented with the variable *internal ratings*. Models (1-3, 6) include country fixed effects. Standard errors are reported in brackets. In models (1-2, 4-6) standard errors are adjusted for clustering by country. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. Table 2 provides definitions and sources of all variables.

Dependent variable	<i>FX loans corporates</i>						
	Model	(1)	(2)	(3)	(4)	(5)	(6)
Foreign greenfield	16.96**	4.451	5.696	14.350	35.46**	53.17*	
	[7.805]	[9.518]	[12.84]	[9.526]	[17.74]	[27.95]	
Foreign takeover	7.675	5.404	4.855	9.776*	27.10*	46.45**	
	[6.907]	[8.943]	[6.394]	[5.760]	[14.29]	[19.45]	
Assets		1.607	1.725	2.867**	4.437***	2.887	
		[2.423]	[1.617]	[1.409]	[1.638]	[1.792]	
Loan size		-0.341	-0.418	0.067	-0.379	-1.059	
		[0.752]	[0.705]	[0.766]	[0.848]	[0.843]	
Wholesale funding		0.366*	0.272	-0.029	-0.278	-0.204	
		[0.178]	[0.508]	[0.444]	[0.533]	[0.713]	
FX deposits		0.409***	0.427***	0.486***	0.480***	0.515***	
		[0.141]	[0.111]	[0.102]	[0.109]	[0.138]	
Interest rate differential				0.414	0.327		
				[0.391]	[0.599]		
Peg				11.14*	6.983		
				[5.888]	[10.44]		
Exchange rate volatility				-1.492***	-0.093		
				[0.546]	[0.777]		
Inflation volatility				5.344	2.129		
				[8.495]	[11.40]		
Foreign *							
<i>Interest rate differential</i>					0.349	0.210	
					[0.582]	[0.600]	
<i>Peg</i>					2.204	-9.511	
					[11.84]	[11.90]	
<i>Exchange rate volatility</i>					-3.518**	-4.377**	
					[1.478]	[2.034]	
<i>Inflation volatility</i>					0.308	-10.960	
					[7.987]	[8.735]	
Method	OLS	OLS	IV	OLS	OLS	OLS	
Country fixed effects	yes	yes	yes	no	no	yes	
R ²	0.45	0.56	0.55	0.38	0.35	0.51	
# Banks	152	152	146	146	146	146	
# countries	20	20	20	20	20	20	

⁸ The marginally significant effect we find in Column (2) disappears once we instrument *wholesale funding* (this effect is indeed due to the instrumentation not due to the slight loss of observations).

Panel B. Lending to households

In this panel the dependent variable is *FX loans households* in 2004. Models (1-2, 4-6) report OLS estimates. Model (3) reports IV estimates in which *wholesale funding* in 2004 is instrumented with the variable *internal ratings*. Models (1-3, 6) include country fixed effects. Standard errors are reported in brackets. In models (1-2, 4-6) standard errors are adjusted for clustering by country. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. Table 2 provides the definitions and sources of all variables.

Dependent variable	<i>FX loans households</i>						
	Model	(1)	(2)	(3)	(4)	(5)	(6)
Foreign greenfield		16.270	0.853	13.100	12.260	-13.570	-24.800
		[10.10]	[11.88]	[27.34]	[16.92]	[33.22]	[61.43]
Foreign takeover		12.550	7.507	12.300	11.100	-11.280	-20.880
		[9.057]	[8.179]	[11.83]	[8.985]	[23.88]	[41.85]
Assets			1.521	0.723	1.673	1.396	0.877
			[1.795]	[1.922]	[1.767]	[1.789]	[1.914]
Mortgage loans			0.216	0.195	0.226*	0.259*	0.245
			[0.159]	[0.125]	[0.127]	[0.135]	[0.155]
Wholesale funding			0.172	-0.272	-0.140	0.063	0.051
			[0.118]	[0.841]	[0.644]	[0.756]	[1.132]
FX deposits			0.603***	0.529***	0.620***	0.591***	0.454***
			[0.187]	[0.156]	[0.123]	[0.120]	[0.134]
Interest rate differential					0.718**	0.760	
					[0.345]	[0.581]	
Peg					-4.033	-0.363	
					[6.211]	[10.17]	
Exchange rate volatility					-3.451***	-4.017***	
					[0.875]	[0.932]	
Inflation volatility					-5.759	-10.010	
					[8.469]	[9.450]	
Foreign *							
<i>Interest rate differential</i>						0.177	-0.208
						[0.713]	[0.709]
<i>Peg</i>						-2.897	5.167
						[12.75]	[12.20]
<i>Exchange rate volatility</i>						1.910	2.281
						[1.945]	[3.003]
<i>Inflation volatility</i>						12.580	19.240
						[11.10]	[12.12]
Method	OLS	OLS	IV	OLS	OLS	OLS	OLS
Country fixed effects	yes	yes	yes	no	no	yes	yes
R ²	0.50	0.60	0.55	0.38	0.43	0.61	0.61
# Banks	147	147	141	141	141	141	141
# countries	20	20	20	20	20	20	20

Our third finding is that macroeconomic stability affects FX lending by banks, and particularly foreign banks. In Columns (5-6) of Panel A and B we examine explicitly whether corporate FX lending by foreign banks is more sensitive to the macroeconomic environment. To do this we interact our macroeconomic indicators with the dummy variable *foreign*, which is 1 for greenfield and takeover foreign banks. This shows that only corporate FX lending by foreign banks is sensitive to real exchange rate volatility. Lower exchange rate volatility

induces foreign banks but not domestic banks to lend more in FX to corporate clients.⁹ A one percentage point increase in the exchange rate volatility reduces the difference between foreign and domestic banks' proportion of corporate FX lending by 4.4 percentage points. In contrast, Panel B shows that the negative impact of exchange rate volatility on household lending in FX was the same for foreign and domestic banks.

Why are foreign banks (or their corporate clients) more sensitive to macroeconomic uncertainty? Foreign banks may be more reluctant to lend in domestic currency because they mistrust domestic macroeconomic policy. Corporate clients may be more affected by such reluctance than households, as they are more likely to take unsecured loans than households. When we include indicators of macroeconomic (in)stability into our regression framework – *interest rate differential*, *peg*, *exchange rate volatility* and *inflation volatility* – the statistical and economic significance of the ownership dummies increases. Whereas foreign banks provided on average 17 percentage points more of their corporate loan portfolio in FX, this difference between foreign and domestic banks would have been considerably higher in case real exchange rates had been less volatile. The results in Table 4 thus suggest that in a stable macroeconomic environment, foreign banks would lend more in FX to corporate clients but not to households. Again, this may be driven by the different corporate client structure of foreign banks as compared to domestic banks.

Overall, our cross-sectional results suggest a key role for the macroeconomic environment as a driver of FX lending. First, we find that banks in countries with lower real exchange rate volatility lend more in FX. Second, within countries, we find that FX lending by both foreign and domestic banks is strongly related to the currency composition of their customer deposits but not to their levels of wholesale funding. As shown by De Nicolo et al. (2005) the macroeconomic environment is a key driver of deposit dollarisation. Third, we find that the currency composition of foreign banks' corporate lending is more sensitive to changes in the macroeconomic environment than in the case of domestic banks.

Lastly, our cross-sectional results show no differences between foreign and domestic banks as to the determinants of their FX lending to households: both lend more in FX when real exchange rate volatility is lower and when inflows of FX deposits are higher. These results are remarkable as they run counter to the view that foreign banks, using cheap funding from abroad, have been 'pushing' FX loans into the hands of unsuspecting retail borrowers.

4.2 Foreign ownership and changes in banks' FX lending over time

It is difficult to establish a *causal* relationship between bank-ownership, bank funding or monetary conditions and FX lending from our cross-sectional results alone. First, the observed impact of customer funding may be driven by omitted bank-level characteristics, for example, customers with income in FX, which affect both FX deposits and FX lending. Second, the observed impact of macroeconomic instability may be driven by unobserved country characteristics, for example, institutional weaknesses which may be correlated with both weak macro policies and the absence of (exporting) firms which demand FX loans. Third, the observed relation between foreign bank ownership and FX lending to corporate clients may be due to reverse causality: Foreign greenfield banks may be more likely to enter countries where there are more clients with a potential demand for financial services in

⁹ We do not distinguish between greenfield and takeover foreign banks here because unreported regression results show no significant differences in the interaction effects between these two types of foreign banks.

foreign currency, that is, countries with more export-oriented firms or a real estate market that is denominated in euro. Foreign institutions may also be more likely to take over domestic banks that already have a clientele that use financial services in foreign currency.¹⁰ In this section, we try to mitigate concerns of omitted variables and reverse causality by looking at *changes* in banks' FX lending between 2001 and 2004, controlling for time-invariant bank- and country-characteristics.

In Table 5 we control for omitted bank-level and country-level variables by running first-difference regressions using a sub-sample of banks that did not change their ownership structure during 2000-04. The dependent variable is the *change* (in percentage points) in the proportion of FX loans to corporate clients (Panel A) or retail clients (Panel B). Likewise all independent variables –with the obvious exception of the *foreign held* dummy– are expressed in changes as well. The structure of the specifications is similar to that in Table 4.

Two results stand out. First, over 2001-04, foreign bank ownership does not impact the *change* in FX lending to firms or households. Second, in line with our cross-sectional results, we find a key role for the macroeconomic environment in influencing the change in FX lending, in particular for foreign banks. Banks in countries that witnessed a decline in exchange rate volatility and in interest rate differentials, increased their proportion of FX lending more.

The result on exchange rate volatility is straightforward as a stable exchange rate implies less uncertainty about the real repayment burden of FX debt. However, the result on the change in the interest rate differential, in the case of corporate lending driven by foreign banks, is less intuitive. One may expect that if the interest rate differential between local currency and FX loans narrows, the relative demand for FX should decrease not increase. However, the finding is easier to understand in terms of supply considerations: banks, especially foreign banks, have expanded their FX lending in particular in economies that were moving towards EU accession and euro adoption. The associated macroeconomic and institutional stabilisation may, somewhat paradoxically, have increased the incentives for denominating debt in FX as the 'certainty' of a euro exit and the expectation of nominal exchange rate stability during the convergence trajectory made FX lending more attractive even when price differences came down at the same time.

¹⁰ For instance, foreign banks like ABN Amro, Bank Austria and Raiffeisen acknowledge the importance of serving foreign firms, in particular home-country clients, as part of their expansion strategy into emerging Europe (De Haas and Naaborg, 2006).

Table 5: Foreign ownership and changes in FX lending

In this panel we examine the sample of banks that were either domestically owned or foreign owned during the entire period 2000-2004 and which report data on FX lending for 2001 and 2004. The dependent variables are the percentage point changes in FX lending (2004 minus 2001). Panel A reports estimates for *FX loans corporates*, Panel B reports estimates for *FX loans households*. All models in both panels report OLS estimates. Models (1-2, 5) include country fixed effects. Standard errors are reported in brackets and are adjusted for clustering at the country level. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. Table 2 provides definitions and sources of all variables.

Panel A. Lending to corporations

Dependent variable	<i>FX loans corporates (2004 minus 2001)</i>					
	Model	(1)	(2)	(3)	(4)	(5)
Foreign held		5.065 [5.389]	10.350 [7.883]	6.816 [4.156]	0.324 [3.249]	-0.262 [4.394]
<i>Bank-level changes 2004-2001:</i>						
Assets			5.174 [4.366]			
Loan size			2.027 [3.329]			
Wholesale funding			-0.047 [0.145]			
FX deposits			-0.058 [0.194]			
<i>Country-level changes 2004-01:</i>						
Interest rate differential				-0.413*** [0.128]	-0.046 [0.237]	
Exchange rate volatility				-2.096*** [0.544]	-2.471*** [0.692]	
Inflation volatility				4.740 [3.422]	4.540 [6.848]	
<i>Foreign *</i>						
Interest rate differential					-1.152*** [0.327]	-1.125*** [0.344]
Exchange rate volatility					-0.314 [1.033]	-0.902 [1.438]
Inflation volatility					-1.154 [6.596]	-3.186 [11.53]
Method	OLS	OLS	OLS	OLS	OLS	OLS
Country fixed effects	yes	yes	no	no	yes	yes
R ²	0.23	0.43	0.17	0.26	0.38	0.38
# Banks	135	90	118	118	118	118
# countries	20	20	18	18	18	18

Panel B. Lending to households

Dependent variable	FX loans households (2004 minus 2001)					
	Model	(1)	(2)	(3)	(4)	(5)
Foreign held		2.596	-5.797	3.398	2.063	2.021
		[5.834]	[7.624]	[4.537]	[4.503]	[4.218]
<i>Bank-level changes 2004 -2001:</i>						
Assets		4.504				
		[10.05]				
Mortgage loans		0.296				
		[0.234]				
Wholesale funding		0.003				
		[0.146]				
FX deposits		0.423*				
		[0.215]				
<i>Country-level changes 2004-01:</i>						
Interest rate differential				-1.739***	-1.413***	
				[0.198]	[0.322]	
Exchange rate volatility				-0.888	-1.921**	
				[0.633]	[0.835]	
Inflation volatility				3.519	-5.075	
				[4.338]	[10.02]	
<i>Foreign *</i>						
Interest rate differential					-0.369	-0.598**
					[0.357]	[0.234]
Exchange rate volatility					1.539	0.768
					[0.949]	[0.476]
Inflation volatility					8.818	22.45***
					[9.890]	[6.826]
Method	OLS	OLS	OLS	OLS	OLS	OLS
Country fixed effects	yes	yes	no	no	yes	
R ²	0.39	0.61	0.31	0.32	0.42	
# Banks	126	81	111	111	111	
# countries	18	18	16	16	16	

4.3 Foreign acquisition and changes in banks' FX lending over time

In Table 6 we control for reverse causality in the observed relationship between foreign bank ownership and FX lending (to firms) by analysing whether the currency composition of bank lending changes when a domestic bank is taken over by a foreign strategic investor. We now restrict our sample to all banks that were domestically owned before 2000. As in Table 5, the dependent variable is the percentage point change in FX lending to firms (Panel A) or households (Panel B). To measure the impact of foreign acquisition we compare banks that remained domestically owned over 2001-04 to those that were taken over by a foreign bank in either 2000, 2001 or 2002. The latter are captured by the dummy *foreign acquired*.¹¹

¹¹ Our definition of *foreign acquired* implies that after a takeover in 2000, 2001, or 2002 there are four, three, and two years, respectively, during which the integration into a multinational group may have influenced the FX lending of these banks. This should be enough time to pick up an effect of foreign ownership as the parent bank may in principle start providing its new subsidiary with intrabank funding as soon as the takeover is finalised.

Table 6: Foreign acquisition and changes in FX lending

In this panel we compare the change in FX lending (2004 minus 2001) by domestic banks which were acquired in 2000, 2001 or 2002 to the change in FX lending by domestic banks that were not acquired. The dependent variables are percentage point changes in FX lending (2004 minus 2001). Panel A reports estimates for *FX loans corporates*, Panel B reports estimates for *FX loans households*. All models in both panels report OLS estimates. Models (1-2, 5) and include country fixed effects. Standard errors are reported in brackets and are adjusted for clustering at the country level. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. The definitions of all variables are provided in Table 2.

Panel A. Lending to corporations

Dependent variable	<i>FX loans corporates (2004 minus 2001)</i>					
	Model	(1)	(2)	(3)	(4)	(5)
Foreign acquired		-4.859	-8.495	-2.164	-3.942	-4.231
		[4.759]	[8.636]	[4.719]	[4.406]	[4.064]
<i>Bank-level changes 2004-01:</i>						
Assets			2.689			
			[4.612]			
Loan size			2.069			
			[3.410]			
Wholesale funding			0.314			
			[0.263]			
FX deposits			-0.116			
			[0.311]			
<i>Country-level changes 2004-01:</i>						
Interest rate differential				-0.601**	-0.579*	
				[0.210]	[0.282]	
Exchange rate volatility				-1.995***	-2.548***	
				[0.586]	[0.773]	
Inflation volatility				11.59*	12.540	
				[6.578]	[9.074]	
<i>Foreign acquired *</i>						
Interest rate differential					-0.226	0.103
					[0.712]	[1.117]
Exchange rate volatility					1.122	0.943
					[1.416]	[2.248]
Inflation volatility					-4.548	-4.334
					[10.37]	[19.85]
Constant				3.330	4.305	
				[2.728]	[3.045]	
Method	OLS	OLS	OLS	OLS	OLS	OLS
Country fixed effects	yes	yes	no	no	yes	
R ²	0.21	0.39	0.15	0.16	0.26	
# Banks	117	73	103	103	103	
# countries	18	18	16	16	16	

Table 6: Foreign acquisition and changes in FX lending**Panel B. Lending to households**

Dependent variable	FX loans households (2004 minus 2001)					
	Model	(1)	(2)	(3)	(4)	(5)
Foreign acquired	2.229	-1.657	1.110	2.090	3.499	
	[5.005]	[10.62]	[5.524]	[6.473]	[7.232]	
<i>Bank-level changes 2004-01:</i>						
Assets		-1.079				
		[7.614]				
Mortgage loans		-0.064				
		[0.120]				
Wholesale funding		0.006				
		[0.164]				
FX deposits		0.098				
		[0.242]				
<i>Country-level changes 2004-01:</i>						
Interest rate differential			-1.680***	-1.652***		
			[0.322]	[0.326]		
Exchange rate volatility			-0.899	-1.521**		
			[0.623]	[0.692]		
Inflation volatility			0.186	-1.637		
			[7.102]	[9.208]		
<i>Foreign acquired *</i>						
Interest rate differential				1.288*	0.760	
				[0.713]	[0.665]	
Exchange rate volatility				2.768**	1.638**	
				[0.985]	[0.690]	
Inflation volatility				6.492	5.418	
				[15.58]	[13.88]	
Constant			-1.384	-1.097		
			[3.032]	[2.763]		
Method	OLS	OLS	OLS	OLS	OLS	
Country fixed effects	yes	yes	no	no	yes	
R ²	0.42	0.66	0.33	0.35	0.45	
# Banks	115	71	102	102	102	
# countries	18	18	16	16	16	

The results in Table 6 do not indicate an effect of foreign acquisition on the proportion of bank lending in FX. While it may be possible that new subsidiaries get more access to FX denominated parent bank funding, or that after a takeover by a foreign bank a bank starts to lend more to similar (foreign) companies as the parent bank does (Peek and Rosengren, 1998) this does not seem to have a large or immediate effect on the proportion of FX lending to either corporate or retail clients. We do confirm, however, our previous result that countries that experienced macroeconomic stabilisation over 2001-04, saw an increase in FX lending. Interestingly, in the case of household lending, this effect is partially (interest rate differential) or even completely (exchange rate volatility) absent for banks that were acquired by a foreign strategic investor during 2000-02.

A concern with our analysis in Panels A and B of Table 6 is selection bias. Foreign institutions choose to takeover particular domestic banks. If our regressions omit indicators which are relevant for the takeover decision, and these indicators (such as the share of exporting firms) are positively correlated with initial FX lending, then we may underestimate the impact of foreign acquisition on the subsequent change in FX lending.

Table 6: Foreign acquisition and changes in FX lending**Panel C. Controlling for endogenous acquisition - propensity score matching**

In this panel we compare the change in FX lending (2004 minus 2001) by domestic banks which were acquired in 2000, 2001 or 2002 to the change in FX lending by domestic banks that were not acquired. The propensity to be acquired is estimated as a function of the banks *asset volume* (Log) and *return on assets* (%) in 2000, its FX lending to corporates and households in 2001 as well as the following country level indicators (averaged for 1998-2000): *assets of foreign banks* (% of total bank assets), *foreign direct investment* (% GDP), *fiscal balance* (% of GDP), *private credit volume* (% of GDP) and the *EBRD Index of Bank Reform*. All of these variables are taken from the EBRD Transition Report 2000. The table reports treatment effects based on unmatched comparisons as well as nearest neighbour matching and kernel matching.

		Acquired	Not Acquired	Difference	S.E.	T-stat
<i>FX loans corporates</i>	Unmatched	5.35	1.96	3.39	6.69	0.51
	Nearest neighbour matching	5.35	0.14	5.21	6.42	0.81
	Kernel matching	7.53	0.59	6.94	8.74	0.79
<i>FX loans households</i>	Unmatched	0.47	7.69	-7.22	8.19	-0.88
	Nearest neighbour matching	0.47	8.58	-8.11	8.27	-0.98
	Kernel matching	0.59	7.72	-7.13	12.25	-0.58

In Panel C we therefore report a propensity scoring exercise in which we attempt to mitigate potential selection bias by comparing banks that were taken over by a foreign bank with *similar* banks that were not taken over (Rosenbaum and Rubin, 1983).¹² In a first step we run a probit regression on the sub-sample of domestic banks in 2000 in which the dependent variable is *foreign acquired*. This probit regression yields a propensity score (the conditional probability of a bank being acquired given pre-acquisition characteristics) for each individual bank. As explanatory variables we include a number of bank-level and country-level factors that may impact the acquisition of a domestic bank by a foreign investor: the size, profitability, and the proportion of FX lending of the bank in 2001; as well as the 1998-2000 average of the percentage of foreign bank assets in total assets in the particular country; FDI as a percentage of GDP; the fiscal balance as a percentage of GDP; private credit volume as a percentage of GDP; and the EBRD Index of Banking Reform. We expect that acquiring banks are mainly interested in large banks, as they search for a minimum presence and scale in a country, profitable banks, and banks with an already high share of FX lending. We also expect that banks prefer to enter a country where the presence of other foreign banks is still limited (low competition), where FDI is high and the potential credit demand from foreign companies is therefore high as well (Grubel, 1977), which has a high fiscal deficit (so that the government may be more inclined to privatise state-owned banks), where lending levels are low, and where banking reforms are well advanced. The probit regression results (available upon request from the authors) show that the main determinants of acquisition probability are bank size (+), the credit-to-GDP ratio (-), and the level of banking sector reform (+). All signs are in line with prior expectations.

¹² See Havrylchyk and Jurzyk (2010) for a similar application to investigate the impact of foreign bank ownership on the performance and market power of acquired banks.

In a second step we match each ‘treated’ (acquired) bank to similar banks that were not acquired by a strategic investor. We either match an acquired bank to the closest propensity score (nearest neighbour match) or use Gaussian kernel matching.¹³ The results in Panel C confirm our findings in Panels A and B: compared to banks that remained in domestic ownership, acquired banks did not see a significantly different change in FX lending over the 2001-04 period.

4.4 Convergence of FX lending within countries and within multinational banks

Many countries covered by the BEPS experienced strong changes in the aggregate level of FX lending between 2001 and 2004. In Slovenia the aggregate share of FX lending increased from 17 to 42 per cent, while in Bulgaria it increased from 35 to 48 per cent. By contrast the aggregate share of FX loans in Serbia decreased from 78 to 29 per cent, while in Kazakhstan it decreased from 71 to 52 per cent. In this section we use our bank-level information on changes in FX lending between 2001 and 2004 to investigate how FX lending evolved in the transition economies during this period. In particular we examine whether FX lending converged over time among banks within the same country and among subsidiaries of the same multinational banking network. Panel A of Table 7 displays the results for within-country and Panel B for within-network convergence.

Panel A reports regressions on our sample of banks for which information on FX lending is available for 2001-04. We relate the change in FX lending over the 2001-04 period to the dummy variable *low FX 2001 in country* which is 1 if in 2001 a bank had a lower proportion of FX lending compared to the country average. In all models we control for cross-country variation in macroeconomic conditions with country fixed-effects. The results provide evidence for convergence of FX lending within countries. Banks with below-average levels of FX lending in 2001 were indeed the ones that increased the share of FX loans the fastest between 2001-04. A bank that had below-average FX lending in 2001 subsequently increased its proportion of FX lending to corporates and households by 10 and 12 per cent more, respectively, compared to banks in the same country that already provided high proportions of FX debt in 2001. In unreported regressions we also find that this convergence effect is asymmetric: banks with below-average FX lending increase their FX lending faster but banks with above-average FX lending do not decrease their FX lending towards the country mean.

In Panel B of Table 7 we examine whether there is also convergence of FX lending among the members of multinational bank networks. If there would be, even when we include country fixed effects, this would be in line with parent banks that steer the proportion of FX lending by their subsidiaries to a group-wide target level, independent of the funding of the subsidiary itself or the host-country macroeconomic environment.

For this exercise we analyze a subsample of banks which belong to a multinational banking group – such as UniCredit Group, Raiffeisen International, or Société Générale – and for which we have at least three subsidiaries from the group in our sample. In all models we relate bank-level changes in FX lending between 2001-04 to a dummy variable *low FX 2001 within network* which is 1 for those subsidiaries with a proportion of FX lending below the 2001 average for the group they belong to. As in Panel A we find positive coefficients for the

¹³ In the latter case the counterfactual outcome is calculated as a kernel-weighted average of the outcomes of all non-acquired banks where weights are inversely proportional to the distance between the propensity scores of acquired and non-acquired banks.

variable *low FX 2001*, however the estimates are neither precisely estimated nor robust. We therefore cannot conclude that during our observation period multinational banking groups used their internal capital markets to equalise the proportion of FX lending throughout their network. Finally, note that in line with Tables 4 and 5B, the increase in FX deposits is a strong determinant of increased FX lending to households.

Table 7: Convergence of FX lending

In Panel A we analyse data for banks which report data for 2001 and 2004. *Low FX 2001 in country* is a dummy variable which is 1 if the bank had a lower fraction of FX loans to corporates (households) in 2001 than the country mean. In Panel B we analyze data for banks that are subsidiaries of a multinational bank. *Low FX 2001 in network* is a dummy variable which is 1 if the bank had a lower fraction of FX loans to corporates (households) in 2001 compared to the mean of all subsidiaries of the multinational bank it belongs to. All models report OLS estimates. Standard errors are reported in brackets and are adjusted for clustering by country. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level. Table 2 provides the definitions and sources of all variables.

Dependent variable (2004 minus 2001)	Panel A. Within country convergence				Panel B. Within network convergence				
	Model	<i>FX loans corporates</i> (1)	<i>FX loans households</i> (2)	<i>FX loans corporates</i> (3)	<i>FX loans households</i> (4)	<i>FX loans corporates</i> (5)	<i>FX loans households</i> (6)	<i>FX loans corporates</i> (7)	<i>FX loans households</i> (8)
Low FX 2001 within country		12.78*** [3.097]	9.865** [4.331]	21.01*** [6.917]	12.23* [6.325]				
Low FX 2001 in network						24.05** [11.15]	14.250 [17.19]	18.440 [17.54]	21.580 [14.34]
<i>Bank-level changes 2004 -01:</i>									
Assets			3.960 [3.917]		2.172 [7.179]		53.430 [74.20]		12.160 [13.29]
Loan size			0.680 [2.488]				-8.913 [31.54]		
Mortgage loans					0.240 [0.163]				0.226 [0.242]
Wholesale funding			0.132 [0.120]		-0.004 [0.113]		0.217 [0.561]		1.049 [0.889]
FX deposits			-0.115 [0.162]		0.381* [0.182]		-0.570 [0.796]		0.741*** [0.0845]
Method		OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Country fixed effects		yes	yes	yes	yes	yes	yes	yes	yes
R ²		0.27	0.41	0.46	0.61	0.49	0.74	0.75	0.83
# Banks		166	106	158	102	46	27	44	31
# countries		20	20	20	20	18	14	18	14

5. Conclusions and policy implications

We use a unique dataset – containing detailed information on the loan and deposit structure of nearly 200 banks in 20 transition economies – to examine how FX lending is related to bank ownership, bank funding, and the macroeconomic environment. We focus on the role that foreign-owned banks have played in contributing to the widespread use of FX lending.

Our main result is that there is not much empirical evidence that foreign banks have contributed more to euroisation than domestic banks. Although foreign banks lend more to corporate clients in FX, we find no differences between domestic and foreign banks in their currency denomination of household lending – one of the main drivers of the rapid increase in FX lending. Over time, foreign banks did not expand their FX lending faster than domestic banks and the proportion of FX lending did not increase after a domestic bank was taken over by a foreign investor. We also find no robust evidence that FX lending is related to wholesale funding of banks, or that FX lending converged within multinational banking groups during our observation period.

These findings tell us that foreign banks did not indiscriminately ‘push’ FX loans through their subsidiary network in the transition region, but followed a more subtle approach where FX lending is targeted to (corporate) clients that can carry the associated risks and to countries in which FX lending is attractive from a macroeconomic perspective. Indeed, we find that FX lending by foreign banks is more sensitive to macroeconomic uncertainty than lending by domestic banks. In effect, macroeconomic uncertainty – in particular exchange rate volatility – turns out to be a strong determinant of FX lending by all banks. Indirectly the macroeconomic environment may matter as well, as FX denominated customer deposits strongly influence FX lending at the bank level. We also find that FX lending converges over time among banks within the same country.

Our results provide important insights to policy makers into the drivers of FX lending in eastern Europe. Our results show that FX customer deposits rather than wholesale funding have been a key driver of FX lending in the region. This suggests that credible macroeconomic policies which encourage customers to save in local currency may in many countries be more important than regulatory proposals to limit the wholesale funding of (foreign) banks. Indeed, countries like the Czech Republic and Poland demonstrate how adherence to credible macroeconomic policies can result in relatively low levels of FX lending even when a majority of the banking system is foreign owned. Similarly, various Latin American countries have successfully de-dollarised by moving to macroeconomic regimes that were more conducive to local currency funding, including flexible exchange rate regimes and inflation targeting (see Zettelmeyer et al., 2010).

In fact, in countries with weak monetary and fiscal institutions a strong regulatory response to reduce FX lending may even be counterproductive as lending in domestic currency is not a realistic alternative in the short term. In those cases, reducing FX lending through regulation may just lead to less bank lending. The current policies in Ukraine and Belarus, where new FX denominated mortgage loans (Ukraine) or all FX retail loans (Belarus) have been banned, may come at the cost of an even sharper decline in bank lending.

This is not to say that regulation can or should not play a role in reducing FX lending. Regulation may well be advisable if banks and their customers create unhedged FX debt whilst disregarding that growing currency mismatches may increase the probability of a systemic crisis. Such behaviour may become apparent when banks count on an explicit or implicit government commitment to maintain nominal exchange rate stability (see Ranciere

et al., 2010) such as in the run up to euro membership. Indeed, our empirical results indicate that FX lending increased the most in those countries where interest rate differentials declined rapidly. In such cases, regulators may for instance require banks to hold unremunerated reserve requirements on their FX funding or may introduce higher capital and/or provisioning requirements for FX loans. Poland has been successful in weighing against the tide of FX lending by introducing the so-called Recommendation S in 2006, which required banks to apply stricter credit underwriting standards and to disclose FX risks when providing FX mortgages. Measures like these may partially restore a level playing field between FX and local currency loans and force banks and their borrowers to take the externalities of their lending decisions into account.

References

- G. Allayannis, G. Brown and L. Klapper (2003), “Capital Structure and Financial Risk: Evidence from Foreign Debt Use in East Asia”, *Journal of Finance* 58, 2667–709.
- C. Arteta (2005), “Exchange Rate Regimes and Financial Dollarisation: Does Flexibility Reduce Bank Currency Mismatches?”, *Berkeley Electronic Journals in Macroeconomics, Topics in Macroeconomics* 5, no. 1: article 10.
- B. Bakker and A. Gulde (2010), “The Credit Boom in the EU New Member States: Bad Luck or Bad Policies?”, IMF Working Paper no. 130, International Monetary Fund, Washington D.C.
- A. Barajas and R.A. Morales (2003), “Dollarisation of Liabilities: Beyond the Usual Suspects”, IMF Working Paper no. 11, International Monetary Fund, Washington D.C.
- H. Basso, O. Calvo-Gonzalez and M. Jurgilas (2007), “Financial Dollarisation and the Role of Banks and Interest Rates”, ECB Working Paper no. 748, European Central Bank, Frankfurt.
- C. Beer, S. Ongena and M. Peter (2010), “Borrowing in Foreign Currency: Austrian Households as Carry Traders”, *Journal of Banking & Finance* 34, 2198–211.
- J. Benavente, C. Johnson and F. Morande (2003), “Debt Composition and Balance Sheet Effects of Exchange Rate Depreciations: A Firm-Level Analysis for Chile”, *Emerging Markets Review*, no. 4: 397–416.
- A. Berger and G. Udell (1998), “The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle”, *Journal of Banking & Finance* 22, 613–673.
- G. Brown (2001), “Managing Foreign Exchange Risk with Derivatives”, *Journal of Financial Economics* 60, 401–448.
- M. Brown, K. Kirschenmann and S. Ongena (2010), “Foreign Currency Loans: Demand or Supply Driven?”, CEPR Discussion Paper no. 7952, London.
- M. Brown, S. Ongena and P. Yesin (2009), “FX Borrowing by Small Firms”, CEPR Discussion Paper no. 7540, London.
- K. Cowan (2006), “Firm Level Determinants of Dollar Debt?”, Central Bank of Chile, Working Paper.
- H. Degryse, O. Havrylchyk, E. Jurzyk and S. Kozak (2009), “Foreign Bank Entry and Credit Allocation in Emerging Markets”, IMF Working Paper no. 270, International Monetary Fund, Washington D.C.
- R. De Haas, D. Ferreira and A. Taci (2010), “What Determines the Composition of Banks’ Loan Portfolios? Evidence from Transition Countries”, *Journal of Banking & Finance* 34, 388–98.

- R. De Haas and I. Naaborg (2006), “Foreign Banks in Transition Countries: To Whom do They Lend and How are They Financed?”, *Financial Markets, Institutions & Instruments* 15, 159–99.
- G. De Nicolo, P. Honohan and A. Ize (2005), “Dollarisation of Bank Deposits: Causes and Consequences”, *Journal of Banking & Finance* 29, 1697–1727.
- E. Detragiache, T. Tressel, and P. Gupta (2008), “Foreign Banks in Poor Countries: Theory and Evidence”, *Journal of Finance* 63, 2123–60.
- European Bank for Reconstruction and Development (2010), *Transition Report 2010: Recovery and reform*, London.
- European Central Bank (2010), *Financial Stability Review*, June, Frankfurt.
- K. Froot and R. Thaler (1990), “Anomalies: Foreign Exchange”, *Journal of Economic Perspectives* 4, 179–92.
- G. Gelos (2003), “FX Debt in Emerging Markets: Firm-Level Evidence from Mexico”, *Economics Letters* 78, 323–27.
- G. Goswami and M.M. Shrikhande (2001), “Economic Exposure and Debt Financing Choice”, *Journal of Multinational Financial Management* 11, 39–58.
- J. Graham and C. Harvey (2001), “The Theory and Practice of Corporate Finance: Evidence from the Field”, *Journal of Financial Economics* 60, 187–243.
- H. Grubel (1977), “A Theory of Multinational Banking”, *Banca Nazionale del Lavoro Quarterly Review* 123, 349–363.
- O. Havrylchyk and E. Jurzyk (2010), “Inherited or Earned? Performance of Foreign Banks in Central and Eastern Europe”, IMF Working Paper no. 04, International Monetary Fund, Washington D.C.
- P. Isard (2006), “Uncovered Interest Parity”, IMF Working Paper no. 96, International Monetary Fund, Washington D.C.
- A. Ize and E. Levy-Yeyati (2003), “Financial Dollarisation”, *Journal of International Economics* 59, 323–47.
- S. Kedia and A. Mozumdar (2003), “FX-Denominated Debt: An Empirical Examination”, *Journal of Business* 76, 521–46.
- M. Keloharju and M. Niskanen (2001), “Why Do Firms Raise FX Denominated Debt?”, *European Financial Management* 7, 481–96.
- A. Luca and I. Petrova (2008), “What drives Credit Dollarisation in Transition Economies?”, *Journal of Banking & Finance* 32, 858–69.
- L. Martinez and A. Werner (2002), “The Exchange Rate Regime and the Currency Composition of Corporate Debt: The Mexican Experience”, *Journal of Development Economics* 69, 315–34.
- S. Mian (1996), “Evidence on Corporate Hedging Policy”, *Journal of Financial and Quantitative Analysis* 31, 419–39.

- J. Peek and E. Rosengren (1998), “Bank Consolidation and Small Business Lending: It’s Not Just Size that Matters”, *Journal of Banking & Finance* 22, 799–819.
- R. Ranciere, A. Tornell and A. Vamvakidis (2010), “Currency Mismatch and Systemic Risk in Emerging Europe”, *Economic Policy* 64, October, 597–658.
- P. Rosenbaum and D. Rubin (1983), “The Central Role of the Propensity Score in Observational Studies for Causal Effects”, *Biometrika* 70, no. 1, 41–55.
- J. Zettelmeyer, P. Nagy and S. Jeffrey (2010), “Addressing Private Sector Currency Mismatches in Emerging Europe”, EBRD Working Paper no. 115, European Bank for Reconstruction and Development, London.

Annex

Table A1: Pairwise correlations

This table provides pairwise correlations for the 2004 values and 2004-01 differences of our bank-level and country-level variables. Table 2 provides variable definitions and sources.

Panel A. Bank-level variables: 2004

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
[1] FX loans corporates	1.00							
[2] FX loans households	0.60	1.00						
[3] Assets	0.03	0.01	1.00					
[4] Loan size	0.17	0.16	0.21	1.00				
[5] Mortgage loans	0.15	0.11	0.23	0.14	1.00			
[6] Wholesale funding	0.16	0.13	0.05	0.02	-0.04	1.00		
[7] FX deposits	0.44	0.43	-0.14	0.02	0.03	-0.11	1.00	
[8] Internal ratings	-0.08	-0.02	0.05	0.02	-0.10	0.24	-0.10	1.00

Panel B. Bank-level variables: 2004-2001 differences

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
[1] FX loans corporates	1.00						
[2] FX loans households	0.27	1.00					
[3] Assets	-0.02	0.11	1.00				
[4] Loan size	0.12	0.14	0.22	1.00			
[5] Mortgage loans	-0.15	0.01	-0.14	-0.13	1.00		
[6] Wholesale funding	0.07	0.06	0.20	0.09	-0.02	1.00	
[7] FX deposits	0.09	0.26	-0.03	0.10	0.15	-0.04	1.00

Panel C. Country-level variables: 2001-04 averages

	[1]	[2]	[3]	[4]	[5]	[6]
[1] FX loans corporates	1.00					
[2] FX loans households	0.82	1.00				
[3] Interest rate differential	0.37	0.41	1.00			
[4] Peg	0.33	0.06	0.16	1.00		
[5] Exchange rate volatility	-0.37	-0.58	-0.37	-0.07	1.00	
[6] Inflation volatility	0.34	0.31	0.39	-0.28	-0.10	1.00

Panel D. Country-level variables: 2004-01 differences

	[1]	[2]	[3]	[4]	[5]	[6]
[1] FX loans corporates	1.00					
[2] FX loans households	0.23	1.00				
[3] Interest rate differential	-0.15	-0.71	1.00			
[4] Peg	-0.06	0.28	-0.15	1.00		
[5] Exchange rate volatility	-0.60	0.03	-0.20	0.03	1.00	
[6] Inflation volatility	0.02	-0.44	0.09	-0.06	-0.04	1.00