What Drives a Local Currency Away from Banking Markets? Some Southeast Europe Insights

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Abstract The chapter explores determinants of currency substitution on a sample of countries of Southeast Europe that follow a variety of exchange rate regimes within different monetary frameworks. In the sampled countries, the level of currency substitution remained rather high despite years-long efforts to address the issue. Although the substituting currency (euro) does not undermine the substituted ones in their role of means of payment, it is the pervasive use of foreign currency as the store of value, or choice of currency for financial assets and liabilities, that becomes a persistent feature of all economies in question. Foreign currency loans continue to dominate local loan markets, and broader money aggregates to a large extent consist of foreign currency deposits (financial euroization). The presence of financial euroization makes interest rate channel of monetary transmission inefficient. Moreover, the pervasive level of financial euroization leaves an economy dangerously exposed to external shocks. This is why understanding roots and mechanisms of financial euroization becomes an increasingly important policy issue. We employed multiple panel regression models feed by the official annual data that cover the last decade. In this study, the choice of explanatory variables is firstly based on the so-called portfolio view which considers economic agents' choice between the classes of domestic and foreign assets driven by risk–return relationship. We have tested the significance of a set of variables pointed out by two international parity conditions, i.e., uncovered interest rate parity and purchasing power parity. The common variable for those international parity relations is exchange rate expectations, or future path of exchange rate. We also included different proxies for external fragility. Those proxies may shape public view of growth and stability prospects, and further on explain puzzling disparities of the international parity relationships, calculated based on current level of exchange rate. Designed that way, econometric models are able to trace wrong policy choices or unsustainable economic policy mix.

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1 Introduction

In the strict meaning of the word, currency substitution means substitution of local/domestic currency with foreign one(s) in its use as a means of payment (transaction purposes). There are other types of dollarization/euroization. The so-called real dollarization appears as indexation of wages, real estate, or durable products prices in foreign currency. At the end, more widely seen phenomenon is financial dollarization. It is the fact that in developing and transition economics agents hold on massive scale financial assets (financial contracts) denominated in foreign currencies since a local currency is considered an inferior store of value (Ize and Parrado 2002). We are naturally inclined to restrict our research focus solely on financial dollarization.

The chapter explores determinants of financial euroization on a sample of countries of Southeast Europe that follow a variety of exchange rate regimes within different monetary frameworks. In the sampled countries, the level of financial euroization remained rather high despite years-long efforts to address the issue. Although the substituting currency (euro) does not undermine the substituted ones in their role of means of payment, it is the pervasive use of a foreign currency as the store of value, or choice of currency for financial assets and liabilities, that becomes the persistent feature of all the economies examined. Foreign currency (FX) loans continue dominating local loan markets. During the period and across the countries, the share of FX loans has been varying in range from 37.6 to 84.1%. Moreover, bank financial liabilities consist of foreign currency deposits and foreign interbank borrowings (financial euroization) to a large extent. The share of FX liabilities has been varying in range from 32.1 to 81.8%. In both cases, the top numbers belong to Serbia. Note that in this study we used the term liability not in the sense that is more or less usual in currency substitution literature. Here, the notion of liability is used as it stems from banking industry side and henceforth means all financial sources of the banking industry.

The remaining part of this chapter is structured as follows. We begin in Sect. 2 with a review of theoretical literature on the roots and consequences of financial euroization, proceeding in Sect. 3 with empirical findings on the drivers of financial euroization. Section 4 describes data set and methodology. Section 5 proceeds with the discussion of results. Finally, Sect. 5.2 presents the conclusion.

2 Financial Euroization: Roots and Consequences

Financial euroization is a complex phenomenon so far enlightened from theories that come from different traditions. Early literature (e.g., Filosa 1995) explores money demand function in the ambience of multiple currencies. However, it is more suitable to explain roots and mechanism of narrowly defined currency substitution and has little to say about drivers of financial euroization. Nevertheless,

from this tradition we know that higher domestic inflation, as an opportunity cost of holding local currency money holdings, contributes to a lesser share of local currency, the same as higher foreign inflation does the opposite. Therefore, inflation differential may matter. If inflation differential per se does not explain exchange rate fluctuations, then real exchange rate may matter, too. Some studies of currency substitution although not clearly focused on comprehensive evaluation of drivers shed some light on the issue. For instance, Guidotti and Rodrigues (1992) explain hysteresis of currency substitution, or the so-called ratchet effect with network externalities and weaker currency effect. According to the former argument, people get used to keep their wealth in foreign currency; it is already widespread throughout an economy, so that even after a serious decline in inflation, high substitution will persist. The latter one is not conflicted with the former, since current fundamentals cannot fully change the public view of an economy strength (weak economy-strong currency inconsistency).

Three competing theories that theoretically explore causes of financial euroization are: portfolio optimization view, market imperfection/failure argumentation, and institutional view. The portfolio optimization view (Ize and Levy-Yeyati 2003) set up the level of substitution as a market equilibrium outcome driven by agents that optimize individual asset portfolio toward minimum variance. The model shifted attention from levels to the volatility of inflation and nominal exchange rate. If the inflation is more volatile (risk of local currency deposits), then exchange rate (risk of foreign currency deposits) depositors will run into foreign deposits and deposit euroization will be higher.

Market imperfection theory argumentation can be summarized in a few sentences. The very idea is that lending institutions are prone to engage in foreign currency intermediation because they take into calculus devaluation risk of soft (local) currency, but neglect the risk associated with transferring currency into default risk when they lend in hard (foreign) currencies. However, this behavior is not to be necessarily caused by myopia, since devaluation/depreciation would have immense and contemporaneous effect on losses while borrower default-driven losses are possible to avoid as long as borrower equity or collateral are safe, despite the losses taken by borrower, so that lenders should be rationally inclined to foreign currency lending. Broda and Levy-Yeyati (2003) propose a model where financial intermediaries choose the optimal currency composition of their liabilities with foreign liabilities being above the socially desirable level because of currency-blind safety net (e.g., deposit insurance). The results are model specific since the model assumes that only foreign lending brings default risk (in case of depreciation) that can be eventually transferred to deposit insurer (moral hazard). In this strand of literature, domestic banking system is the main "culprit" for the financial euroization, since the models allow banks to do imperfect currency hedging (or speculation), by leaving their books open. Cataõ and Terrones' (2000) banking market imperfection model stresses two imperfections: credit market segmentation and limited competition. The model assumes two market segments: the tradable borrowers (large corporations or natural hedgers) and non-tradable borrowers (small firms and households). There is relative market power of banks over

borrowers from different segments. Banks exert monopoly power over clients who can only borrow locally, so that interest margin (spread) for FX intermediation tends to be higher, which makes local currency loans more attractive. It is different than the case with firms that have direct access to foreign funds that can press for less costly foreign currency borrowing. This model defines the level of loan euroization as an outcome of divergent forces. The more likely and severe currency depreciation, the higher interest margin on foreign currency intermediation, and the availability of natural hedgers, the more attractive will foreign currency loans be for banks. On the other hand, domestic currency loans will be more attractive to banks if the banks have monopoly power over non-natural hedgers; the lower probability of depreciation (and its impact on loan default), the higher interest margin on domestic deposit to loan intermediation. Therefore, credit market structure, relative costs of intermediation, and macroeconomic shocks will matter.

Fresh argumentation comes from the institutional view theories which underline the role of credibility of macroeconomic policy and policymakers (De Nicoló et al. 2003). This strand of literature looks for macroeconomic drivers of euroization. In the world of paper currencies, "it is the good money that displaces the bad money," so that "monetary authorities need to improve the quality of their product." Namely, the level of euroization reveals the public view about future path of inflation, interest rates, and exchange rate. There may be a huge gap between current values of the fundamentals and the respective values foreseen by the public. This theory offers novel explanation for euroization hysteresis as being well-established empirical fact. A complementary approach is explanation that blames past macroeconomic mismanagement for contemporary dollarization (Barajas and Morales 2003). Moreover, though exchange rate policy is commonly seen as being held captive by deposit (or loan) euroization, the causal relationship may be exactly the opposite. Namely, if a central bank provides implicit exchange rate guarantee by intervening large-scale and with bias to restrain currency depreciation it will reveal its weak position and foster euroization.

Official dollarization (no separate legal tender) is sometimes suggested to rather small and open countries as a way to import stability from a better performing (anchoring) country. The very essence of this policy alternative is to "close exits" in order to discipline policymakers and ensure their commitment to the announced policy goals. It is a high-stake strategy to overcome a weak currency issue. To increase the credibility of exchange rate parity, policymakers raise exit costs, i.e., expose the economy to the risk of balance-of-payment crisis (De la Tore et al. 2003). Nevertheless, even the countries that rule out this policy option are frequently forced to admit that their own legal tender is squeezed out of monetary area. Economic science points out several drawbacks of unofficial financial dollarization. Losing control over monetary policy, more likely economic contraction or bank distress in case of sharp currency depreciation, and bank run, are among the most prominent examples.

There is almost a consensus among researchers (Reinhart et al. 2003 appears as an exception) that high level of financial euroization harms monetary authority ability to use the full set of instrumental portfolio for monetary management (Kraft

2003; Šošić and Kraft 2006; Levy-Yeyati 2006). For example, Aleksić et al. (2008) found that the effects of policy interest rate (2-weaks repo rate) vanished when the level of euroization exceeded a threshold of 64.5%. At the same time, exchange rate pass through on domestic prices grows stronger, which is the regularity that appears clear in international studies (Reinhart et al. 2003). Using bank-specific data, Kujundžić and Otašević (2012) support the abovementioned estimate, highlighting that the dynamics of local and foreign reference rates may explain only a local currency denominated fraction of banks credit activity while FX credit volume stays largely out of the influence. On the case of four biggest Central European countries, Brzoza-Brzezina et al. (2010) found a side effect of restrictive monetary policy, i.e., the increase of local policy rate on foreign currency denominated credit activity, which even accelerates with small overall effects on total lending.

High level of financial euroization is also a serious macro-prudential issue. Economies with higher levels of financial euroization are exposed to balance of payment and financial crisis in the presence of large exchange rate fluctuations. While financial intermediaries can easily hedge their books passing currency risk to their borrowers, this is not an available solution for borrowers that have a large part of their revenue stream in local currencies (absent natural hedge). If there is no available (derivatives) market for currency risk hedging instruments, there is nothing left that can help them to match their books (balance sheet exposure). Reinhart et al. (2003) stressed different implications of loan and deposit euroization on the economy fragility. If banks heavily lend in foreign currencies, sharp depreciation can bring severe economic contraction or bank distress (solvency type of bank disturbances) while deposit euroization makes a banking system faced with foreign liquidity drainage exposed to bank run.

Such economies are not only exposed to currency risk, but also they lose an effective instrument to cope with it. Since sharp depreciation may harm domestic economy, authorities do not resist the tendency to respond to high dollarization with a "fear of floating" (Calvo and Reinhart 2002). This policy does not help in the long run, but instead further amplifies fundamental disparities and dollarization.

3 Survey of Empirical Literature

There is vast empirical literature on determinants of financial dollarization. It was initially oriented to the developing Latin American countries that were straggling desperately for control of inflation (Guidotti and Rodriguez 1992; Sevastano 1996). Since former communist economies have launched and gone underway their transition to market economy, issue of euroization arose there. In this chapter, the prime focus is on (post) transition economies. The summary of the review of empirical literature is presented in Table 1, so we would restrict detailed discussion only to a few most recent multi-country studies.

Table 1 Summary of empirical literature survey

Study	Geographical/time coverage	Methodology	Core findings
Naceur et al. (2015)	Caucasus and Central Asia (2001–2014 quarterly)	Dynamic panel regression (FE, RE)	Volatile exchange rate, asymmetric exchange rate policy, and inflation drives DE
Pepić et al. (2015)	Southeast Europe (2003–2014, annual)	Panel regression (FE, RE)	Currency depreciation, DE, and interest differential drives CE
Manjani (2015)	Albania	Johansen cointegration approach and VEC	Interest rate differential, inflation, exchange rate, and credit euroization trigger DE
Rajković and Urošević (2014)	Central and Southeast Europe (2005–2013 monthly)	Panel cointegration and dynamic panel regression	Portfolio optimization matters in the long run, while interest rate spread, nominal exchange rate drive short-run euroization
Luca and Petrova (2008)	21 transition economies (1990–2003, annual)	Panel regression (FE, RE)	Financial depth, DE drives CE
Basso et al. (2007)	24 transition economies (2000–2006, monthly)	Panel regression (FE)	Interest rate differential and availability of foreign funds matter
Arteta (2005)	92 developing and transition economies (1990–2000, annual)	Pooled OLS regression	Flexible exchange rate regime increases DE and decreases CE
Barajas and Morales (2003)	14 Latin American and Caribbean economies (1980–2001, quarterly and annual data)	Panel regression (OLS and FE)	Official FX interventions boost DE, loan to deposit spread differential matters
Komárek and Melecký (2001)	Czech Republic (1994–2001, quarterly)	Johansen cointegration approach	Macroeconomic instability and illegal economy drive currency substitution

Notes: FE stands for fixed effects, RE for random effects, CE for credit euroization, DE for deposit euroization.

Despite a bulk of available empirical studies, just a few explored the drivers of both loan and deposit euroization. In a most recent study, Naceur et al. (2015) found frequent depreciation and high volatility of nominal exchange rates associated with a rise in FX deposits (but not FX loans). The authors also found dollarization persistent, financial depth (availability of currency risk sharing market mechanisms), low and stable inflation decreasing dollarization. Moreover, specific to the sampled countries (Table 1) asymmetric nature of exchange rate policy, i.e., official FX intervention that places more weight on supporting local currency (sales of pivot currency dominate in official FX trade) increases deposit dollarization.

Rajković and Urošević (2014) employ Minimum Variance Portfolio model on the sample of Central European countries (added Albania, Romania, and Serbia) and differ between short- and long-run determinants of deposit euroization. The authors found beneficial distinguishing between them since deviation from the international parity conditions based on relevant interbank rates (UIP) generates effects only in the short run, in the same way as nominal exchange rate movements do influence while inflation does not influence transitory component of euroization. The authors challenge the sustainability of generated effects based on manipulation of interest dis(parity) and advocate for a credible inflation targeting policy and more flexible exchange rate policy.

Previous estimates for sampled countries (Pepić et al. 2015) rule out importance of domestic inflation, current account balance, while FDI has been on the borderline of significance for loan euroization. Interest differential between local and the policy rate of European Central Bank is tested and proved significant, as well as nominal exchange rate and total bank liability euroization.

Since they are less relevant for our study, some single-country studies are compiled (Table 1) but not discussed in details.

4 Data and Methodology

This chapter analyzes the impact of a set of variables on the level of financial euroization. We examined how much these variables contributed to the high loan euroization in six countries of Southeast Europe: Albania, Bosnia and Herzegovina, Croatia, Macedonia FYR, Romania, and Serbia.

According to IMF classification, three out of six countries in this sample adopt floating regimes, i.e., allow market to determine their local currencies' exchange rate. Nevertheless, all three countries are not freely floaters. Some authors (Grubišić and Kamenković 2013) differ between those three regimes, marking Albania and Romania as loosely managed floaters while Serbia is assessed as a country that tightly manages its float. Croatia and Macedonia FRY adopt soft peg type of regime (with category differing between them) while Bosnia and Herzegovina adopt hard peg type. According to IMF, crawl-like arrangement assumes increased interventions in response to one-sided exchange rate pressure, or the unintentional outcome of foreign exchange reserve management in a shallow market. This description fits rather well the exchange rate management that Serbia followed during its exchange rate anchoring period, i.e., till mid 2006. Since Serbia shifted to inflation targeting (from mid 2006 onwards), the nature of official interventions changed. Stabilized arrangement may reflect the tendency of countries with such arrangements to manage their exchange rate in response to events in the external environment, including differences in inflation across countries, capital flow pressures, and new trend in world trade.

In the following, we will discuss rationale for the data set, as well as the expected sign of influence for each variable.

Uncovered interest parity (hereafter UIP) is a non-arbitrage supported condition that links the rates on two comparable assets denominated in different currencies. If UIP holds, interest rate differential should be explained by the expected change in nominal exchange rate and should not matter as a determinant of financial euroization. The deviations from uncovered interest parity (UIP) may take both positive or negative values, with negative numbers meaning that the interest differential grants positive return in excess of (not completely offset by) currency depreciation, for those who borrow in foreign currencies and lend in domestic (carry trade). It makes local currency assets more attractive for lenders, decreases loan euroization, and increases bank liability euroization. Thus, the relation between UIP deviations and loan euroization should be positive, and inverse one with total bank liability euroization. Another problem in using variables that incorporate exchange rate expectations (UIP) is an implicit assumption that market participants are perfect forecasters.

It is not clear how variables that indicate either a temporary disequilibrium or a fragile external liquidity/solvency position of a country may behave in terms of their influence on the level of euroization. For example, annual rate of change of real effective exchange rate (REER) takes positive values in the case of currency real appreciation while the values are negative in the case of real depreciation. We also experimented with cumulative REER index, but the change produced no difference in results. We believe that the influence of REER on the level of financial euroization is ambiguous because it goes through both direct and indirect channels. Directly, the real appreciation favors local currency as a choice of financial assets currency. Based on this channel, the sign of influence should be negative. Nevertheless, an appreciated local currency may damage trade balance. If the appreciation is taken as unsustainable in the long (or even short) run, public will expect depreciation to take place in future. The developments are very similar to the well-known peso problem. Therefore, the depreciation means that "dam is broken" while appreciation may mean that the pressure is accumulated to the level that "dam is just about to get cracked." Either depreciation or appreciation may indicate the same risk, possibility that local currency will move downside. This is exactly the rationale for ambiguous predicted effect of REER on the level of financial euroization.

Inflation differential (tested in Guidotti and Rodriguez 1992) is a common input both in REER and UIP formulae although more directly in former than latter one. This is why we expect to get more complete picture by testing the above more sophisticated measures. Despite that, we also included inflation differential itself. By way of construction, positive sign of estimate for inflation differential indicates that increasing the difference between local and foreign inflation would boost loan euroization, and consequently, decreasing of the difference will help reversing the euroization.

The variables like current account balance (tested in Barajas and Morales 2003) and foreign direct investment stream indicate a county competitiveness and attractiveness, respectively. Both indicators encapsulate foreign currency inflow/outflow

that come from the side of real economy. However, trade imbalance is a fragile position, with deficit indicating possible currency depreciation. We expect current account surplus to be negatively associated with both loan and bank liability euroization, so that increase of positive values of this explanatory variables should be associated with decrease of euroization. If current account deficit is financed to a large extent by FDI, the trade pressure on exchange rate will diminish. Thus, FDI to GDP ratio is expected to be negatively associated with euroization.

The same way we would discuss rationale for including three indicators that are here to point out external financial fragility. Higher external debt to GNI ratios should indicate problems with sustaining external solvency. However, it is country specific. There is no one-size-fits-all threshold able to indicate a critical point-of-no-return. The stock of external debt tells nothing about maturity structure of the debt. This is why we include debt service variable as a better proxy for external debt burden.

International reserves to external debt stock is a ratio that indicates foreign liquidity position. Seemingly, higher levels of the ratio tell us that an economy is more likely to handle successfully an adverse impact of foreign debt on currency value in the short run. Nevertheless, similar to liquidity of banking organizations, external liquidity is a concept that makes sense in the short run. What makes banks sound in the long run is not the ratio of liquid to total assets or liabilities, but the quality of assets. Banks will never have liquid reserves to the level that makes them able to cover all liabilities (fractional reserve banking). Furthermore, in economies that are already highly dollarized (from the bank liability side) the high share of international reserves comes from the required reserves applied on foreign currency savings and funds that banks borrow from abroad (Marinković 2009). This part of reserves moves up when FX liabilities move the same way, covering just a part of total FX liabilities. In the analysis, we use gross international reserves since data for net reserves are not readily available for all countries. The high level of international reserves may also indicate strong commitment of authorities to support the currency in the ambience of unbalanced flow of capital or trade deficits of chronic nature (fragile position). This is why we take the possible influence of reserves to external debt to be ambiguously aligned to the level of euroization.

The idea to include lagged value of dependent variables in the set of explanatory variables is not a novel one (see, e.g., Naceur et al. 2015). This intervention changed the panel regression model into dynamic panel. The economic rationale is the so-called inertia, hysteresis, or euroization persistence. It is a well-documented empirical fact that the level of euroization is persistent despite strong authorities' efforts to change fundamentals in favor of local currency. Therefore, we experimented with Arellano and Bond (1991) dynamic panel-data estimation and found lagged value of both FX/total loans and FX/total liabilities statistically significant in corresponding specifications.

In this study, we have omitted a range of institutional variables, or policy undertakings aimed to tackle financial euroization. The list is not exhaustive and

may include such measures like capital regulation (risk weights), loan classification and provisioning, liability-based required reserves, etc. If those measures or policies are designed the way that differ between currency classes of bank assets and liabilities, then they clearly have the potential to influence on the level of financial euroization (for a review of implemented measures, see Dimova et al. 2016).

The list of used variables is attached in the Appendix, along with definitions and data sources (Table 7). The data set is shown in diagrams of time series (Table 8) in the Appendix. We used data from official sources. The relatively short time series of annual data were used due to the problems with consistency of data. We examined the combined impact of nine independent variables on the degree of loan euroization for the period from 2003 to 2014. We analyzed the so-called panel data, as a combination of cross section data and time series. Panel data enable significant increase in the sample, greater variability, and higher efficiency of evaluation. For baseline panel regressions (Tables 2 and 3), as well as for the disaggregated sample regressions (Table 4) we apply the random-effects Generalized Least Square (GLS) model, while fixed-effects estimations are available too,

Table 2 Benchmark models (RE–GLS): dependent variable FX/total loans

Regressor	Estimation without lag	Arellano-Bond dynamic estimation
FX/total loans (t−1)	–	0.336***
		(0.0956)
FX/total liabilities	0.308*** (0.0633)	0.238** (0.103)
Inflation differential	0.971** (0.469)	0.0865 (0.228)
External debt stock/GNI	0.246*** (0.0584)	0.113** (0.0516)
Reserves/external debt stock	0.522*** (0.120)	0.187** (0.0775)
Debt service/export	–0.0945*** (0.0362)	–0.242*** (0.0713)
Constant	13.57 (8.554)	20.55* (10.49)
Diagnostics		
Observations	64	54
R-squared (within group)	0.207	–
R-squared (between groups)	0.641	–
R-squared (overall)	0.489	–
Wald χ^2 (5)	138725	65.10
Sargan	–	65.06

Notes: Standard errors in parentheses: ***$p < 0.01$, ** $p < 0.05$, *$p < 0.1$

Table 3 Benchmark models (RE–GLS): dependent variable FX/total liabilities

Regressor	Estimation without lag	Arellano-Bond dynamic estimation
FX/total liabilities (t-1)	–	0.665***
		(0.0955)
REER	–0.268***	–0.286***
	(0.0953)	(0.0771)
Current account/GDP	–0.467***	–0.314***
	(0.130)	(0.116)
External debt stock/GNI	0.226***	0.0375
	(0.0811)	(0.0381)
Constant	40.77***	15.13***
	(6.568)	(5.813)
Diagnostics		
Observations	69	57
R-squared (within group)	0.176	–
R-squared (between groups)	0.771	–
R-squared (overall)	0.491	–
Wald χ^2 (5)	23.99	67.33
Sargan	–	49.75

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 4 Dependent variable FX/total loans—Random-effects GLS

Regressor	Floaters	Fixers
FX/total liabilities	0.282***	0.754***
	(0.0793)	(0.0752)
External debt stock/GNI	0.251	0.286***
	(0.244)	(0.0565)
Reserves/external debt stock	0.496***	0.212*
	(0.143)	(0.113)
Debt service/export	–0.248	–0.325***
	(0.196)	(0.0688)
Constant	21.63*	–3.814
	(11.27)	(9.151)
Diagnostics		
Observations	32	32
R-squared (within group)	0.187	0.465
R-squared (between groups)	0.999	0.998
R-squared (overall)	0.693	0.849

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 5 List of tested explanatory variables

Explanatory variables	Expected sign of influence	
	Loan euroization	Bank liability euroization
FX/total loans (t−1)	+	
FX/total liabilities	+	
FX/total liabilities (t−1)		+
UIP	+	–
REER	±	±
Inflation differential	+	+
Current account/GDP	–	–
FDI/GDP	–	–
External debt stock/GNI	+	+
Reserves/external debt stock	±	±
Debt service/export	+	+

Notes: (+) positive influence; (–) negative influence; (±) ambiguous influence.

but only for models that operate with full set of variables, whether significant or not (results are enclosed in the Appendix, Tables 5 and 2). States (countries) are used as a group variable, with all variables varying by group.

5 Results and Discussion

5.1 Drivers of Loan Euroization

In the table below (Table 2) are shown variables that are proven statistically significant as determinants of loan euroization. The model includes five out of nine tested variables. The results for the models extended to include all variables are enclosed in the appendix (Tables 9 and 10). Apart from three variables that indicated fragility of external position, two more variables appear significant.

It is quite obvious that banks match their books. It is a consequence of prudential regulation that limits bank net open position in foreign currencies. Therefore, the currency composition of liabilities may drive the currency composition of assets, or even vice versa.

In the first specification, inflation differential appears significant. Therefore, the countries that are better performing in terms of inflation may account on less euroized economy. Further on, if more rigid regime or exchange rate anchoring strategy may help in doing that, then the choice of exchange rate regime and monetary strategy may matter.

Three indicators of external fragility proved significant in both specifications, with reserves to external debt ratio negatively associated with loan euroization.

According to the above argumentation, it may mean that authorities by accumulating strong international reserves position actually send a signal to the market that they hold strong the last line of defense, but it also reveals that the first line is broken.

It is likely that dirty data dismissed UIP variable from the specifications. Namely, not all countries in the sample are issuing public debt instruments or offer any kind of risk free investments in local currencies, so we have in some cases to use policy rates instead. That's way, deviation from UIP time series are not that clean that a rigorous research would demand. For future research, we suggest using more clean data for nominal interest rate differential. The researchers would benefit if they had readily available data for loan to deposit interest rate spread in different currencies. If we assume that banks match currency composition of assets with that of liabilities, they will opt either for local currency or foreign currency intermediation, and thus, relative interest rate spread will matter.

5.2 Drivers of Bank Liability Euroization

In the majority of empirical studies, loan euroization is treated as determined by deposit euroization (e.g., De Nicoló et al. 2003) while there are also rare examples where the two variables are causally linked opposite way (Manjani 2015). Although, due to prudential regulation, bank total liability euroization stays closely linked with bank assets euroization (Table 2), there is a good reason to delve into examination of driver of bank total liability euroization itself. In some empirical studies, deposit euroization is found differently determined than asset euroization (e.g., Naceur et al. 2015). The empirical regularity has clear economic justification. "Investors" (depositors) whose decisions drive the level of deposit euroization belong to the less informed market participants, opposite to the key players on the loan market (banks). Those groups may behave differently.

Yet, our proxy for bank liability euroization does not correspond fully to the frequently studied deposit euroization. It comprises both foreign currency deposits and banks international borrowings. Those flows may have different drivers. Cross-border interbank loans may be driven the same way as loan euroization since in both cases banks are players that make decisions. Moreover, those two alternative financial sources may move divergently. For instance, a decrease of interest rates on international credit funds will consequently decrease FX deposit rates, and change the composition of bank liabilities in favor of international funds on the account of local FX deposits. Deposit euroization will decrease while loan euroization will probably stay the same.

Implicitly, we assume that depositors are free to choose between assets of different classes: foreign currency or local currency denominated. According to the portfolio view, savers will opt for one or another currency according to the

relative risk–return relationship, with return expressed in the same currency based on the holding period nominal exchange rate changes. Moreover, transaction costs (costs of conversion to another currency) may also matter.

The key differences in terms of drives of loan and bank liability euroization are as follows. REER appears significant for liability euroization while it is clearly ruled out of the set of significant variables for loan euroization. Here, the REER sign is negative, which means that the real currency depreciation boosts liability euroization, the same way as the real appreciation decreases the level of euroization. In the dynamics of REER, the movement of nominal exchange rate overpowers movements of relative inflation, with the latter component remaining less visible and hence less relevant for depositors' choice of currency. Although exchange rate dynamics and inflation rate have common determinants, and often go hand in hand in the long run, they are crucially different in terms of visibility. Inflation rate can be polished by official statistics and takes time to become obvious. The data on exchange rates are published daily and can be carefully monitored by anyone. This is probably why exchange rate plays a greater role in shaping the public view about financial stability than inflation reports.

The same as previous, current account balance plays the role in shaping liability euroization. Worsening of this external stability indicator generates no immediate cost to depositors. We know that trade deficit can be ignored for some time, since it has no immediate impact on exchange rates, as long as the deficit can be successfully financed, but it can have a snowball effect, which can be eventually triggered.

Finally, more sophisticated measures of external fragility proved insignificant for liability euroization. It is not surprising since more sophisticated measures are not readily available to general public. Opposite to that, data on external debt stock are frequently communicated to the public and may shape public opinion about policy sustainability.

5.3 Decomposing the Sample Based on Countries' Exchange Rate Regime/Policy

Thus far, we have looked at the sample of countries as homogenous. However, if it is not the case, the above baseline regression results are nothing more but an average, silent in terms of the role that the choice of exchange rate regime may have on euroization. Other stimuli to explore possible effects of the choice of exchange rate regime on loan euroization came from surveying the empirical literature. Ize and Levy-Yeyati (2005) suggest that more flexible exchange rate regimes combined with inflation targeting framework, if successful, provide nominal exchange rate that is more volatile than inflation, what contributes to less incentives to dollarize. Arteta (2005) also found flexible regimes positively

associated with deposit dollarization and to a smaller extent with credit dollarization.

It is rather trivial empirical regularity that countries that adapt more rigid exchange rate regimes, e.g., conventional peg, currency board, or soft peg regimes express lower nominal exchange volatility (if any). Volatility of nominal exchange rate is a variable of choice in many empirical studies (e.g., Yinusa 2007). At the same time, the "fixers" are expected to better perform in terms of inflation records, which may mean that economic agents have less incentive to dollarize. But if they fail to converge domestic inflation to foreign, "fixers" will be more sensitive to the risk of having over-valuated exchange rate in the long term.

Since we use yearly sampled (annual) data, it is not feasible to regress to exchange rate volatility indexes directly, so we have experimented with introducing a dummy variable (binary indicator) as a proxy for nominal exchange rate variability. If a country follows a rigid regime, it is marked with zero, otherwise 1. Unfortunately, the results were not stable, and we finally went into decomposing the total sample along two groups of countries. The sample is equally weighted with three countries going into each subsample according to IMF classification of de facto regimes based on 2014 report (Table 6). The procedure will not be ideal if during the period countries shift from one to another regime. However, each country position was more or less stable.

As expected, the groups differ in terms of significant explanatory variables. Different external fragility indicators matters for each group. For the group of "floaters," gross international reserves help explaining the level of loan euroization. In a way peculiarly, higher reserves to external debt ratio is associated with higher level of euroization. It seems that market participants are not persuaded that the reserves can guarantee sustainable external position, but contrary, high level of international reserves indicates a burdensome task taken by authorities to support the currency in the ambience of unbalanced flow of capital or trade deficits of chronic nature. Interestingly, for the group of "fixers," external liquidity is secondary, with debt stock and service seeming to be the prime concern.

Table 6 List of sampled countries, exchange rate regimes, and monetary strategies

Country	De facto ER regime	Monetary policy framework
Albania	Floating	Inflation-targeting
Bosnia and Herzegovina	Currency board	Exchange rate anchor (Euro)
Croatia	Crawl-like arrangement	Exchange rate anchor (Euro)
Macedonia FRY	Stabilized arrangement	Exchange rate anchor (Euro)
Romania	Floating	Inflation-targeting
Serbia	Floating	Inflation-targeting

Source: IMF (2014) Annual report on exchange arrangements and exchange restrictions 2014. International Monetary Fund, Washington, DC.

6 Conclusion

This study has proved that different proxies for external fragility (trade balance, external debt stock to GNI, debt service to export, etc.) explain the choice that players on credit and deposit markets make in term of currency composition of their assets (liabilities). Those findings comply with institutional view of financial euroization. External fragility indicators may shape public view of growth and stability prospects, and further on explain puzzling disparities of the international parity relationships, calculated based on the current level of exchange rate. Even strong international reserves were of no use for the sampled economies in their attempts to raise policy credibility.

Here, we came to the crux of the debate. A common policy element of all countries in the sample is that authorities by opting rigid exchange regimes, or leaning strong against currency depreciation, actually are sending a message to the public that holding strong value of the local currencies is not beyond their means. It is a wrong idea persuading market participants that everything goes well when serious risks are there. If we simplify, a peculiar game takes place between authorities and market. Market participants expect that in some point in the future fundamentals must align (disparities will disappear), but the authorities use their (limited) power to give a lesson to them that economic science may go wrong, and that what ultimately must happen, will happen when they want to. That's way, none will concentrate to forecasting market forces, but, opposite, to guessing when the authority will pull out, i.e., decide (or be forced) to give up. Moreover, what matters is not professional economists' assessment (precise calculations) of the level of fragility, but public perception of what is "unsustainable" in any specific episode. This is why we expect that less sophisticated measures of external fragility play bigger role in shaping public opinion.

When it comes to policy agenda, we would comment that inflation targeting remains a good choice for financially euroized economy, if it produces a real effect on inflation records. The same holds for exchange rate anchoring monetary strategy, or rigid exchange rate regimes, if this type of regime may guarantee better inflation records. If not, real appreciation is an unavoidable outcome with its potential to amplify euroization in the long run.

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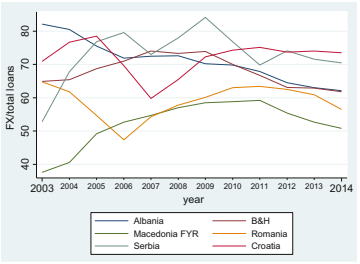
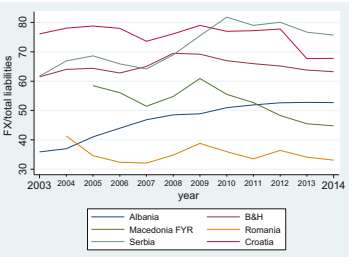
Appendix

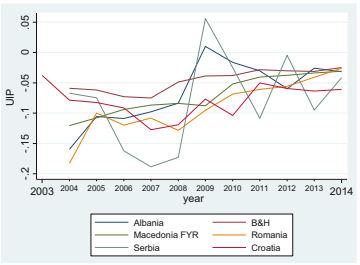
Table 7 Variable definition

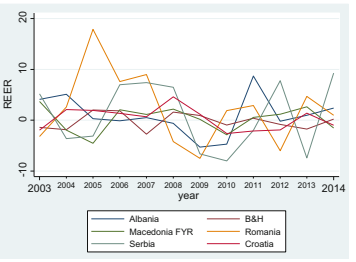
Variable	Definition	Data source
FX/total loans	Foreign currency denominated loans to total loans (in percentage); for B&H, Macedonia FYR, and Croatia, the numerator also includes foreign currency indexed loans; for Romania, the denominator includes only loans to private sector (non-governmental loans).	IMF (Country Reports)
FX/total liabilities	Foreign currency denominated (or indexed) bank liabilities to total bank liabilities (in percentage), except for Macedonia FYR where the figures includes only deposits.	IMF (Country Reports)
UIP	Deviations (extra return) from uncovered interest parity calculated based on change in nominal exchange rates of national currencies vis-à-vis euro (direct quotation) and interest rate differential. Local policy rates (end of period): for Albania, one-week repo rate for open market operations, for B&H deposit rate (CBB&H); for Romania before 2006 open market operations deposit facility interest rate, afterwards repo rate for various maturities; for Serbia open market two-weeks repo rate before 2012, afterwards one-week repo rate; for Croatia, official discount rate. For foreign rate used, German 3-months bond yield.	IMF (Country Reports), official national sources, and Investing.com online data base
REER	Index of annual change of real effective exchange rate (positive values indicated real appreciation).	IMF (Country Reports)
Inflation differential	Difference between annual domestic and foreign inflation based on CPI (end of period).	IMF (Country Reports) and Eurostat
Current account/GDP	Current account balance to gross domestic product (in percentage).	IMF (Country Reports) and complementary sources.
FDI/GDP	Foreign Direct Investments to Gross Domestic Product (in percentage).	IMF (Country Reports) and complementary sources.
External debt stock/GNI	Total external debt (public and private) to country Gross National Income.	The World Bank (International debt statistics)
Reserves/external debt stock	Gross international reserves to external debt stock (in percentage).	The World Bank (International debt statistics)
Debt service/export	Debt service due in each year to value of export (in percentage).	The World Bank (International debt statistics)

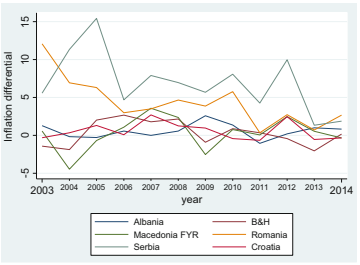
Table 8 Time series of variables

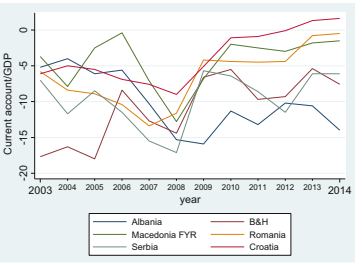


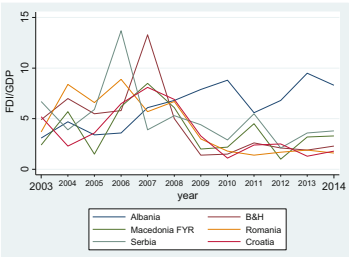


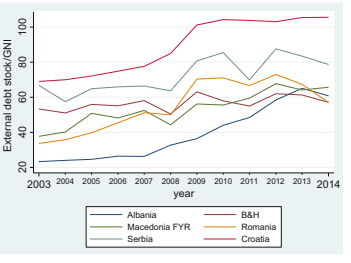


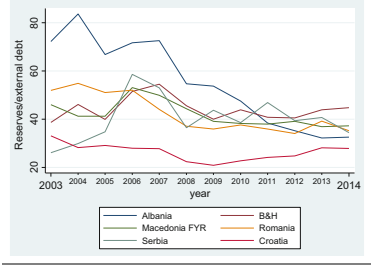












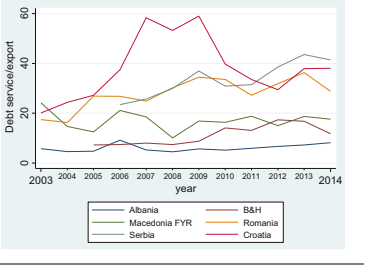


Table 9 Extended models: dependent variable FX/total loans

Regressor	Fixed effects	Random-effects GLS
FX/total liabilities	0.0796	0.246***
	(0.153)	(0.0748)
UIP	7.821	0.792
	(16.40)	(20.74)
REER	–0.153	–0.110
	(0.136)	(0.191)
Inflation differential	0.122	–0.285
	(0.367)	(0.403)
Current account/GDP	–0.0814	–0.615**
	(0.243)	(0.271)
FDI/GDP	–0.449*	–0.397
	(0.256)	(0.353)
External debt stock/GNI	0.124	0.337***
	(0.0882)	(0.107)
Reserves/external debt stock	0.312**	0.568***
	(0.124)	(0.123)
Debt service/export	–0.239***	–0.0458
	(0.0877)	(0.106)
Constant	48.41***	6.342
	(16.02)	(9.575)
Diagnostics		
Observations	63	63
F-test	2.900	–
Prob $> F$	0.00804	–
R-squared (within group)	0.352	0.165
R-squared (between groups)	0.0770	0.738
R-squared (overall)	0.137	0.557
Rho	0.776	–
Wald χ^2 (5)	–	66.75

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p<0.05$, *$p < 0.1$

Table 10 Extended models: dependent variable FX/total liabilities

Regressor	Fixed effects	Random-effects GLS
UIP	11.57	–5.637
	(15.19)	(37.69)
REER	–0.264**	–0.359
	(0.121)	(0.343)
Inflation differential	0.312	–1.349*
	(0.339)	(0.710)
Current account/GDP	0.0516	–1.522***
	(0.226)	(0.447)
FDI/GDP	0.116	–0.196
	(0.238)	(0.641)
External debt stock/GNI	–0.157*	0.862***
	(0.0791)	(0.155)
Reserves/external debt stock	–0.323***	0.425**
	(0.106)	(0.216)
Debt service/export	0.000270	–0.0546
	(0.0817)	(0.192)
Constant	81.94***	–20.12
	(9.263)	(17.19)
Diagnostics		
Observations	63	63
F-test	3.254	–
Prob > *F*	0.00475	–
R-squared (within group)	0.347	0.0175
R-squared (between groups)	0.224	0.897
R-squared (overall)	0.000156	0.538
Rho	0.946	–
Wald χ^2 (5)	–	62.93

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

References

Aleksić M, Đurđević L, Palić M, Tasić N (2008) Kanal kamatne stope u uslovima dolarizacije: slučaj Srbije. NBS Working Paper Series, No. 15. Narodna banka Srbije, Beograd

Arellano M, Bond S (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Rev Econ Stud 58(2):277–297

Arteta C (2005) Exchange rate regimes and financial dollarization: does flexibility reduce bank currency mismatches in bank intermediation? International Financial Discussion Paper, No. 738. Board of Governors of the Federal Reserve System, Washington DC

Barajas A, Morales A (2003) Dollarization of liabilities: beyond the usual suspects. IMF Working Paper No. 03/11. International Monetary Fund, Washington DC

Basso HS, Calvo-Gonzales O, Jurgilas M (2007) Financial dollarization: the role of banks and interest rates. ECB Working Paper Series, No. 748. European Central Bank, Frankfurt am Main
Broda C, Levy-Yeyati E (2003) Endogenous deposit dollarization. FRBNY Staff Reports, No. 160. Federal Reserve Bank of New York, New York
Brzoza-Brzezina M, Chmielewski T, Niedźwiedzińska J (2010) Substitution between domestic and foreign currency loans in Central Europe do central banks matter? ECB Working Paper Series, No. 1187, May. European Central Bank, Frankfurt am Main
Calvo G, Reinhart C (2002) Fear of floating. Quart J Econ 117(2):379–408
Cataõ L, Terrones M (2000) Determinants of dollarization: the banking side. IMF Working Paper, No. 146. International Monetary Fund, Washington DC
De la Tore A, Levy-Yeyati E, Schmukler S (2003) Living and dying with hard pegs: the rise and fall of Argentina's currency board. Economia 3(2):43–108
De Nicoló G, Honohan P, Ize A (2003) Dollarization of the banking system: good or bad? IMF Working Paper, No. 03/146. International Monetary Fund, Washington DC
Dimova D, Kongsamut P, Vandenbussche J (2016) Macroprudential policies in Southeastern Europe, IMF Working Paper 16/29. International Monetary Fund, Washington DC
Filosa R (1995) Money demand stability and currency substitution in six European countries (1980–1992). BIS Working paper No. 30. Bank for International Settlements, Basle
Grubišić Z, Kamenković S (2013) Exchange rate regime and its influence on balance of payment imbalances in the SEE countries. In Hanić et al. Post crisis recovery, Belgrade Banking Academy, Belgrade, 84–98.
Guidotti PE, Rodriguez CA (1992) Dollarization in Latin America Gresham's law in reverse? IMF Staff Papers 39(3):518–544
IMF (2014) Annual Report on exchange arrangements and exchange restrictions 2014. International Monetary Fund, Washington, DC
Ize A, Levy-Yeyati E (2003) Financial dollarization. J Int Econ 59(2):323–347
Ize A, Levy-Yeyati E (2005) Financial de-dollarization: is it for real? IMF Working Paper, No. 05/187. International Monetary Fund, Washington DC
Ize A, Parrado E (2002) Dollarization, monetary policy and the pass-through. IMF Working Paper, No. 02/188. International Monetary Fund, Washington DC
Komárek L, Melecký M (2001) Currency substitution in the transition economy: a case of the Czech Republic 1993–2001, Warwick Economic Research Papers, 613. The University of Warwick, Coventry
Kraft E (2003) Monetary policy under dollarization: the case of Croatia. Compar Econ Stud 45 (3):256–277
Kujundžić S, Otašević D (2012) The bank lending channel in an euroised economy: the case of Serbia, NBS Working Paper Series, July. Narodna banka Srbije, Beograd
Levy-Yeyati E (2006) Financial dollarization: evaluating the consequences. Econ Pol 21 (45):61–118
Luca A, Petrova I (2008) What drives credit dollarization in transition economies? J Bank Financ 32(5):858–869
Manjani, O. (2015) Estimating the determinants of financial euroization in Albania, Graduate Institute of International and Development Studies Geneva (IHEID), Working Paper No. 07-2015.
Marinković S (2009) Mechanics and causes of twin crises: the case of recent currency-banking disturbances in Serbia. In: Reić Z, Šimić V (eds) Challenges of Europe: financial crisis and climate change. Ekonomski fakultet, Split, pp 183–200
Naceur SB, Hosny A, Hadjian G (2015) How to de-dollarize financial systems in the Caucasus and Central Asia? IMF Working Paper, No. 15/203. International Monetary Fund, Washington DC
Pepić M, Marinković S, Radović O, Malović M (2015) Determinants of currency sustitution in Southeast European countries. Economic Themes 53(2):167–189
Rajković I, Urošević B (2014) Dollarization of deposits in short and long run: evidence from CESE countries, NBS Working Paper Series, 28. Narodna banka Srbije, Beograd

Reinhart M, Rogoff S, Savastano A (2003) Addicted to dollars. NBER Working Paper Series No. 10015. National Bureau of Economic Research, Cambridge, MA

Savastano MA (1996) Dollarization in Latin America: recent evidence and some policy issues. IMF Working Paper, No. 96/4. International Monetary Fund, Washington DC

Yinusa DO (2007) Between dollarization and exchange rate volatility: Nigeria's portfolio diversification option. J Pol Model 30:811–826

Šošić V, Kraft E (2006) Floating with a large life jacket: monetary and exchange rate policies in Croatia under dollarization. Compar Econ Pol 24(4):492–506