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Regional Spillovers in Financial Dollarization

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Abstract

This paper examines the presence of cross-country or regional spillovers in financial dollarization. Using spatial econometric techniques and a unique monthly dataset of deposit and loan dollarization extending over two decades for 23 transition countries that belong in the same geographical region, we find strong evidence of regional spillovers in both types of dollarization. Spillovers are channelled by trade and banking linkages, and pass through to all countries independently of their level of financial dollarization. Policy interventions that reduce dollarization in one country can, therefore, affect neighboring countries.

JEL Classification: C23; E44; F36; G15

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1. Introduction

Financial dollarization (FD), defined as the holdings by a country's residents of the share of financial assets and liabilities in foreign currency, has long been a source of concern in many developing countries due to its contribution to slower and more volatile growth, higher degree of financial fragility, lower effectiveness of monetary policy, and the emergence of balance of payments crises (see De Nicoló et al., 2005; and Levy Yeyati, 2006). The high levels of FD in these countries as documented by EBRD (2010) have sparked a growing interest on this issue by academics and policymakers alike in an effort to identify policy instruments to control this phenomenon. The sizeable work that has been produced over the years has identified the underlying determinants of FD, associated to both demand and supply factors. But, the existing work has limited its attention on the drivers of FD within each country, thereby assuming that influences on FD are country-specific or there exists independence of FD across countries. In this paper, we depart from this assumption and examine the presence and extent of spillovers in FD beyond national borders, at the regional level.

Why can FD spread across national borders? We propose two reasons based on the literature that studies the transmission and propagation of economic shocks across countries. First, due to bilateral trade between pairs of countries that requires the use of a currency foreign to the national, either the currency of the trading country or a common foreign currency for both traders (Forbes, 2012). Exporters and importers in both countries need to hold and access foreign currencies to conduct transactions, so that more trade encourages deposits and loans in foreign currency in both countries. Second, the large and growing international linkages of domestic banking systems means that access to foreign currency borrowing and lending becomes easier and can spread across borders (Brown and De Haas, 2012; Brown et al. 2014). Access to foreign currency financing and its cross-country spread can take place either via cross-border lending, or through foreign banks entering the domestic market of a host country in the form of a subsidiary or a branch to provide credit and accept deposits locally (De Haas and van Horen, 2012). For example, an increase in local-currency nonperforming loans in a country can cause banks to increase the domestic supply of loans in foreign currency (Euro or US dollar) and raise loan dollarization in this country. Through cross border lending or local lending by

foreign banks' affiliates, the original expansion in foreign currency lending can then spill over to the supply of credit in other countries in an effort for the bank to restore its capital adequacy or adjust its risk exposures. Given that bilateral trade and banking linkages encourage cross-country transactions, ignoring the presence of such interdependence may lead to biased inference about the determinants of FD.

With this qualification in mind, the main objective of this study is to put into formal test the hypothesis on whether financial dollarization spills over across nations to a wider geographical region. To achieve this, we employ an empirical model that allows for spillovers among countries. Specifically, we regress each country's level of deposit dollarization (DD) on the weighted DD of the other countries in the region and repeat the analysis for loan dollarization (LD). Acknowledging that regional dollarization is endogenous and subject to a reflection problem, we adopt an instrumental variable strategy that allows taking into account the channels of transmission mentioned above: bilateral trade and foreign bank penetration. A further contribution is that our estimation technique takes into account spatial dependence in our data and corrects estimated standard errors with respect to unobserved determinants of dollarization collected in the error term. Specifically, the econometric method relies on generalized method of moments estimation and provides consistent estimates under heteroskedastic disturbances. Moreover, it is immune against a certain degree of mis-specification of the spatial dependence of the disturbances (see Kelejian and Prucha, 2007). We also think that the group of countries in our data are best suited for testing the presence of regional spillover effects since all of them are located in the same geographical region, Central and Eastern Europe, corresponding to 23 economies in transition over the 1990s and 2000s.

We find strong evidence that both deposit and loan dollarization spill across national borders with both channels of transmission (trade and banking) playing a significant role. On average, regional dollarization raises country-specific dollarization by 3.7 percentage points in deposits and 4.7 percentage points in loans. When splitting the country sample according to the level of dollarization, interestingly we find that spillovers are mainly driven by low-dollarization countries: the magnitude of the spillover effect is dictated mainly by countries that exhibit dollarization ratios of less than

50%. Our findings are robust to alternative samples, model specifications and estimation techniques, whilst also controlling for additional factors in the regressions does not alter main results. An implication of our findings is that efforts to dampen financial dollarization in one country are likely to be beneficial to other countries in the region as well. This would then justify international cooperation and coordination efforts as a way of combating and minimizing the regional spillover effects of dollarization.

Our study contributes to two growing strands of the literature. First, we add to the existing evidence on the determinants of financial dollarization. While the majority of the literature originally focused on the determinants of foreign currency deposits (see, for example, Ize and Levy Yeyati, 2003, De Nicoló et al., 2005; Levy-Yeyati, 2006; Rennhack and Nozaki, 2006; Vieira et al., 2012; and Lin and Ye, 2013), more recent work has shifted attention to the asset side of banks' balance sheets (Barajas and Morales, 2003; Arteta, 2005; Honig, 2009). The latter phenomenon has gained particular attention in Central and Eastern European countries due to their dynamic financial developments and expansion in foreign currency loans (Luca and Petrova, 2008; Neanidis and Savva, 2009, 2013; Neanidis, 2010; Basso et al., 2011; Firdmuc et al., 2013; Kishor and Neanidis, 2015). Our work acts complementary to these studies by offering a new mechanism that promotes FD: cross-country spillovers in both deposit and loan dollarization. The importance of this mechanism is illustrated by the magnitude of the spillover effects, along with the channels via which they materialize.

Second, our study contributes to an emerging literature that investigates the role of international banking integration on the transmission of financial shocks across countries. De Haas and van Lelyveld (2014) provide evidence that multinational banking although can mitigate domestic financial shocks, raises the transmission of foreign banking shocks. De Haas and van Horen (2012) show that during the 2007-2009 recession, when banks faced substantial shocks to their capital and access to long term debt, they transmitted these shocks across borders by reducing their cross-border lending. For the same period, Cocozza and Piselli (2010) find that higher interconnectedness between Western and Eastern European banking systems has contributed to two-way cross-border contagion. These results are echoed by Glasserman and Young (2015), who estimate that in a network structure high financial connectivity amongst financial

institutions amplifies shocks to the financial system. Our findings are in support of this line of research since we document that one of the channels of transmission of financial dollarization at the regional level is taking place via increased cross-border bank connectivity.

The remainder of the paper is organized as follows. Section 2 presents the data, while section 3 describes the econometric model. Section 4 reports the findings of the analysis and, finally, section 5 concludes.

2. Data

We use a panel of monthly observations from the early 1990s (the earliest date is January 1993) to the end of the 2000s (the latest date is December 2009) drawing on a variety of data sources.[1] Details about the data and their construction can be found in Table A. In the rest of this section, we provide a summary description of the dataset.

Countries – Our dataset comprises 23 transition economies located in Central and Eastern Europe and the former Soviet Union.[2] The sample includes Albania, Armenia, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia FYR, Moldova, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Turkey and Ukraine.[3] The choice of the sample has been guided by two principles to best capture spillover effects: (i) the countries' geographical proximity to each other, and (ii) the comprehensive coverage of deposit and loan dollarization series. The first principle is reflected in Figure 1 which shows the regional proximity of the countries, while Figure 2 and 3 reflect the second principle: the

[1] The main reason why our sample ends in 2009 is because we wanted to exclude from our analysis the period of the Great Recession that may have pronounced even further spillover effects across countries. In other words, one may consider our estimates to reflect lower bounds of spillovers in the absence of extreme common international economic shocks.

[2] The list of transition economies follows the IMF (2000) and the World Bank (2002). We exclude from the list the following Asian economies: Cambodia, China, Laos, and Vietnam. We include Turkey because of its long history of financial dollarization.

[3] The end-of-period coverage for the Slovak Republic and Slovenia is at the end of 2008 and 2006, respectively, as a way of avoiding the periods after which these countries formally adopted the euro as their legal tender. This means that we focus in the periods during which countries were using their own national currency, against which financial dollarization shares are calculated.

continuous and uninterrupted series for deposit and loan dollarization for each of the countries.

Financial dollarization – Although the early dollarization literature proxies this phenomenon with measures of deposit dollarization only, viewing this measure as mirroring loan dollarization, more recent contributions have shown that the two processes are independently influenced by different factors. This has the implication that both deposit and loan dollarization need to be examined separately and for this reason we treat in our analysis both sides of the banks' balance sheets as our dependent variable, one at a time. We define DD as the ratio of foreign currency deposits to total deposits of a country's residents in domestically-based banks, and LD as the ratio of foreign currency loans to total loans of domestically-based banks to a country's residents. In line with the literature, these definitions emphasize that financial dollarization does not only include dollar or euro holdings but also deposits and loans in every foreign currency.

All dollarization data are drawn primarily from National Central Bank reports and the sample covers countries with varying experiences in dollarization. For example, Figure 2 and 3 show countries that exhibit low levels of dollarization (Czech Republic and Slovak Republic) and others with high levels of dollarization (Armenia, Bulgaria, Georgia, and the Kyrgyz Republic). They also show that some countries have experienced low variation over time (Macedonia FYR and Moldova) compared to some other with high variation (Armenia, Georgia, Turkey). Despite their various experiences, however, it is indicative that most countries exhibit high persistence in FD across time.

Our main control variable is the proxy for regional deposit and loan dollarization. This is measured as the sum of deposit or loan dollarization over all countries in the region other than the country we are treating each time. Thus, for countries $j = 1,\ldots,n$, and time t, regional dollarization for country i is calculated as

$$Regional\ FD_{it} = \sum_{j=1}^{n} FD_{jt} - FD_{it}, \qquad \forall i \neq j, \qquad FD = DD, LD.$$

We are careful to weight the size of regional or neighboring dollarization by the relative contribution of each of countries j to the dollarization of the region. Specifically, we create weights for the relative size of FD for each country j as

$$weight_{jit} = \frac{FD_{jt}}{Regional\ FD_{it}},$$

where

$$\sum_{j=1}^{n} weight_{jit} = 1, \qquad \forall i \neq j,$$

and then multiply the weight of each country *j* with the level of its respective financial dollarization, FD_{jt}, to obtain a measure of every country's contribution to regional FD. Adding through by time period *t* across countries *j*, we calculate for each country *i* the level of its weighted average neighboring FD. In our calculations, we consider for each country only the number of observations that are available in each month in an effort to not bias the measurement of regional FD due to missing observations. In this way, the size of regional dollarization is determined by (i) the relative importance of each individual country's level of dollarization in the region and by (ii) its available time series coverage.[4] Figure 4 illustrates the time series profile of weighted average regional deposit and loan dollarization ratios. After an initial upward trend, both series have stabilized at rates of 50%-60%, highlighting the high and persistent share of foreign currency holdings in the region.

Trade and banking linkages – For the purpose of our instrumental variable strategy, we resort to two channels through which financial dollarization in other countries can change the domestic level of financial dollarization. We coin these channels spillovers because they are the unintended consequence of changes in financial dollarization elsewhere in the region. In each case, we capture interdependence by all countries in the sample in weighted form with weights reflecting the strength of linkages amongst countries.

Bilateral trade is the first channel of diffusion of financial dollarization and is meant to capture trade linkages that reflect aggregate demand effects (Forbes, 2012). The data are extracted from the IMF's Direction of Trade Statistics (DOTS), which provide

[4] A simpler alternative would be to treat every country in the region as exerting the same weight to the region, i.e., using an unweighted average of each country's dollarization contribution to the region. This, however, would be a naïve treatment of neighboring dollarization as it would consider every country's contribution to regional dollarization as being of the same importance independently of its size in each country. Nevertheless, we have also considered this measure in our analysis and did not find any different qualitative effects, only quantitative as one can imagine.

bilateral trade (imports and exports) in U.S. dollars. Bilateral trade offers to countries opportunities to import and export goods and services in exchange for (foreign) currencies. Hence, to expedite trade, traders in both countries need to hold deposits and obtain loans in foreign currency. For this reason, greater bilateral trade linkages in a region are expected to contribute to higher levels of regional financial dollarization. We use bilateral trade to create weights of cross-country linkages as follows. For a country pair *i* and *j*, denote the elements of the weighting matrix as w_{ij} and the indicator value for bilateral trade as $trade_{ij}$. Then, averaging across all time periods *t*, the trade-based matrix is of the form

$$w_{ij} = \frac{trade_{ij}}{\sum_{j=1}^{n} trade_{ij}}.$$

The second channel of spillover of financial dollarization is represented by financial linkages that reflect credit supply channels (Forbes, 2012). Although there are several measures of cross-country financial linkages, we use the share of foreign bank penetration by the EBRD. This measures the percentage of domestic banks with assets of foreign ownership in excess of 50% and, by doing so, proxies the exposure of a country's banking system to the international financial network (Brown and De Haas, 2012; Claessens and van Horen, 2014). The more exposed a country's banks are, the greater the transmission of shocks from one country to the next, including changes in financial dollarization (Cocozza and Piselli, 2010; De Haas and van Horen, 2012). However, we do not use data on bank penetration between pairs of countries because they are not readily available. Instead, we use a measure of the degree of a country's foreign bank penetration, without considering the country of origin of the penetrating bank. For this reason, we build the weights according to this channel as follows. For country *i*, denote as w_{ijt} the weighting matrix and as $penetration_{jt}$ the degree of country's *j* foreign bank penetration. Then, for each time period *t*, the banking-based matrix is of the form

$$w_{ijt} = \frac{penetration_{jt}}{\sum_{j=1}^{n} penetration_{jt}}.$$

This weighting matrix assumes that for a country *i*, the transmission of FD depends on the degree of bank penetration of every neighboring country in the region. That is, the more the region is penetrated by foreign banks, the greater the degree of transmission to each of the countries in the region. We believe this is a very plausible assumption,

especially when countries share foreign ownership by international banks. Finally, it is worth noting that by construction both weighting matrices have the following properties:

$$\sum_{j=1}^{n} w_{ij} = 1, \qquad \forall i \neq j,$$

and

$$w_{ii} = 0.$$

Covariates – To gauge the relevance of regional effects in FD we include in the regression analysis a set of explanatory variables within a vector $\boldsymbol{X}$. These are a host of economic and financial variables associated with macroeconomic conditions, regulatory requirements and bank-specific factors, having been found by the extant literature to influence the shares of deposit and loan dollarization (sources include the IFS, AREAR and the WDI). Macroeconomic variables include (i) the rates of inflation and depreciation as these variables by changing the value of the domestic currency can change the value, and attractiveness, of foreign currency deposits and loans (see Savastano 1996; Arteta 2005); (ii) the minimum variance portfolio (MVP) dollar share which captures movements in the second moments of inflation relative to that of real depreciation (Ize and Levy-Yeyati 2003); and (iii) indicators of financial and trade openness that make the domestic economy more accessible to the rest of the world (Luca and Petrova 2008; Honig 2009; Neanidis and Savva 2009).[5] Controls for the regulatory and institutional environment include a set of three dummy variables: (i) a dummy that proxies for restrictions on holding deposits (loans) in foreign currency (Arteta, 2005); (ii) a dummy associated with a country's European Union (EU) admission process (Neanidis, 2010); and (iii) a dummy that controls for periods and countries that experience high shares of DD and LD (Neanidis and Savva, 2009) as an indicator of time and country persistence in foreign currency holdings. Bank-specific variables include (i) differences in interest rates between the local and foreign currencies for both deposits and loans as a way of capturing the financial cost (benefit) of borrowing (saving) in either currency (Neanidis

[5] Note that we add directly as control variables measures of a country's *aggregate* trade and financial openness. This is in addition to the measures of bilateral trade and foreign bank penetration we use as instruments. This inclusion allows avoiding omitted variables bias in the regression and, at the same time, allows capturing the exogenous component of the instruments in the IV regression.

and Savva, 2009; Basso et al., 2011); and (ii) banks' net foreign assets which represent an alternative to bank holdings of LD, so that higher net foreign assets limit the need of banks for foreign currency lending. Finally, we include the share of DD as control in the regression of LD because it has been found that banks lend more in foreign currency as they receive more foreign currency deposits in an effort to limit their exchange rate risk (Luca and Petrova, 2008; Neanidis and Savva, 2009). The summary statistics of all variables are displayed in Table 1.

3. Econometric model

The main goal of this paper is to identify spillover effects of financial dollarization at the country level. Hence, the main question of interest is whether and to which extent the level of financial dollarization in some country depends on that in other countries. An important econometric issue in evaluating cross-country spillover effects is cross-sectional interdependence, where observations in one country are dependent on observations in other countries. To address this problem, we make use of spatial econometric methods designed to tackle spatial dependence. These methods, originally developed in geographical statistics, have been recently gaining ground in economics and have been used to identify interaction between different locations. Examples include the empirical analysis of economic growth (Conley and Ligon, 2002; Lopez-Bazo et al., 2014), regional development (Sanso-Navarro et al., 2016), corruption (Becker et al., 2009), international R&D (Coe et al., 2009), military conflict (König et al., 2017), FDIs (Lin and Kwan, 2017), and fiscal consolidations (Poghosyan, 2017).

Spatial econometric methods for data with cross-sectional dependence require modelling the channel(s) of interdependence. Otherwise, the estimation is subject to a simultaneity or reflection problem, a common challenge in the estimation of network externalities (Manski, 1993). In this class of models, it is usually difficult to separate contextual effects, i.e., the effects of the exogenous characteristics of a country's peers on a country's own outcome. Ignoring this problem yields inconsistent estimates of the spillover parameters. In our model, we tackle the problem with an instrumental variable strategy where we assume that interdependence is related to trade and financial links amongst countries. Doing so, our estimation eliminates the problem of correlated effects.

Regression specification – We employ a specification where the variation in financial dollarization over time is driven by the realization of group- and time-specific shocks, amplified by the endogenous response of the group, which, in turn, hinges on the network structure. The normal practice in the spatial econometrics literature is to represent the network structure between group members by an *n x n* matrix *W* that has been row-normalized so each row sums to 1. Before showing the regression equation for *n* countries, let's first consider a two-country example:

$$FD_{1t} = \alpha_1 + \beta_1 FD_{2t} + \gamma X_{1t} + \varepsilon_{1t},$$
$$FD_{2t} = \alpha_2 + \beta_2 FD_{1t} + \gamma X_{2t} + \varepsilon_{2t}.$$

This system of equations implies a simultaneous data generating process, where the value of FD in country 1 depends on the value of FD in country 2, and vice versa. Expanding this to *n* countries, gives rise to ($n^2 - n$) cross-country relations which leads to over-parameterization. To solve this issue, the spatial econometrics literature proposes a parsimonious relationship between cross-country observations in the form of a spatial autoregressive process:

$$FD_{it} = \alpha_i + \beta \sum_{j=1}^{n} weight_{jit}\, FD_{jt} + X_{it}'\gamma + \varepsilon_{it}, \qquad (1)$$

where α_i is an unobservable time-invariant country-specific shifter (i.e., a country-fixed effect), X_{it}' is a vector of observable shocks with coefficients $\boldsymbol{\gamma}$ (i.e., the covariates), and ε_{it} is an i.i.d., zero-mean unobservable shock. The term $\sum_{j=1}^{n} weight_{jit}\, FD_{jt}$ is the spatial lag for country *i*, representing the linear combination of values of the dependent variable constructed from observations of the other *j* countries. As described in the data section, the weights are greater for those countries that exhibit higher levels of FD in each period. The coefficient β is the spatial lag coefficient, which measures the direction and intensity of cross-country dependence. Under the assumption that $\sum_{j=1}^{n} weight_{jit} = 1$, it has the property that $|\beta| < 1$ (see Kelejian and Prucha, 2007). If the spatial lag coefficient is insignificant, it would imply that the data generating process follows the conventional panel data structure, with independent observations across countries. Alternatively, if the spatial lag coefficient is significant, it would imply spatial dependence and the existence

of cross-country spillovers.[6] Estimating equation (1) with standard panel data OLS techniques can lead to inconsistent estimates because of the correlation of the spatial lag variable with the error term. For this reason, we rely on a panel IV spatial regression model.

Instrumental variables – In most economics applications that involve interdependence due to geography and space, researchers include the channels of interaction across countries directly into equation (1) in the form of the spatial lag variable. In this way, they test for each potential transmission mechanism one at a time in isolation from all others – be it adjacency, distance or any other plausible link – to proxy for the intensity of interactions. By doing so, they also assume that each advanced mechanism satisfies the exogeneity restriction so that the regression does not suffer from simultaneity bias. Recent advancements in spatial econometric techniques, however, allow testing for all possible channels within one regression specification by using these channels as instruments in an instrumental variable regression. In this way, they can also test for exogeneity rather than assuming it away (see for example König et al., 2017). Prompted by this recent literature, we also opt for an IV estimation of equation (1).

The weight matrix based on bilateral trade flows [w_{ij}] and the weight matrix based on foreign bank penetration [w_{ijt}] parameterize the structure of spatial dependence across the n regions. Formally, our instruments are $FD_{trade,it} = \sum_{j=1}^{n} \frac{trade_{ij}}{\sum_{j=1}^{n} trade_{ij}} FD_{jt}$ and $FD_{penetration,it} = \sum_{j=1}^{n} \frac{penetration_{jt}}{\sum_{j=1}^{n} penetration_{jt}} FD_{jt}$, where FD_{jt} denotes the level of FD in country j. By using these instruments, we accept the trade and financial scope of the spillover mechanisms as identification conditions. Identification, in turn, requires the instruments to satisfy the conditions of relevance and exogeneity. Relevance is satisfied when bilateral trade and foreign bank penetration are correlated with regional financial dollarization. We have explained in the previous section why this is expected to be the case and we document below that this is so in the data. In addition, exogeneity requires

[6] We follow Becker et al. (2009) and König et al. (2017) in simplifying the model by assuming that the error term does not also follow a spatial process. We simply compute heteroskedasticity robust standard errors by means of a heteroskedasticity- and spatial autocorrelation-consistent (HAC) estimator of the variance–covariance matrix.

that our instruments are not correlated with FD in country *i* after controlling for regional FD and all other second-stage regressors. In other words, both instruments must satisfy the exclusion restriction that trade and foreign bank penetration in neighboring countries *j* have no direct effect on country *i*'s FD, other than their effect via regional FD. We believe that variables such as trade or foreign bank penetration should not have an effect on local FD other than through neighboring countries' FD. Consider for instance the foreign bank penetration of neighbors. A greater exposure of the neighbors' banks to the international banking system gives them greater access to foreign currency borrowing and lending that can more easily spread across borders. In this way, foreign bank penetration decreases the cost of cross-country financial spillovers, a channel consistent with earlier studies (e.g., Brown et al. 2014).

To further alleviate the concern that our instruments may not satisfy the exclusion restrictions, we control in the second stage regression for both country *i*'s trade openness and foreign bank penetration. For instance, one may assume that both trade and foreign bank penetration in country *i* are correlated with those in country *j*. By including these two variables as non-excluded instruments in country *i*'s FD regression, their values in country *j* represent a valid instrument for *j*'s FD.

Spatial correlation – It is very likely that FD, bilateral trade and foreign bank penetration are all clustered in space. For this reason, it is important to correct standard errors to account for spatial dependence in the data. Following the lead of recent studies from various literatures that use such techniques (Bustos et al., 2016; Berman et al., 2017; König et al., 2017), we estimate standard errors with a spatial HAC correction allowing for both cross-sectional spatial correlation and location-specific serial correlation, first developed by Conley (1999). In the time dimension, we impose no constraint on the temporal decay for the Newey-West/Bartlett kernel that weights serial correlation across time. This means that observations within the spatial radius can be correlated over time without any decay pattern. In the spatial dimension, we retain a radius of 1606km for the spatial kernel, corresponding to the average internal distance in our sample of countries according to the CEPII geodist dataset. More specifically, the weights in the covariance

matrix are assumed to decay linearly with the distance from the central point of country *i*, reaching zero after 1606km.[7]

A challenge with this error-correction technique is to test for the underidentification and weak identification of the excluded instruments, i.e., the Kleinbergen and Paap (2006) rk statistic and Wald F-statistic. These represent rank tests of the first-stage VCE matrix that are standardly used with IV estimators and cluster robust standard errors. These statistics are valid under general assumptions, and the main requirement is that the first-stage estimates have a well-defined asymptotic VCE. Unfortunately, our routine does not produce these two tests statistics, although we do try to partly compensate for this by reporting their values in IV regressions that do not control for spatial HAC correction. On the positive side, our routine does report the Hansen J overidentification test.

4. Empirical Analysis

In this section, we present estimates of regional spillovers in financial dollarization, quantify the magnitude of their effect, and check robustness.

4.1 Baseline results

We start by estimating regression equation (1). In all specifications we include country fixed effects to filter out all countrywide characteristics affecting local financial dollarization. In every case, we focus on the coefficient estimates of interest, i.e., those of regional deposit and loan dollarization. The estimates of all other control variables are not discussed as they are in line with findings in the related literature. Further, and as discussed in the previous section, all regressions control for trade openness and foreign bank penetration, the latter not shown because throughout it is not statistically significant.[8]

Table 2 displays the estimates of β for the two types of regional dollarization. Columns (1) and (2) are based on an OLS specification. An increase in the region's DD

[7] Given that the distance decay parameter cannot be estimated and has to be fixed, later we explore robustness to alternative spatial and temporal kernels.

[8] The variable trade openness includes for each country in the sample both the size of regional bilateral trade, the weights of which are used in the creation of one of our instruments, and non-regional trade with the rest of the world.

and LD is associated with a higher domestic DD and LD, with the coefficient estimates significant at the 1 percent level. Using the same technique, but correcting the estimations for standard errors under the assumption of spatial and within-group correlation, gives rise to columns (3) and (4). Although coefficient estimates remain the same, the precision by which they are estimated increases as illustrated by the lower standard errors. Moreover, since the OLS estimates are subject to an endogeneity bias, in the remaining columns we run a set of IV regressions. Columns (5) and (6) replicate the specifications of columns (1) and (2) in a 2SLS setup using the bilateral trade and foreign bank penetration of each country's neighbors as excluded instruments. Here, we shut down all spatial correlation and simply cluster standard errors at the country level. The estimated coefficients of regional DD and LD continue to be positive and statistically significant at the 1 percent level, with their magnitudes now twice as large as that under the OLS estimations. Turning on the control for spatial correlation in the error term, columns (7) and (8) indicate even higher coefficient estimates for regional FD, both estimated with greater precision. In general, the larger effects recorded with 2SLS imply a downward bias in our OLS estimates, suggesting the importance of considering the presence of reflection effects.

The associated first-stage regressions are reported in the corresponding columns at the lower panel of Table 2, where, for presentational purposes, only the coefficients of the excluded instruments are displayed. If our identification strategy is correct, then regional spillovers in FD should be increasing with the trade and banking linkages of each country with the region. It is therefore reassuring that both bilateral trade within the region and foreign bank penetration in the region have a positive effect on regional FD (the latter more so than the former). The first-stage results demonstrate that our set of instruments is indeed capable of explaining a large fraction of the variation in regional FD, in excess of 60 percent. Also, in regressions (5) and (6) the large F-tests suggest no weak instrument problem, while the Kleibergen and Paap (2006) LM-tests reject the null hypotheses of underidentification of the excluded instruments. Finally, the null hypothesis of the Hansen J test is not rejected in any IV specification, indicating that the overidentification restrictions are valid. In what follows below, the last two columns represent our preferred specification and will be the basis of our robustness checks.

The spillover coefficients of interest are quantitatively large given that by construction they have an upper bound of 1. To quantify their importance, consider the estimates in our preferred specification. For DD, a one standard deviation increase in regional DD from its mean translates into a 3.7 percentage point increase in domestic DD (i.e., 0.805*0.046). Given the sample average share of domestic DD of 40 percent, spillovers represent almost a 10-percentage point contribution to local DD. By the same calculation, a one standard deviation increase in regional LD from its mean translates into a 4.7 percentage point increase in domestic LD (i.e., 0.732*0.064). This means that the contribution of regional spillovers to domestic LD corresponds to 11 percentage points.

How do these effects compare with those from some of the other controls in the regressions? Let's consider a policy variable, the presence of formal restrictions in holding foreign currency. The coefficient estimates of this variable imply that relaxing such restrictions by a one standard deviation from their mean leads to an increase in local deposit dollarization by 1.2 percentage points and in local loan dollarization by 2.8 percentage points respectively. These effects are much smaller compared to those of regional FD. The same is true when quantifying the effect of another control variable, international financial integration, which leads to increases by 1.8 percentage points in local DD and 2 percentage points in local LD. From this exercise, therefore, it becomes clear how important regional spillovers in FD are, both in absolute and in relative terms. Overall, the instrumental variable approach appears to support that more intensive trade and banking linkages across countries augment regional spillovers in financial dollarization.

4.2 Robustness checks

In this subsection we test the robustness of our baseline estimates in three different dimensions. First, we consider different levels of cross-sectional spatial correlation. Second, we add a large number of additional control variables drawn from the literature that examines the drivers of FD. Third, we test whether the spillover effects are heterogeneous across country groupings. All these checks include the standard set of control variables and instruments considered in Table 2 while correcting for spatial correlation.

Alternative spatial kernels – Recall that following Conley (1999 and 2008), our baseline results estimate standard errors with a spatial HAC correction allowing for both cross-sectional spatial correlation and location-specific serial correlation. Specifically, we allow serial correlation to be present for an infinite horizon across time and a spatial radius of 1606 kilometers. In this way, the weights in the covariance matrix are assumed to decay linearly with the distance from the central point of a country *i*, reaching zero after 1606km. In this section, we check whether spillovers in regional FD are affected by assuming alternative spatial kernels.

The choice of the spatial kernels is such that we consider the minimum distance between any pair of countries in our sample (Croatia to Slovenia, 117km), the maximum pairwise distance (Kazakhstan to Slovenia, 4824km), and the average minimum (Moldova, 1170km) and average maximum (Kazakhstan, 3845km) distance of every country from the rest of the countries in the region. Table 3 reports that regional spillover coefficients remain statistically significant at the 1 percent level and are very stable across both DD and LD when standard errors are assumed to be correlated within different kilometric distances. We find these results reassuring.

Additional controls – An obvious robustness check is with regard to the exclusion from the vector of covariates X'_{it} of possibly relevant variables. These are candidate variables that have appeared in many studies and include: (i) a disaggregation of the EU dummy into its three distinct stages of the EU admission process—beginning of the EU process, confirmation of decision to join the EU, and eventual EU membership (Neanidis, 2010); (ii) an index of asymmetry of exchange rate movements (Rennhack and Nozaki 2006); (iii) an index of exchange rate intervention to control for different exchange rate regimes (Barajas and Morales 2003); (iv) a dummy for forward market liberalization (Luca and Petrova, 2008); (v) a dummy for the 1998 Russian crisis (Neanidis and Savva, 2009); (vi) a measure of institutional quality proxied by corruption (De Nicoló et al., 2005); and (vii) the flow of a country's remittance receipts (Capasso and Neanidis, 2016).[9]

[9] Details for the definition and construction of all additional covariates appear in Table A.

Results are reported in Table 4A for DD and Table 4B for LD. Most of the additional control variables are statistically significant, and when they are, they are so at the 1 percent level. Specifically, we find that every stage of the EU admission process reduces both the shares of deposit and loan dollarization, providing partial support to Neanidis (2010). Asymmetric exchange rate movements reduce DD while they have no effect on LD, implying that only depositors exhibit a bias towards local-currency depreciation. Exchange rate intervention toward a harder peg, on the other hand, discourages both DD and LD, supporting the rationale that both depositors and lenders consider themselves immune to exchange rate fluctuations as authorities set an explicit commitment to defend the peg. Similarly, the presence of a functional forward market depresses equally DD and LD in line with the argument that forward market liberalization allows foreign currency holders to insure against currency risk and hedge their exposure in the form of forward contracts. The Russian crisis does not appear to have any impact on the size of FD, whereas higher institutional quality, proxied by the control of corruption, makes residents having more faith in the domestic currency and switch to local-currency deposits and loans. Further, corroborating the findings in Capasso and Neanidis (2016), remittance receipts reduce the share of a country's foreign currency deposits (although the effect is not statistically significant) and raise the share of foreign currency loans. Finally, the last column of Tables 4A and 4B limit the sample period to the post-1996 years to control for the early abnormal transition years experienced by participants in the foreign currency market in our sample due to the uncertainty that surrounded the success of market oriented policies.[10]

In terms of our central result, it proves to be robust to the inclusion of additional controls and when limiting the period coverage. Across regressions, the coefficients of regional DD and regional LD are always positive and highly significant. The coefficients are also stable, except in columns (6)-(8) where there is a drop in observations, in some cases by a large margin. In all cases, the Hansen J-statistic is above 0.1.

From this exercise we can, therefore, conclude that there is no indication of a bias from omitted variables in our specifications. There is a robust cross-border spillover

[10] Figure 4 shows that for the early years, regional FD was more volatile than latter years. This may justify the exclusion of the early period to abstract from years of higher uncertainty.

effect of FD, after controlling for all plausible institutional, policy and economic variables.

Heterogeneous effects – In principle, there are many types of heterogeneous effects one may consider. In our case, we explore whether heterogeneity is driven by a country's level of financial dollarization. This is prompted by the findings of Neanidis and Savva (2009), who show the effects of local-currency depreciation and monetary expansion on short-run FD to differ in countries with different levels of dollarization. By the same rationale, it is plausible that the average coefficient of regional FD masks significant heterogeneity in the spatial patterns. Put differently, it is likely that regional FD exerts a different marginal impact on domestic FD in conditions of high dollarization compared to an environment of low-dollarization. There are indeed reasons to expect regional spillovers to have a stronger impact in low-dollarized nations: it might for example be rational for international banks operating in the region to disperse their currency risk by expanding their portfolio of deposits and loans in foreign currency to countries with low levels of such assets/liabilities. This international rebalancing of bank balance sheets, in turn, would lead to a regional convergence of dollarization, where countries with low FD suffer a greater impact from regional FD compared to countries with high local FD.

To assess the heterogeneous impact of regional FD spillovers, we use our baseline specification to which we add an interaction term between regional FD and a high FD dummy. Consistent with the literature (see Honohan, 2007), the dummy takes up the value of 1 when a county's value of DD or LD exceeds 50 percent. That is, when the majority of a country's deposits or loans are in foreign currency. Table 5 displays the results for both types of financial dollarization. In columns (1) and (4), regional FD continuous to exert a positive spillover effect to both deposits and loans, with the coefficient of the interaction being negative and statistically significant. This means that in high-dollarized countries, the magnitude of the spillover effect is smaller compared to that of low-dollarized countries. Estimating the magnitude of the effect, as we did for our baseline findings, reveals that a one standard deviation increase in regional DD translates into a 5.1 percentage point increase in domestic DD in low-dollarized economies compared to a 3.2 percentage point increase in high-dollarized countries. Similarly, a one

standard deviation increase in regional LD has a more sizeable effect on low-dollarized countries, 8.1 percentage point increase in local LD compared to 2.7 percentage point increase for high-dollarized countries.

We further confirm these findings by running regressions where we restrict the country sample to those observations for which FD is either below or above the 50 percent cut-off threshold. Columns (2) and (3) confirm that indeed the impact of regional DD is much higher in low-dollarized environments. The same is true in columns (5) and (6) that explore the impact of regional LD. Obviously, these regressions test regional FD spillovers only within countries that belong to groups that share similar dollarization experiences, either low or high dollarization. Unfortunately, the test cannot offer an indication of cross-country spillovers running from high-dollarized to low-dollarized countries or vice-versa. This analysis would require a different estimation methodology, one that examines the presence of pure and shift contagion, a task we undertake in a companion paper, Neanidis and Savva (2015).

We conclude this section by reporting that we detect strong heterogeneous effects in cross-country FD spillovers, owing to countries' levels of dollarization. Although all countries experience higher domestic dollarization due to regional spillovers, the effects are particularly pronounced in countries with low levels of financial dollarization. Thus, countries where deposits and loans are dominated by the local currency are exposed to greater FD spillovers from the other countries in the region.

5. Conclusions

A long literature has established the main determinants of financial dollarization. In this way, it has provided policymakers with guidance on how to best tackle this important issue. A common thread of this literature, however, is that it implicitly assumes that financial dollarization is due to country-specific characteristics and, therefore, is independent across countries. This paper is the first attempt to test this assumption and examine cross-country spillovers in financial dollarization in a geographic region with a prolonged and diverse experience of this phenomenon.

We use an empirical model that allows for spatial effects and tackles a reflection problem through an instrumental variable strategy. Our results support the presence of

regional spillovers in financial dollarization, where dissemination across countries occurs via bilateral trade and foreign bank penetration channels. According to our estimates, regional spillovers contribute by 4-5 percentage points to the average local level of financial dollarization observed in transition countries over 1993-2009. We perform numerous sensitivity tests and show that the results are robust to a variety of alternative specifications. We further show that spillover effects are heterogeneous across countries with the greater impact identified for economies that exhibit low levels of financial dollarization, a contribution of up to 8 percentage points.

Our findings have important policy implications. They suggest that countries in the same region are well served to work together to encourage policies that jointly address the size of financial dollarization. Doing so only at the individual country level, would neglect the fact that financial dollarization crosses country lines. Therefore, a coordinated regional strategy that takes into account these spatial spillovers is likely to be more successful in controlling this phenomenon than a strategy that views a country as in isolation from its neighbors.

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Table A: Variable Definitions and Sources

Variable	Definition [source]
Dependent variables	
Deposit dollarization (DD)	Foreign currency denominated deposits to total deposits of residents held in resident banks [IMF, International Financial Statistics (IFS) and National Central Banks (NCB)]
Loan dollarization (LD)	Foreign currency denominated credit to total credits of residents issued by resident banks [IFS and NCB]
Control variables	
Regional financial dollarization	Sum of deposit or loan dollarization of all other countries located in the region weighted by the relative size of dollarization for each of the countries for the number of observations available in each time period [Author's calculation]
High DD dummy	Dummy variable that takes the value of 1 if deposit dollarization exceeds 50 percent and 0 otherwise [Author's calculation]
High LD dummy	Dummy variable that takes the value of 1 if loan dollarization exceeds 50 percent and 0 otherwise [Author's calculation]
Net foreign assets	The ratio of commercial banks' and other depository corporations' foreign assets minus external liabilities to total domestic deposits [IFS and NCB]
Restrictions	Dummy variable that takes the value of 1 when there are restrictions on residents holdings of onshore foreign currency deposits (loans) and 0 otherwise [AREAR, IMF]
MVP dollar share	[Var(Inflation)+Cov(Inflation, Δ(Real exchange rate))]/[Var(Inflation)+Var(Δ(Real exchange rate))+ΔCov(Inflation, D(Real exchange rate))] as constructed by Ize and Levy-Yeyati (2003). Following Basso et al. (2011), we compute MVP based on all historical information up to the observation point [Author's calculation]
Inflation	Logarithmic difference of the Consumer Price Index [IFS]
Depreciation	Logarithmic difference of the nominal official exchange rate (national currency/USD) [IFS]
Interest rate difference	Deposit and loan interest rate differences (local currency – foreign currency)/100 [IFS and NCB]. No data availability of loan interest rates for Turkey
Index of international financial integration	Volume-based measure of international financial integration as constructed by Lane and Milesi-Ferretti (2007): (total external assets + total external liabilities) / GDP [updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007)]
Trade openness	The ratio of trade to GDP [WDI]
EU dummy	Dummy variable that takes the value of 1 during the dates of (i) the beginning of the EU accession negotiations, (ii) the end of the negotiation process, and (iii) after full membership to the EU, and 0 otherwise. See below for details on each of these periods and the countries involved [Author's calculation]
Instruments	
Bilateral trade	Sum of deposit or loan dollarization of all other countries located in the region weighted by the average bilateral goods trade flows for all pairs of countries between 1993 and 2010. For total trade $\sum_{j=1}^{n} trade_{ij}$ of country *i* with the rest of the countries in the region and bilateral trade $trade_{ij}$ with country *j*, averaging across all time periods *t*, the index becomes $FD_{trade,it} = \sum_{j=1}^{n} \frac{trade_{ij}}{\sum_{j=1}^{n} trade_{ij}} FD_{jt}$, where FD represents either DD or LD [annual data on the value of merchandise exports and imports between each country and all its trading partners is from the IMF Direction of Trade Statistics (DOTS) database]

Foreign bank penetration	Sum of deposit or loan dollarization of all other countries located in the region weighted by the average share of a country's foreign bank penetration to the total penetration of the region between 1994 and 2010. For aggregate regional foreign bank penetration $\sum_{j=1}^{n} penetration_{jt}$ at period *t* and penetration $penetration_{jt}$ of country *j* at time *t*, the index becomes $$FD_{penetration,it} = \sum_{j=1}^{n} \frac{penetration_{jt}}{\sum_{j=1}^{n} penetration_{jt}} FD_{jt},$$ where FD represents either DD or LD [annual data on foreign ownership, defined as banks with assets of foreign ownership > 50%, are from the European Bank for Reconstruction and Development (EBRD) Banking Survey]
Robustness variables	
Start of EU accession process	Dummy variable that takes the value of 1 during the dates of the beginning of the EU accession negotiations and before the end of the negotiation process and 0 otherwise. The beginning of negotiations started on March 1998 for the Czech Rep., Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Rep., and Slovenia; on December 1999 for Bulgaria; on October 2005 for Turkey [http://europa.eu/abc/history]
Decision to join EU	Dummy variable that takes the value of 1 during the dates decided by the EU for negotiating countries to join the EU and before full EU membership and 0 otherwise. The negotiations ended on December 2002 for the Czech Rep., Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Rep., and Slovenia; on April 2005 for Bulgaria [http://europa.eu/abc/history]
EU membership	Dummy variable that takes the value of 1 after full membership to the EU and 0 otherwise. Full membership started on May 2004 for the Czech Rep., Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Rep., and Slovenia; on January 2007 for Bulgaria [http://europa.eu/abc/history]
Dummy for forward market liberalization	Dummy variable that takes the value of 1 if there exists a functional forward market and 0 otherwise [Luca and Petrova (2007) and AREAR, IMF]
Index of asymmetry of exchange rate movements	Index of asymmetry of exchange rate movements as constructed by Rennhack and Nozaki (2006): assigning a value of 0 in months of currency appreciation and 1 in months of currency depreciation [Author's calculation]
Index of exchange rate intervention	Indicator of exchange rate intervention as constructed by Barajas and Morales (2003): $(\Delta int\_res/M2)^2$ / ((First Difference(Exchange Rate)/ Exchange Rate)^2 + $(\Delta int\_res/M2)^2$) [Author's calculation drawn from IFS]
Corruption	Inverse of corruption perception index proxying for the control or absence of corruption [Transparency International]
Russian crisis	Dummy variable that takes the value of 1 during August–December 1998 and 0 otherwise
Remittances	Logarithm of remittances, in millions of US dollars [Author's calculation]

Figure 1: Country Sample

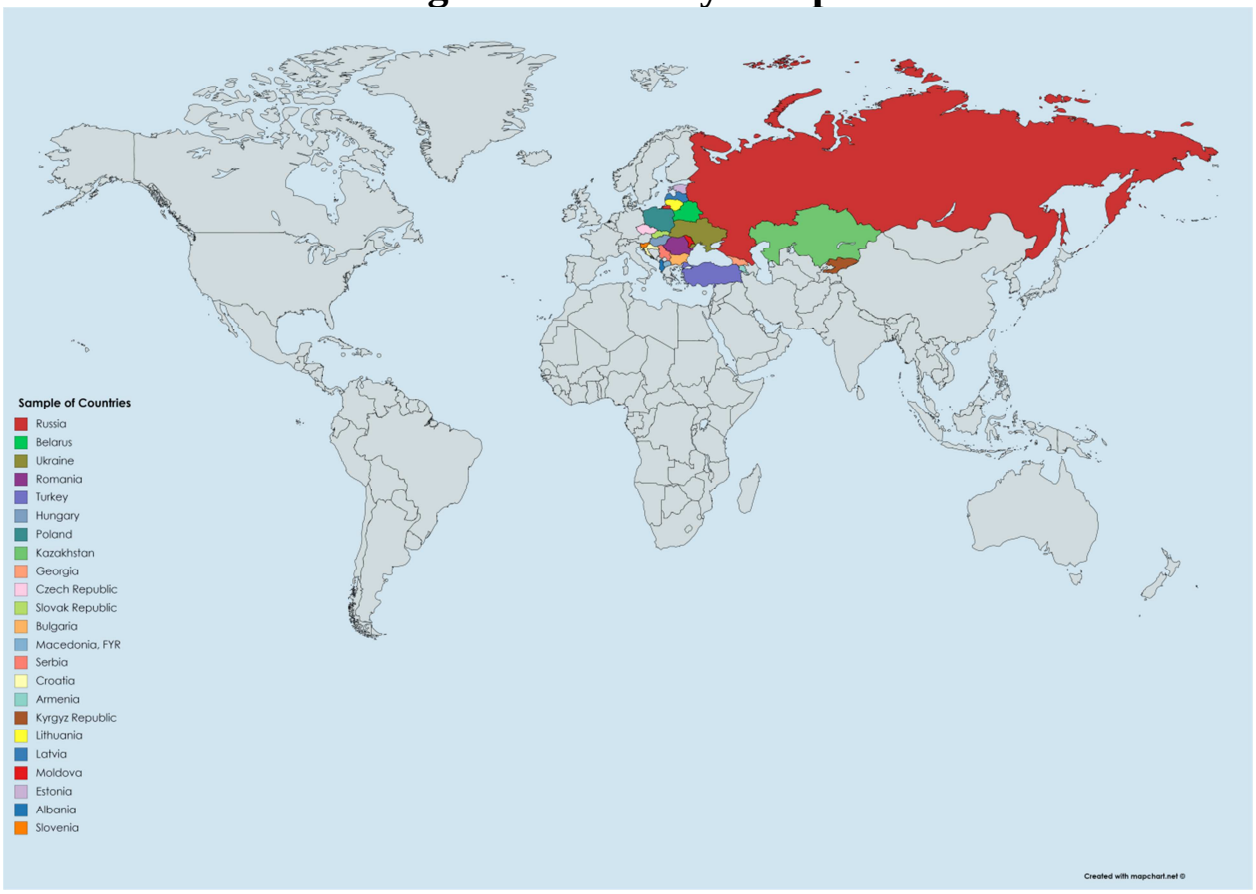

Figure 2: Deposit Dollarization

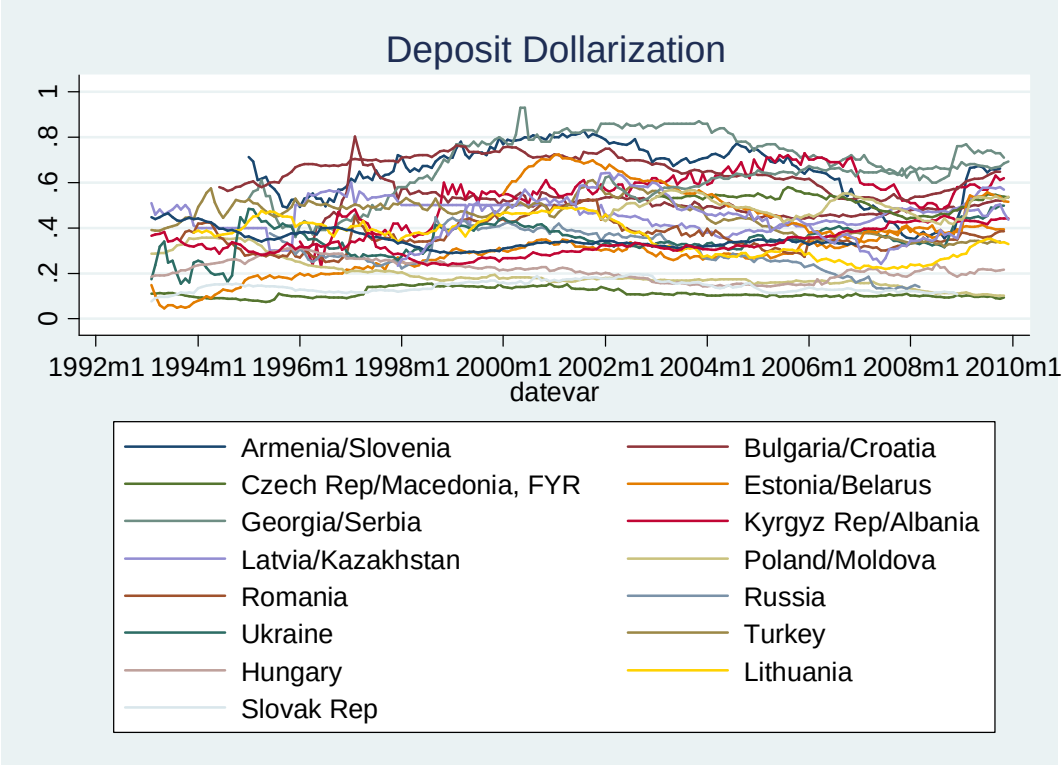

Figure 3: Loan Dollarization

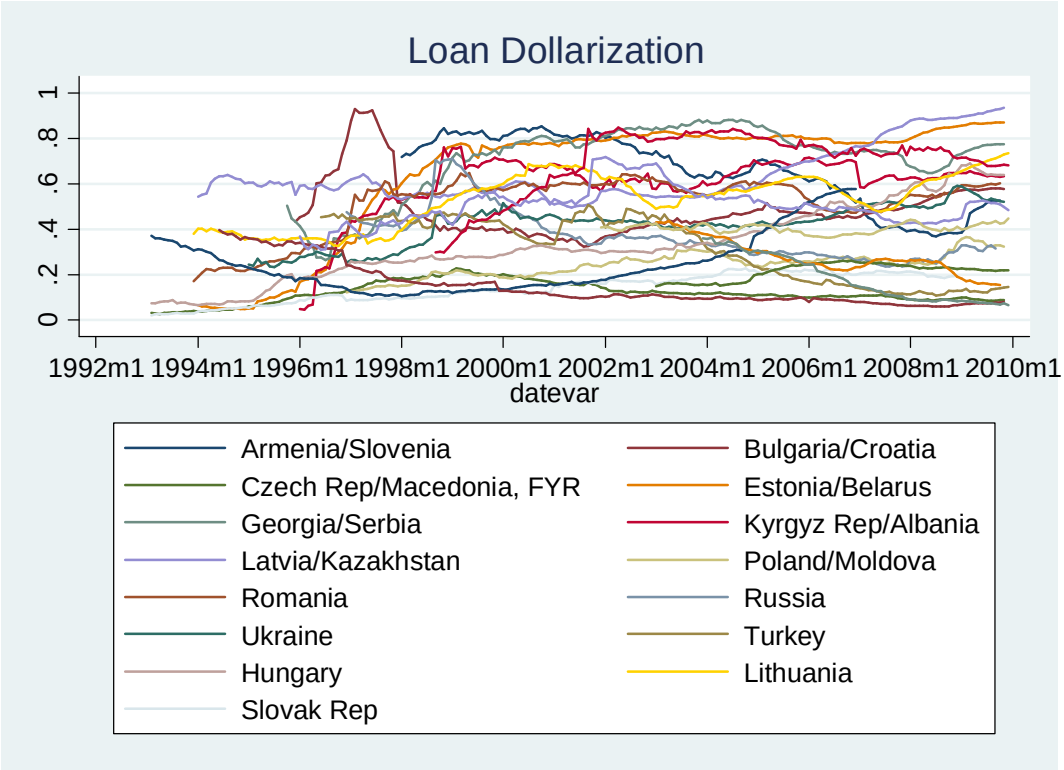

Figure 4: Regional Financial Dollarization

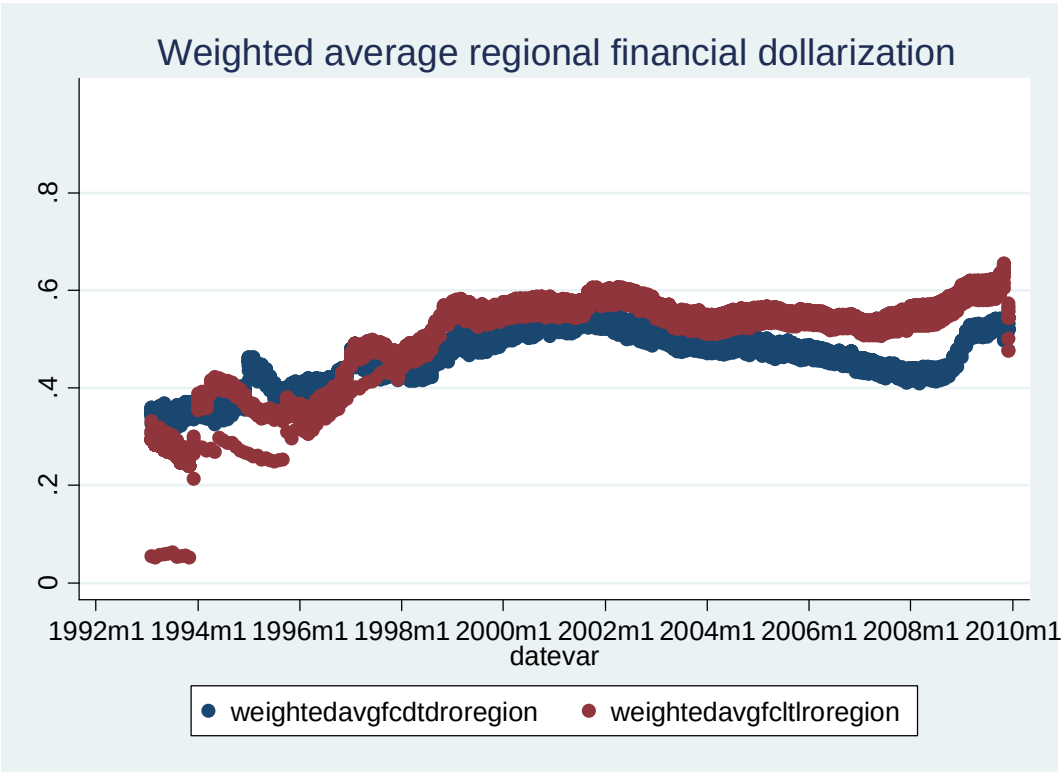

Table 1: Summary Statistics

Variable	Mean	Std Deviation	Min	Max	Obs
Dependent Variables					
Deposit dollarization (DD)	0.399	0.181	0.071	0.930	3609
Loan dollarization (LD)	0.420	0.230	0.034	0.930	3210
Control Variables					
Regional deposit dollarization	0.479	0.046	0.324	0.564	3609
Regional loan dollarization	0.531	0.064	0.249	0.630	3210
High DD dummy	0.292	0.455	0	1	3609
High LD dummy	0.386	0.486	0	1	3210
Net foreign assets	-0.022	0.273	-1.65	0.790	3210
Restrictions	0.605	0.488	0	1	3609
MVP dollar share	0.300	0.211	-0.121	1.09	3609
Inflation	0.011	0.031	-0.056	1.23	3609
Depreciation	0.005	0.046	-0.252	1.03	3609
Interest rate difference on deposits	0.084	0.207	-0.181	3.23	3609
Interest rate difference on loans	0.107	0.304	-0.203	8.15	3210
Index of international financial integration	1.20	0.540	0.332	4.39	3609
Trade openness	0.966	0.321	0.387	1.74	3609
EU dummy	0.374	0.484	0	1	3609
Instruments for DD					
Bilateral trade	0.299	0.082	0.075	0.489	3609
Foreign bank penetration	0.348	0.046	0.087	0.438	3609
Instruments for LD					
Bilateral trade	0.324	0.103	0.020	0.611	3210
Foreign bank penetration	0.383	0.086	0.031	0.489	3210

Notes: For definitions and sources see Appendix Table A.

Table 2: Baseline regressions

Estimator →	**Pooled OLS**		**Spatial HAC OLS**		**IV**		**Spatial HAC IV**	
Dependent variable →	**DD**	**LD**	**DD**	**LD**	**DD**	**LD**	**DD**	**LD**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Regional DD	0.287***		0.287***		**0.563*** **		**0.805*** **	
	(0.037)		(0.016)		**(0.195)**		**(0.026)**	
Regional LD		0.304***		0.304***		**0.646*** **		**0.732*** **
		(0.030)		(0.017)		**(0.184)**		**(0.019)**
DD		0.059***		0.059***		0.020		0.012
		(0.015)		(0.012)		(0.113)		(0.012)
Net foreign assets		-0.048***		-0.048***		-0.037		-0.048***
		(0.007)		(0.006)		(0.038)		(0.006)
High LD dummy		0.354***		0.354***		0.351***		0.353***
		(0.005)		(0.006)		(0.046)		(0.007)
High DD dummy	0.287***		0.287***		0.271***		0.277***	
	(0.004)		(0.004)		(0.033)		(0.004)	
Restrictions	-0.022***	-0.004	-0.022***	-0.004*	-0.020	0.001	-0.025***	-0.014***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.021)	(0.022)	(0.003)	(0.002)
MVP dollar share	0.184***	0.277***	0.184***	0.277***	0.156***	0.264***	0.182***	0.286***
	(0.008)	(0.009)	(0.008)	(0.008)	(0.057)	(0.063)	(0.007)	(0.008)
Inflation	0.168**	0.054	0.168***	0.054***	0.191*	0.182**	0.237***	-0.036***
	(0.065)	(0.064)	(0.008)	(0.013)	(0.110)	(0.081)	(0.010)	(0.017)
Depreciation	0.070*	0.010	0.070***	0.010***	0.074**	-0.089	-0.055***	0.105***
	(0.036)	(0.056)	(0.003)	(0.004)	(0.032)	(0.060)	(0.003)	(0.007)
Interest rate difference	-0.006	0.018**	-0.006**	0.018***	-0.010	0.021	0.009***	0.037***
	(0.011)	(0.007)	(0.003)	(0.002)	(0.033)	(0.014)	(0.003)	(0.002)
International financial integration	0.035***	0.047***	0.035***	0.047***	0.027	0.025	0.034***	0.038***
	(0.003)	(0.005)	(0.002)	(0.003)	(0.026)	(0.020)	(0.003)	(0.003)
Trade openness	-0.060***	0.024***	-0.060***	0.024***	-0.059	-0.031	-0.057***	0.033***
	(0.006)	(0.007)	(0.003)	(0.004)	(0.043)	(0.030)	(0.003)	(0.004)
EU dummy	-0.077***	-0.046***	-0.077***	-0.046***	-0.085***	-0.079***	-0.095***	-0.073***
	(0.004)	(0.005)	(0.002)	(0.002)	(0.024)	(0.028)	(0.002)	(0.002)
Countries / Obs	23 / 3609	22 / 3210	23 / 3609	22 / 3210	23 / 3609	22 / 3210	23 / 3609	22 / 3210
R-square (centered)	0.729	0.794	n.a.	n.a.	0.722	0.772	n.a.	n.a.
LM test (p-value)	n.a.	n.a.	n.a.	n.a.	0.000	0.000	n.a.	n.a.
F test	n.a.	n.a.	n.a.	n.a.	246.2	220.3	n.a.	n.a.
Hansen J-test (p-value)	n.a.	n.a.	n.a.	n.a.	0.243	0.021	0.320	0.313
First-stage results								
Dependent variable →					**Regional DD**	**Regional LD**	**Regional DD**	**Regional LD**
Bilateral trade					0.267***	0.142***	0.267***	0.142***
					(0.031)	(0.022)	(0.002)	(0.003)

Foreign bank penetration	0.438*** (0.041)	0.458*** (0.040)	0.438*** (0.004)	0.458*** (0.003)
R-square (centered)	0.626	0.731	n.a.	n.a.
F test	218.5	220.3	n.a.	n.a.

Notes: Dependent variables are deposit dollarization (DD) and loan dollarization (LD). Standard errors in parentheses based on robust standard errors adjusted for heteroskedasticity and serial correlation. Constant term not reported. Instrumented variables are in bold type. Regressions (1)-(2) based on pooled OLS, (3)-(4) based on pooled OLS corrected for cross-sectional spatial dependence and panel-specific serial correlation, (5)-(6) based on two-step efficient GMM estimation clustered by country, and (7)-(8) based on two-step efficient GMM estimation corrected for cross-sectional spatial dependence and panel-specific serial correlation. The LM test p-value refers to the LM Kleibergen and Paap (2006) rk statistic, which is a generalization to non-iid errors of the LM version of Anderson canonical correlations likelihood ratio test, with null hypothesis that the first-stage regression is underidentified. The F-test refers to the Kleibergen and Paap (2006) rk Wald F-statistic, which tests weak identification of the excluded instruments. The null hypothesis is that the first-stage regression is weakly identified. The Hansen J-test p-value refers to the overidentification test of all instruments, with null hypothesis that instruments are uncorrelated with the error term. The lower panel reports the coefficient estimates of the excluded instruments from the first-stage regressions. The null hypothesis of the F-test in the first-stage regressions is that the coefficients on the excluded instruments equal zero. ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

Table 3: Alternative spatial kernels

Estimator →	**Spatial HAC IV**							
Spatial threshold →	**117km**	**1170km**	**3845km**	**4824km**	**117km**	**1170km**	**3845km**	**4824km**
Dependent variable →	**DD**	**DD**	**DD**	**DD**	**LD**	**LD**	**LD**	**LD**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Regional DD	**0.768*** **	**0.804*** **	**0.807*** **	**0.807*** **				
	(0.086)	**(0.030)**	**(0.017)**	**(0.015)**				
Regional LD					**0.732*** **	**0.732*** **	**0.732*** **	**0.732*** **
					(0.070)	**(0.022)**	**(0.012)**	**(0.011)**
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES
Countries / Obs	23 / 3609	23 / 3609	23 / 3609	23 / 3609	22 / 3210	22 / 3210	22 / 3210	22 / 3210
Hansen J-test (p-value)	0.359	0.322	0.318	0.318	0.268	0.312	0.316	0.316

Notes: Dependent variables are deposit dollarization (DD) and loan dollarization (LD). Constant term and first-stage regression results not reported. Instrumented variables are in bold type. All regressions based on two-step efficient GMM estimation corrected for cross-sectional spatial dependence and panel-specific serial correlation. The Hansen J-test p-value refers to the overidentification test of all instruments, with null hypothesis that instruments are uncorrelated with the error term. ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

Table 4A: Additional controls

Dependent variable →	**DD (1)**	**DD (2)**	**DD (3)**	**DD (4)**	**DD (5)**	**DD (6)**	**DD (7)**	**DD (8)**
Regional DD	**0.817*** (0.028)**	**0.809*** (0.025)**	**0.685*** (0.024)**	**0.804*** (0.025)**	**0.806*** (0.025)**	**0.647*** (0.022)**	**0.974*** (0.041)**	**0.898*** (0.045)**
Start of EU accession process	-0.096*** (0.002)							
Decision to join EU	-0.110*** (0.002)							
European Union membership	-0.086*** (0.003)							
Asymmetry of exchange rate movements		-0.005*** (0.001)						
Exchange rate intervention			-0.062*** (0.003)					
Forward market liberalization				-0.039*** (0.002)				
Russian crisis					-0.002 (0.002)			
Corruption						-0.017*** (0.001)		
Remittances							-0.001 (0.001)	
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES
Countries / Obs	23 / 3609	23 / 3609	23 / 3548	23 / 3474	23 / 3609	20 / 2856	15 / 1535	23 / 3324
Hansen J-test (p-value)	0.321	0.320	0.322	0.326	0.320	0.316	0.315	0.318

Notes: Dependent variables are deposit dollarization (DD) and loan dollarization (LD). Constant term and first-stage regression results not reported. Instrumented variables are in bold type. All regressions based on two-step efficient GMM estimation corrected for cross-sectional spatial dependence and panel-specific serial correlation. The Hansen J-test p-value refers to the overidentification test of all instruments, with null hypothesis that instruments are uncorrelated with the error term. ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

Table 4B: Additional controls

Dependent variable →	**LD (1)**	**LD (2)**	**LD (3)**	**LD (4)**	**LD (5)**	**LD (6)**	**LD (7)**	**LD (8)**
Regional LD	**0.724*** (0.018)**	**0.744*** (0.018)**	**0.738*** (0.018)**	**0.767*** (0.016)**	**0.735*** (0.020)**	**0.846*** (0.090)**	**0.333*** (0.029)**	**0.703*** (0.024)**
Start of EU accession process	-0.087*** (0.002)							
Decision to join EU	-0.037*** (0.003)							
European Union membership	-0.039*** (0.002)							
Asymmetry of exchange rate movements		0.002 (0.002)						
Exchange rate intervention			-0.037*** (0.002)					
Forward market liberalization				-0.017*** (0.003)				
Russian crisis					-0.002 (0.002)			
Corruption						-0.008*** (0.003)		
Remittances							0.004*** (0.001)	
Additional controls	YES	YES	YES	YES	YES	YES	YES	YES
Countries / Obs	22 / 3210	22 / 3210	22 / 3185	22 / 3088	22 / 3210	19 / 2495	14 / 1263	22 / 3018
Hansen J-test (p-value)	0.314	0.313	0.314	0.314	0.314	0.315	0.317	0.314

Notes: Dependent variables are deposit dollarization (DD) and loan dollarization (LD). Constant term and first-stage regression results not reported. Instrumented variables are in bold type. All regressions based on two-step efficient GMM estimation corrected for cross-sectional spatial dependence and panel-specific serial correlation. The Hansen J-test p-value refers to the overidentification test of all instruments, with null hypothesis that instruments are uncorrelated with the error term. ***, **, * denote significance at the 1%, 5%, 10% level, respectively.

Table 5: Marginal effects and sub-sample estimates

Sample →	**Interaction**	**High DD**	**Low DD**	**Interaction**	**High LD**	**Low LD**
Dependent variable →	**DD**	**DD**	**DD**	**LD**	**LD**	**LD**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Regional DD	**0.907*** (0.025)**	**0.375*** (0.063)**	**1.01*** (0.026)**			
Regional LD				**0.852*** (0.016)**	**0.176*** (0.070)**	**0.854*** (0.013)**
Regional DD * High DD dummy	**-0.443*** (0.078)**					
Regional LD * High LD dummy				**-0.871*** (0.039)**		
Additional controls	YES	YES	YES	YES	YES	YES
Countries / Obs	23 / 3609	13 / 1056	21 / 2553	22 / 3210	14 / 1239	22 / 1971
Hansen J-test (p-value)	0.608	0.985	0.318	0.601	0.314	0.313

Notes: Dependent variables are deposit dollarization (DD) and loan dollarization (LD). Constant term and first-stage regression results not reported. Instrumented variables are in bold type. All regressions based on two-step efficient GMM estimation corrected for cross-sectional spatial dependence and panel-specific serial correlation. The Hansen J-test p-value refers to the overidentification test of all instruments, with null hypothesis that instruments are uncorrelated with the error term. ***, **, * denote significance at the 1%, 5%, 10% level, respectively.