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# Euroization of bank deposits

## SUMMARY

*In Central, Eastern and Southeastern Europe a substantial share of bank deposits are denominated in foreign currency. Deposit euroization poses key challenges for monetary policy and financial sector supervision. On the one hand, it limits the effectiveness of monetary policy interventions. On the other hand, it increases financial sector fragility by exposing banks to currency risk or currency-induced credit risk. Policymakers disagree on whether countries in the region should tackle deposit euroization with 'dedollarization' policies or should rather strive to adopt the Euro as their legal tender. Assessing the potential effectiveness of 'dedollarization' policies requires a clear understanding of which households hold foreign currency deposits and why they do so. On the basis of survey data covering 16,375 households in ten countries in 2011 and 2012, we provide a comprehensive household-level analysis of deposit euroization in Central, Eastern and Southeastern Europe. We examine how households' preferences for, and holding of, foreign currency deposits are related to individual expectations about monetary conditions and network effects. We also examine to what extent monetary expectations and deposit euroization are the legacy of past financial crises or the outflow of current policies and institutions in the region. Our findings suggest that deposit euroization in Central, Eastern and Southeastern Europe can be partly tackled by prudent monetary and economic decisions by today's policymakers. The preferences of households for Euro deposits are partly driven by their distrust in the stability of their domestic currency, which in turn is related to their assessment of current policies and institutions. However, our findings also suggest that a stable monetary policy may not be sufficient to deal with the hysteresis of deposit euroization across the region. First, we confirm that the holding of foreign currency deposits has become a 'habit' in the region. Second, we find that deposit euroization is still strongly influenced by households' experiences of financial crises in the 1990s. Our findings question the effectiveness of supply side interventions (e.g. bank regulation) or demand side interventions (e.g. local currency capital market development) in de-euroizing household savings. First, we show that deposit euroization is largely demand driven. Second, we show that households already have access to a broad range of savings products in local currency.*

*JEL codes: G21, E41, D14*

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# The euroization of bank deposits in Eastern Europe

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## 1. INTRODUCTION

Policymakers and academics agree that the widespread euroization of bank deposits in Central, Eastern and Southeastern Europe constrains domestic monetary policy and poses a major threat to financial stability (Levy-Yeyati, 2006; Ranciere et al., 2010). However they disagree on how best to deal with deposit euroization. International financial institutions, for example the EBRD and the IMF, emphasize the need to 'dedollarize' the banking sector (e.g. Nagy et al., 2011). Enhancing the credibility of domestic monetary policy is seen as a key step towards dedollarization (Kokenyne et al., 2010). Further policy recommendations include the development of local currency capital markets, or regulatory interventions to discourage the provision of foreign currency savings and credit products (Hake et al., 2014). By contrast, some policymakers in the

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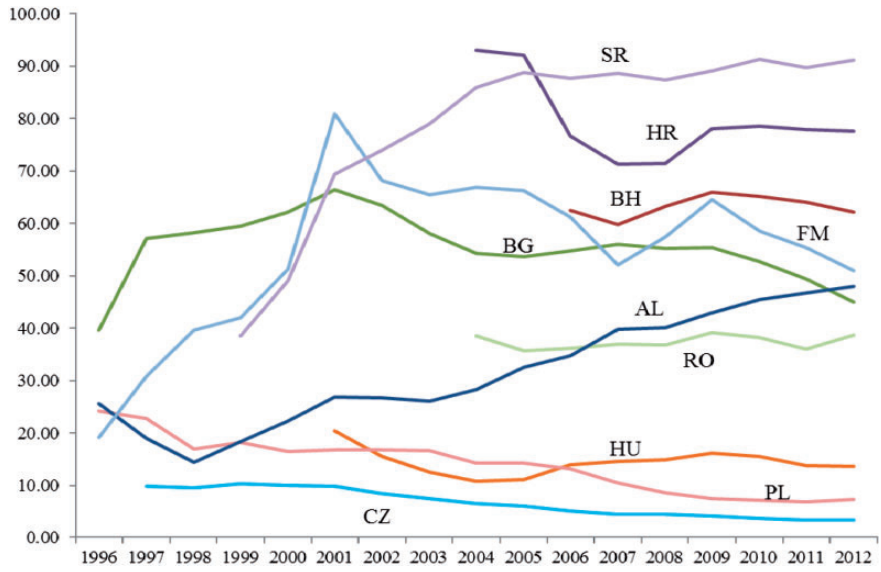



**Figure 1. Deposit substitution in Eastern Europe.**

*Notes:* The figure shows aggregate shares of deposits in foreign currency (in %) for private households (and non-profit organizations) in the ten countries covered by the OeNB Euro Survey over the period 1996–2012.

*Source*: National Central Banks.

region view deposit euroization as an inevitable heritage of past financial crises, and thus recommend a fast adoption of the Euro.

In 2012, more than 75% of bank deposits in Croatia and Serbia and more than 40% of deposits in Albania, Bosnia and Herzegovina, Bulgaria and FYR Macedonia were denominated in foreign currency, predominantly the Euro. Figure 1 shows that the share of foreign currency denominated deposits increased strongly in Southeastern Europe (e.g. Serbia, Albania, Romania and Bulgaria) during the financial crises of the 1990s and has remained high throughout the more recent financial and sovereign crises. By contrast, the share of foreign currency deposits has declined gradually in Central Europe (e.g. Poland, Hungary and Czech Republic).

What drives these large differences in the euroization of deposits across countries? Are households' expectations regarding future monetary conditions the main driver of foreign currency deposit holdings? If so, are these expectations affected by the recent track-record of domestic policymakers or are they rooted in historical experiences of banking and currency crises? To what extent do habit or network effects, which are also possibly rooted in past financial crises, determine households' preferences for foreign currency deposits?

In this paper, we use household-level survey data to clarify the drivers of deposit euroization in Central, Eastern and Southeastern Europe, and to assess the potential effectiveness of dedollarization policies. We examine how the demand for foreign currency deposits is related to individual expectations about future monetary conditions as

opposed to network effects. Motivated by the recent empirical research on the role of financial sophistication and financial decision making, we also examine to what extent financial literacy affects the demand for foreign currency deposits across households.

Our analysis is based on a representative household-level data set collected by the Euro Survey project of the Austrian Central Bank (OeNB). Since 2007 the OeNB has repeatedly carried out surveys among private individuals to collect information on the role of the Euro in ten Central, Eastern and Southeastern European countries–the six new EU member countries Croatia, Bulgaria, Romania, Poland, Hungary and Czech Republic as well as the four (potential) EU candidates Albania, Serbia, Bosnia and Herzegovina and FYR Macedonia. Our analysis focuses on the two surveys from Fall 2011 and Fall 2012 because they provide comprehensive information on the potential drivers of deposit euroization. Moreover, these two survey waves elicited information on households' foreign currency deposit preferences, irrespective of whether they had savings in a deposit account or not. This information enables us to disentangle demand from supply effects of deposit euroization. Also, we obtain information on the demand for foreign currency deposits among the numerous households which have a bank account, but do not (currently) have savings in a deposit account.

We report five main findings. First, we document that the euroization of deposits in Central, Eastern and Southeastern Europe is demand-driven: among households which have a savings account the share of foreign currency deposits coincides with stated preferences for foreign currency savings. Second, we show that deposit euroization at the household-level is strongly related to monetary expectations: households which expect a depreciation of the local currency over the next year or who have little trust in the long-term stability of the local currency are more likely to prefer foreign currency deposits. Exchange rate expectations have a stronger impact on deposit substitution in countries with a pegged currency, likely because any depreciation in these countries would be severe. Third, we find that network effects strongly affect the preferences of households for foreign currency deposits: conditional on their monetary expectations, households which report that foreign currency saving is common in their country are more likely to prefer foreign currency deposits themselves. Fourth, we show that financially sophisticated households are more likely to base their currency choice on monetary expectations. Finally, we document that deposit euroization in the region is strongly influenced both by past financial crises as well as by current policies and institutions. The role of past versus current policies is surprisingly similar across household cohorts.

Overall, our results suggest that deposit euroization in Central, Eastern and Southeastern Europe may be partly tackled by a stable monetary regime and sound economic policies of today's policymakers: deposit euroization is related to trust in the stability of the local currency, which in turn is influenced by households' assessments of current policies and institutions. Our results, however, also show that stable monetary policy is unlikely to be sufficient to deal with the hysteresis of deposit euroization across the region: we confirm that the holding of foreign currency deposits has become a 'habit' and is still strongly influenced by the experience of financial crises in the 1990s.

Our findings question the effectiveness of policies targeted towards local currency capital market development as well as bank regulation targeted towards discouraging the supply of savings products in foreign currency. First, we show that households have ample access to a broad range of savings products in local and foreign currency. Second, we show that the deposit euroization is largely demand driven. Thus any policy to discourage foreign currency deposits may well encourage the use of other foreign currency-denominated financial assets, like foreign currency cash, rather than local currency bank deposits.

**Box 1. The availability of retail savings products in foreign currency**

Retail depositors in Central, Eastern and Southeastern Europe have broad access to savings products in foreign currency. This is revealed by a survey of the websites of the three major banks (as measured by their number of branches) for each of the countries covered in our analysis. In all ten countries, major banks offer current accounts, non-maturing (sight) deposit accounts and term deposit accounts in foreign currency to their retail customers. Minimum balances and maturities for foreign currency (and local currency) term deposits vary across countries and across banks within the same country. For example, in Bulgaria the three major banks (DSK bank, UniCredit Bulbank and Central Cooperative Bank) offer foreign currency term deposits from 250, 100 and 50 Euro, respectively. Within each bank, minimum maturities do not differ for local currency and foreign currency term deposits but minimum balance requirements are typically higher for foreign currency deposits. For example, in May 2014 UniCredit Bulbank (Bulgaria) offered term deposits in Bulgarian Lev (1.96 BGN = 1 EUR) and Euro with maturities from 1 week to 24 months. The minimum balance for local currency term deposits was 50 Lev compared to a minimum balance of 100 Euro for foreign currency deposits. The same bank offered their retail customers' current accounts (from a minimum balance of 50 BGN or 25 Euro) and sight deposits (from a minimum balance of 10 Lev or 50 Euro) in both currencies.[1]

## 2. DEPOSIT SUBSTITUTION: THEORY AND EVIDENCE

The term dollarization–or in our case euroization–relates to the use of foreign currency as a medium of payments (*currency substitution*) and as a medium to store wealth (*asset substitution*). In this paper we examine the preferences of households for foreign currency savings accounts as opposed to local currency savings accounts. We relate this *deposit*

[1] http://www.unicreditbulbank.bg/en/Individual_Clients/Deposits/DepositOnHand/Documents/index.htm (accessed May 25, 2014).

*substitution* primarily to the motive of wealth storage. However, the funds held in foreign currency savings accounts may also be used directly for payment purposes. Thus in the following we relate our analysis to the existing literature on both asset substitution and currency substitution.

### 2.1. Theory

Ize and Levy-Yeyati (2003) provide a *portfolio theory of asset substitution*. They propose that–under the condition that the uncovered interest rate parity holds–risk-averse investors choose the currency composition of their assets and liabilities so as to minimize the variance of the real value of their net worth. Higher inflation volatility and lower volatility of the real exchange rate imply a higher share of foreign currency assets and liabilities in the minimum variance portfolio (MVP). The portfolio theory thus suggests that deposit substitution will increase if households expect higher volatility of domestic inflation *or* lower volatility of the real exchange rate. When the uncovered interest parity does not hold households deviate from the MVP: they increase the share of foreign currency assets and decrease the share of foreign currency liabilities as the real interest rate differential between the foreign and local currency widens.[2] The portfolio theory suggests that deposit substitution will increase if the expected real interest rate on foreign currency deposits rises compared to the real interest rate on local currency deposits. Thus–for given market deposit rates–households which expect higher domestic inflation and/or a stronger depreciation of the local currency will be more likely to prefer foreign currency deposits.

Broda and Levy-Yeyati (2006) provide a *market failure theory of asset substitution*. In their model a positive correlation between exchange rate risk and default risk encourages banks to finance themselves with foreign currency deposits. They show that if there is asymmetric information about their currency exposure and government safety nets (i.e. deposit insurance) treat foreign currency and local currency deposits equally, depositors will accept lower real interest rates on foreign currency deposits than on local currency deposits. In a further model of market failure Ranciere et al. (2010) show that implicit bail-out guarantees (e.g. the guarantee that the exchange rate of the local currency will not be allowed to depreciate) give incentives for debtors and creditors to write debt contracts in foreign currency.[3] Such implicit guarantees are likely to be stronger, the larger the share of domestic borrowers which hold unhedged foreign currency debt.[4] For deposit substitution, the market failure theories suggest a possible

[2] See Froot and Thaler (1990) for evidence on deviations from the uncovered interest parity.

[3] See also Schneider and Tornell (2004).

[4] Recent policy measures to protect foreign currency mortgage borrowers in Hungary provide an example of implicit bail-out guarantees for foreign currency borrowers. The experience of Latvia during the 2008–9 financial crisis provides an example of how widespread foreign currency borrowing may limit the ability to devalue the domestic currency.

role of network effects: households with given expectations regarding monetary conditions will be more likely to choose foreign currency deposits if deposit substitution is widespread in the economy. This is the case because widespread deposit substitution enables monetary authorities to devalue the local currency without hurting domestic savers.

*Currency substitution theories* (e.g. Engineer 2000) suggest that agents choose the foreign versus local currency as a means of payment by trading off the purchasing power risk of local currency versus the transaction costs of using foreign currency. In these models foreign currency is more likely to be used as a medium of exchange if (i) the expected depreciation of the local currency is high, and (ii) the transaction costs of using foreign currency (counterfeit risk, currency conversion costs) are low. Craig and Waller (2004) show that due to network effects the transaction costs of using foreign currency versus local currency can be endogenous to the level of currency substitution. For deposit substitution these theories suggest that households that regularly use savings deposits for payment purposes will be more likely to hold their deposits in foreign currency if expected inflation and depreciation of the local currency is high and foreign currency is widely used as a payment medium.

## 2.2. Evidence

Empirical evidence on the determinants of deposit substitution is scarce and mostly limited to aggregate data.[5] Ize and Levy-Yeyati (2003) examine aggregate data for 46 low-income, middle-income and upper-income countries for the period 1990–5. They provide evidence supporting the minimum-variance portfolio theory: the aggregate share of foreign currency deposits is positively related to inflation volatility and negatively related to real exchange rate volatility (see also Levy-Yeyati, 2006). De Nicolo et al. (2005) examine a sample of 100 countries for the period 1990–1 and confirm the impact of inflation and exchange rate volatility on aggregate deposit dollarization. In addition, they find that higher inflation levels and weak institutions (government efficiency, rule of law, corruption, etc.) are associated with higher levels of dollarization. Brown et al. (2013*a*) examine the relation between regional consumer price inflation

[5] By contrast, there is now ample research documenting the relevance of foreign currency deposits for foreign currency lending and thus for financial sector fragility, specifically in Emerging Europe. Luca and Petrova (2008) and Basso et al. (2011), examining aggregate credit dollarization for transition countries, document that countries in which banks have a higher share of foreign currency funding display a higher share of loans in FX. Brown and De Haas (2012) examine bank-level survey data from 20 transition countries and find that banks with a higher share of foreign currency customer deposits lend more in foreign currency to firms and households. Brown et al. (2014) confirm this result using administrative data from one Bulgarian Bank. Brown et al. (2011) and Fidrmuc et al. (2013) use survey data to provide firm-level and household-level evidence on the determinants of foreign currency borrowing in Emerging Europe. Hake et al. (2014) provide a meta-analysis of studies on the determinants of dollarization in Emerging Europe and Latin America.

and financial dollarization within Russia. They match regional-level data on CPI inflation with data on the currency denomination of bank deposits and loans for 71 Russian regions over the period 2005–8. They find that regions with higher local inflation experience a stronger dollarization of bank deposits.

Valev (2012) provides household-level evidence on the use of foreign currency as a means of payment in Eastern Europe. Using household survey data from Bulgaria in 2003 he finds that the use of the Euro (rather than Bulgarian Lev) as a means of payment is related to network effects rather than to expected currency depreciation. Using the same Euro Survey data as we use in this paper, Stix (2013) provides evidence on why households hold cash in foreign currency as opposed to domestic currency. In contrast to Valev (2012) these cash holdings are not necessarily confined to payments but also serve as a store of value. His results highlight both the role of network effects (i.e. households are more likely to hold cash in foreign currency if they report that payments in foreign currency are common) and of depreciation expectations.

### 2.3. Our contribution

We complement the above empirical literature by employing household-level data to study the determinants of foreign currency deposits in Central, Eastern and Southeastern Europe. The use of household-level as opposed to aggregate data allows us to address a number of identification problems that are inherent in the latter: (1) household-level data allow us to isolate the behavior of individual savers from that of firms; (2) household-level data allow us to disentangle demand drivers of deposit dollarization from supply-side drivers; (3) household-level measures of monetary expectations and network effects enable us to accurately identify the main determinants of financial dollarization.

The use of household-level data also allows us to study heterogeneities in the preferences for foreign currency deposits across households: we can establish to what extent households' preferences for foreign currency deposits are related to household age and personal experience of past financial crises. We can also establish to what extent foreign currency deposit preferences are related to the financial sophistication of households.

## 3. DATA AND METHODOLOGY

### 3.1. Empirical framework and hypotheses

The empirical framework for our analysis is presented in Figure 2. Based on the theories reviewed above we conjecture that household demand for foreign currency deposits (as opposed to local currency deposits) is directly affected by (1) monetary expectations of the household (exchange rate and inflation expectations); (2) network effects (the use of foreign currency as a means of storage or payment by other households); and

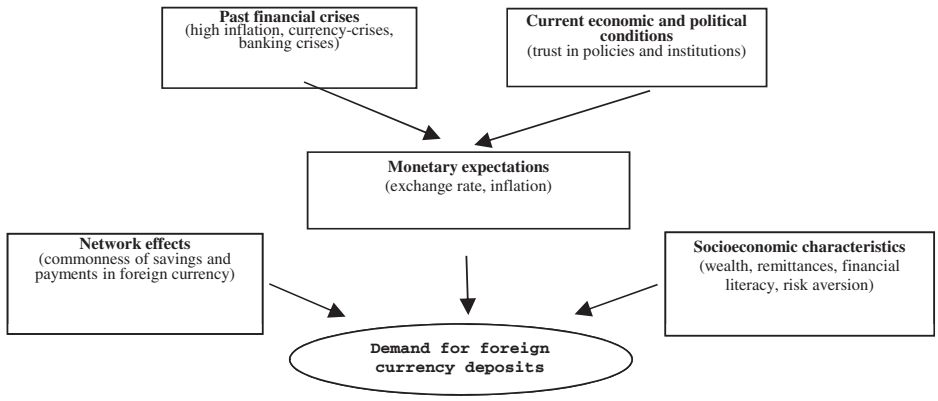



**Figure 2. Empirical framework.**

(3) selected socioeconomic characteristics of the household (income, risk tolerance, financial literacy).

We further conjecture that deposit substitution may be indirectly affected by household-level experiences of financial crises in the past as well as by the household's assessment of current policies and institutions. Existing evidence suggests that monetary expectations household preferences (e.g. risk tolerance) and financial behavior may be influenced by past macroeconomic turbulence. Ehrmann and Tzamourani (2012) document hysteresis in monetary expectations of households.[6] Osili and Paulson (2014) show that households that have experienced a banking crisis in the past are less likely to use bank deposit accounts. Malmendier and Nagel (2011) document that households which have experienced macroeconomic downturns are less risk tolerant and have a lower propensity to invest in financial markets. Employing the same survey data we use in this study Stix (2013) documents that memories of past banking crises and current trust in the banking sector affect the propensity of households to save in cash as opposed to with banks.

Based on this empirical framework we split our analysis into two sections: first, we examine to what extent deposit euroization is driven by individual monetary expectations, network effects and socioeconomic characteristics of the household. Second, we examine how past experiences of financial crises as opposed to the assessment of economic policies and institutions affect deposit substitution indirectly through monetary expectations. With respect to these questions we test the following two hypotheses:

> **Hypothesis 1:** Households prefer foreign currency as opposed to local currency deposits if (1) they expect a depreciation of the local currency and or higher domestic inflation, and (2) if they perceive that a larger share of other households in their country hold foreign currency deposits.

[6] Feige (2003) provides evidence for hysteresis of currency substitution in transition economies.

**Hypothesis 2:** Households which experienced a financial crisis in the past and households that have a negative assessment of current policies and institutions are more likely to distrust the domestic currency and thus are more likely to prefer foreign currency deposits.

Motivated by the recent literature on financial sophistication and financial decision making we further examine to what extent household education and financial literacy affect the demand for foreign currency deposits. Existing evidence suggests that financially literate households (or households with strong cognitive abilities) are more likely to hold more sophisticated financial assets (Christelis et al., 2010; Van Rooij et al., 2011) and are more likely to diversify their financial asset holdings (Guiso and Jappelli, 2009).[7]

Financial sophistication may also affect the sensitivity of household currency choice to monetary expectations and network effects. First, the existing evidence shows that households with stronger numerical abilities are more likely to successfully process complex financial information (Agarwal and Mazumder, 2013). In our setting, it is therefore likely that households with higher education and stronger financial literacy predominantly base their deposit currency choices on available and relevant financial information regarding future exchange rate developments. Second, Hong et al. (2004) show that social interaction affects stock market participation and that this network effect is stronger for the better educated and wealthy–i.e. financially sophisticated households. They argue that social interaction may affect investment behavior as (1) households learn about more complex financial assets and (2) households draw utility from being able to 'talk about' holding such assets. In our setting this could imply that the deposit currency choices of financial sophisticated households are more likely to be subject to network effects.

Based on the above evidence we derive our third empirical hypothesis:

**Hypothesis 3:** Financially sophisticated households, e.g. better educated and financially literate households, are more likely to hold foreign currency deposits. Moreover, the currency choice of financially sophisticated households is more sensitive to exchange rate expectations and network effects than that of households with less financial sophistication.

### 3.2. The Euro Survey data

Our household-level data are taken from the Euro Survey project of the Austrian Central Bank (Oesterreichische Nationalbank, OeNB). Our analysis focuses on the two surveys which were conducted in Fall 2011 and Fall 2012, and for which instruments

[7] By contrast, recent evidence (based on the same survey data we use) also documents that households which are literate with respect to the implication of exchange rate changes issues are less likely to choose foreign currency as opposed to local currency loans (Beckmann and Stix, 2014).

were devised to elicit detailed information about deposit substitution and monetary expectations.

For each of the two survey waves, face-to-face interviews were carried out with roughly 1,000 randomly chosen respondents aged over 14 in each country. For the estimations in this paper, we only use data for respondents above the age of 18 who are either employed, unemployed or retired. This restriction was chosen to make sure that the sample only includes respondents who face economic choices concerning savings decisions and leaves us with a sample of 16,375 observations. Due to missing information for selected household-level covariates the number of observations in each of our regressions deviates from this number. All variables that are used in our empirical analysis are defined in Appendix A1, while Appendix A2 presents descriptive statistics. These descriptive statistics as well as subsequent regressions are not weighted.

**Box 2: The OeNB Euro Survey**

As part of its strategic focus on the economic analysis of the countries of Central, Eastern and Southeastern Europe, the Oesterreichische Nationalbank (OeNB) launched the Euro Survey project in 2007. The goal of this survey is to collect information from individuals about the role of the Euro in households' portfolios in ten Central, Eastern and Southeastern European countries: six EU Members States which are not part of the Euro-area (Bulgaria, Croatia, Czech Republic, Hungary, Poland and Romania) as well as four (potential) EU candidate countries (Albania, Bosnia and Herzegovina, FYR Macedonia and Serbia). In these countries, repeated cross-sectional surveys have been conducted since Fall 2007 with a core questionnaire and varying special topics.

The surveys are centrally organized by the Austrian Gallup Institute (Karmasin Marktforschung) and carried out by national contractors in the respective countries. In general, samples are selected via a multistage stratified random sample procedure, with the exception of Bulgaria, where a variant of random quota sampling is applied. For countries that apply multistage stratified random sampling, strata are formed according to regions (typically NUTS II regions or equivalents) and urbanization levels and the sampling points represent the whole territory of the countries surveyed (until Spring 2012, only the population of the ten largest cities was sampled in Poland; thereafter the surveys cover Poland as a whole) and starting points are selected randomly. Further addresses are selected using standard 'random route' procedures from the starting point. Finally, the selection of the interviewee in each household is randomized by standard procedures. The surveys may be conducted as part of omnibus surveys or as stand-alone surveys.

In each country the target population comprises residents aged 15 years or older and interviews are carried out face-to-face at the respondent's residence. Respondents do not get incentives for participating. The share of refused interviews amounts to ∼34% on average per country. The final sample per country contains ∼1,000 respondents.

We employ survey data from Fall 2011 and Fall 2012. In these surveys the first section of the Euro Survey questionnaire elicits respondents' evaluations and expectations of the current and future economic conditions. The second and third parts of the survey include questions about saving and borrowing activities of the household. The remaining sections of the questionnaire gather information on (1) the role of foreign currencies for incoming and outgoing payments, (2) personal experience of banking and currency crises, as well as socioeconomic information on respondents. In general, the survey collects basic information on households' financial portfolios (i.e. ownership of assets) but does not inquire about amounts. Another difference in comparison to household wealth surveys (e.g., European Central Bank, 2013) is that the unit of observation is the respondent and not the household. However the survey accounts for joint ownership of financial assets by asking whether the interviewed person owns them personally or jointly with a partner.

Further details and selected results can be found at http://www.oenb.at/en/Monetary-Policy/Surveys/OeNB-Euro-Survey.html (accessed March 25, 2014).




### 3.3. Deposit substitution

The Euro Survey provides us with two indicators of deposit substitution. The first indicator measures the share of deposits held in foreign currency for those households which have savings deposits at a bank. Survey respondents are asked whether they personally (or jointly with a partner) have a current account (transaction account) and/or a savings

**Table 1. Deposit substitution: preferences versus actual shares**

| | Households without a deposit account | Households with a deposit account | | | All households |
|---|---|---|---|---|---|
| | | All | Only local currency deposits | With foreign currency deposits | |
| | ($n = 13{,}577$) | ($n = 2{,}798$) | ($n = 1{,}891$) | ($n = 907$) | ($n = 16{,}375$) |
| Mean share of FC deposits (%) | | 23 | 0 | 72 | |
| Median share of FC deposits (%) | | 0 | 0 | 80 | |
| FC preference (mean) | 0.45 | 0.43 | 0.27 | 0.74 | 0.44 |

*Note:* Results of a *t*-test of equal sample means for *FC deposit preference* for households with only an LC deposit and households with an FC deposit yields a test statistic of 26.91 (*P*-value < 0.01).

deposit account (savings book, term deposit) with a bank. The overwhelming majority of the survey respondents are banked with 72% reporting that they have an account for transaction purposes. However, less than one in five respondents (17%) reports that they hold savings in a deposit account. Respondents who report a savings account are asked whether a share of the savings is denominated in foreign currency, and if yes, what share is denominated in foreign currency. The variable *FC deposit share* takes on the value 0–3 if the household reports that 0, 1–40, 41–60, 61–100% of their savings deposits are held in foreign currency. Table 1 shows that 907 of the 2,798 respondents with a savings account (32%) report to hold at least part of these deposits in foreign currency. Among the households which do have foreign currency deposits, the median share of deposits held in foreign currency is 80%. These figures suggest that only few households diversify their deposits between local and foreign currency.[8]

Our second indicator of deposit substitution measures household preferences for foreign currency as opposed to local currency deposits. All survey respondents were asked the following hypothetical question: '*Suppose you had [an amount of about two average monthly wages in local currency] to deposit in a savings account. Would you choose to deposit this amount in. . .(a) [the respective local currency], (b) Euro, (c) US dollar, (d) other foreign currency?*'. The dummy variable *FC preference* takes a value of one if the respondent prefers any foreign currency and zero if the respondent prefers local currency.

Table 1 shows that 44% of all households in our sample respond that they would prefer foreign currency to local currency deposits. It is noteworthy that the share of households which prefer foreign currency is almost identical among households which have a savings account (43%) and households which do not have a savings account (45%). Importantly, among the households with a savings account stated preferences for foreign

[8] Households may of course diversify the currency composition of their total liquid financial wealth (cash + transaction accounts + deposit account) across local and foreign currency. See Stix (2013) for evidence on the use of cash vs. bank deposits as a means of storage.

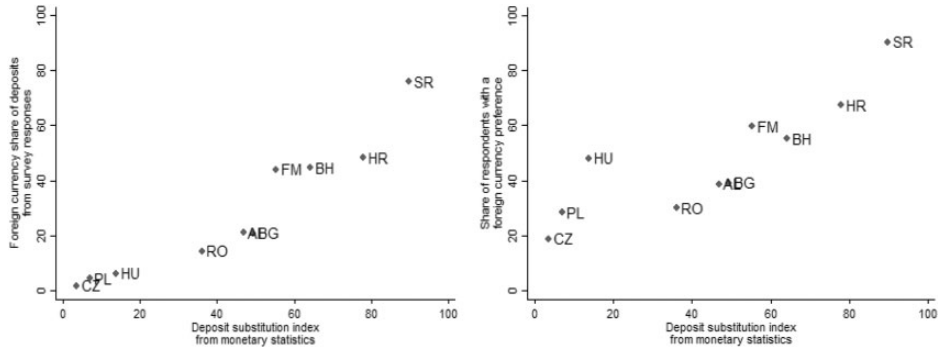



**Figure 3. Deposit euroization: survey versus aggregate data.**

*Notes:* This figure compares evidence on the share of foreign currency deposits and foreign currency preferences (among households with deposits) from the Euro Survey to evidence on aggregate deposit substitution from monetary statistics. In the right panel, we use responses only for households which have a savings account so that the reported mean is representative for those households which are covered by the aggregate monetary statistics. The latter data are inherently based only on the sample of deposit account holders.

*Sources*: OeNB Euro Survey data from 2011 and 2012, the deposit substitution index is calculated from national central bank data for the year 2011.

currency correspond well with the actual holding of foreign currency deposits. Among households with foreign currency deposits, 74% respond to the hypothetical question by preferring foreign currency deposits, compared to only 27% among households which hold only local currency deposits.

Our survey-based indicators of deposit substitution provide a surprisingly accurate picture of aggregate foreign currency deposit holdings in Central, Eastern and Southeastern Europe. Figure 3 plots the mean of the survey-reported *FC deposit share* (left panel) and *FC preference* (right panel) by country as reported in the survey against the aggregate share of bank deposits held in foreign currency as reported by national monetary authorities. The figure shows that both the share of foreign currency deposits and the stated preferences for foreign currency deposits are highly correlated with aggregate deposit substitution.

Our measure of foreign currency deposit preferences (*FC preference*) has three main advantages over our measure of foreign currency deposit holdings (*FC deposit share*): first, it allows us to examine preferences regarding foreign currency deposits for all households rather than just the small share of those households with a savings account. Second, it provides us with an unbiased measure of household demand for foreign currency deposits, as the use of foreign currency savings accounts may be affected by supply factors (i.e. differential minimum balances for accounts in foreign currency). Third, relying on survey-reported savings behavior, rather than administrative data, may lead to imprecise results as households do not accurately report their savings behavior. For example, households may underreport their savings if they are reluctant to disclose their wealth to strangers. Our hypothetical question on foreign currency preferences is less affected by disclosure issues than the question on actual savings.

A drawback of the indicator *FC preference* is that it asks households to choose between either foreign currency deposits or local currency deposits. Thus, it does not precisely measure currency preferences for those households who wish to diversify between local and foreign currency deposits. However, Table 1 shows that few households in our sample who maintain deposit accounts do diversify between currencies. This finding suggests that despite its binary nature *FC preference* is unlikely to be plagued by considerable measurement error. Our main analysis is thus based on this indicator.

### 3.4. Monetary expectations

The Euro Survey provides us with a range of indicators for monetary expectations at the respondent level. We employ two indicators of medium-term exchange rate expectations. Each respondent is asked whether they think the respective local currency will depreciate, stay the same or appreciate against the Euro over the next year. The dummy variable *Depreciation (1-year)* takes on the value 1 for households which report that they expect a depreciation of the local currency and 0 for households which expect no change or an appreciation of the local currency over the next 12 months.[9] Expected exchange rate volatility is elicited with the survey question '*How predictable do you think is the exchange rate of the [LOCAL CURRENCY] vis-à-vis the Euro over the next 12 months?*' The categorical variable *Exchange rate unpredictable (1-year)* takes on values from 0 (very predictable) to 3 (very unpredictable). This indicator does not exactly reflect the theoretical concept of the real exchange rate volatility proposed by Ize and Levy-Yeyati (2003) as it measures nominal instead of real exchange rate volatility.[10] On the other hand, this survey-based measure is superior to the use of volatilities derived from ex-post exchange rates because it is forward looking and it captures expected volatility even in countries with a currency board and in countries which have had a rather stable exchange rate.

Our two measures of medium-term inflation expectations were elicited similar to those for exchange rates: the dummy variable *Inflation higher (1-year)* is a dummy variable which takes on the value 1 for respondents which expect inflation to increase over the next 12 months and takes on the value 0 for households which expect lower or similar inflation. The dummy variable *Inflation unpredictable (1-year)* takes on values from 0 for respondents who state that inflation is very predictable over the next 12 months to 3 for respondents who state that inflation is very unpredictable.

[9] Similar information is available for expectations over the next five years. As all results are qualitatively similar to the one year-expectations we do not report estimates based on five-year expectations.

[10] This also reflects a balance between theoretical precision and what layman can understand, e.g. it would be very difficult to obtain a direct survey measure of real exchange rate volatility in a public opinion survey.

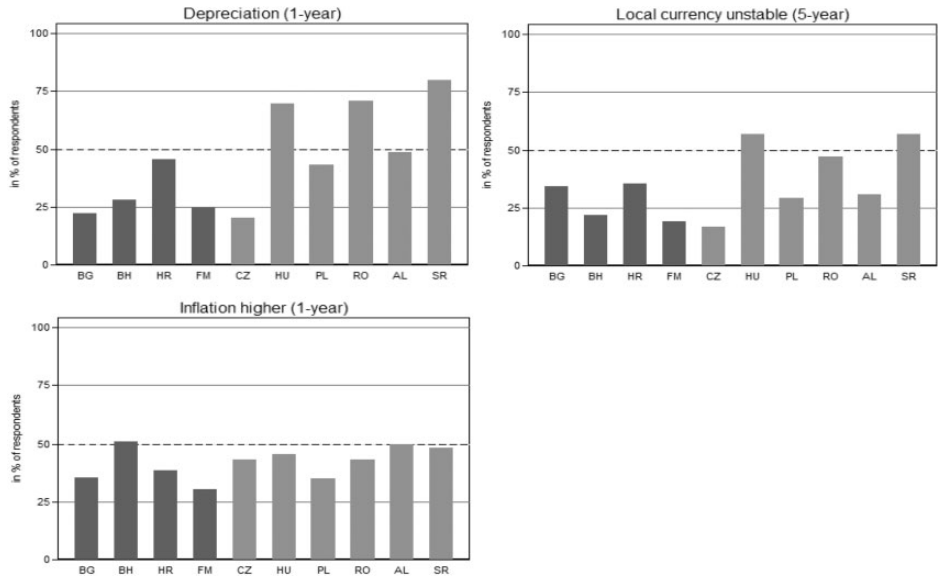



**Figure 4. Monetary expectations.**

*Notes:* The figure displays mean exchange rate and inflation expectations by country. Countries are grouped according to exchange rate regimes (floating versus (Quasi-)Peg).

*Sources*: OeNB Euro Survey data from 2011 and 2012.

In addition to our indicators of medium-term monetary expectations, we employ two indicators of long-term monetary expectations. These indicators are based on questions which elicit sentiments towards the local currency and the Euro respectively. The survey elicits the consent of respondents (on a 6-step Likert scale) to the following statement: '*Over the next five years, the [CURRENCY] will be very stable and trustworthy*.' The categorical variable *Local currency unstable (5-year)* takes on values from 0 for households which disagree or strongly disagree to 2 for households which agree or strongly agree with this statement with respect to the local currency. The categorical variable *Euro unstable (5-year)* is defined similarly with respect to the Euro instead of the local currency.

Figure 4 presents the sample means by country for three indicators of monetary expectations: *Depreciation (1-year)*, *Inflation higher (1-year)* and *Local currency unstable (5-year)*. Unsurprisingly, the figure shows that more households expect depreciation in countries with a floating exchange rate regime (e.g. Poland, Hungary, Romania and Serbia) than in countries with a currency board or a quasi-peg (e.g. Bulgaria and Croatia). However, in line with previous evidence (Carlson and Valev, 2008) the figure reveals that expectations of depreciations are prevalent even in countries that have maintained a very stable exchange rate or even a currency board. Figure 4 also shows that–across countries–our sentiment indicator of long-term monetary expectations [*Local currency unstable (5-year)*] is highly correlated with medium-term exchange rate expectations [*Depreciation (1-year)*]. With respect to inflation expectations the figure does not reveal any discernible differences in inflation expectations across exchange rate regimes.

Somewhat surprisingly, the individual-level inflation expectations also do not indicate a marked difference for the countries that pursue an inflation targeting regime (Albania and Serbia).

### 3.5. Network effects

The market failure theory of asset substitution and the currency substitution theory suggest that deposit substitution may be driven by network effects. We include an indicator for both types of network effects. Network effects with respect to asset holdings are derived from the consent to the statement that '*In [MY COUNTRY] it is very common to hold foreign currency deposits*'. The dummy variable *Network savings strong* takes on the value 1 for respondents which strongly agree or agree to this statement (32% of our sample) and 0 otherwise. Network effects with respect to payments are derived from the consent to the statement that '*In [MY COUNTRY] it is very common to make certain payments in Euro*'. The dummy variable *Network payments strong* takes on the value 1 for respondents which strongly agree or agree to this statement (26% of our sample) and 0 otherwise.

Our two indicators for network effects capture a respondent's assessment of whether other households in the same country use the Euro for savings and payments. These indicators are imperfect proxies for network effects as suggested by theory. First and foremost, the reference group in each question is not the peer group of the respondent or the group of potential trading partners. Thus the questions may capture the general use and availability of foreign currency savings products and the euroization of transactions, rather than the use of foreign currency among the more narrow reference group of the respondent. Second, the responses to both of the above questions may be influenced by self-serving biases: households which use the Euro for savings and payments themselves may infer that other households in their country do the same.

Figure 5 shows that despite its potential shortcomings our main network variable seems to capture the local use of the Euro for savings in the region where the household is located. We plot, by region, the mean value of *Network savings strong* against the mean share of households with a foreign currency deposit account (among households with a deposit account). The figure shows a high correlation (0.65, $P < 0.01$) between the two indicators at a regional level, suggesting that our network variable does not just capture the use of the Euro at a country level. This correlation also holds if we restrict our network indicator to households which themselves do not have a deposit account, suggesting that our indicator of network effects is not primarily driven by a self-serving bias.

### 3.6. Financial sophistication and socioeconomic controls

We use two indicators to measure financial sophistication at the household level. Our first indicator relates to the education level of the respondent. The dummy variable *Education high* takes on the value one for households with a higher than primary or lower secondary education. Our second indicator of financial sophistication captures the

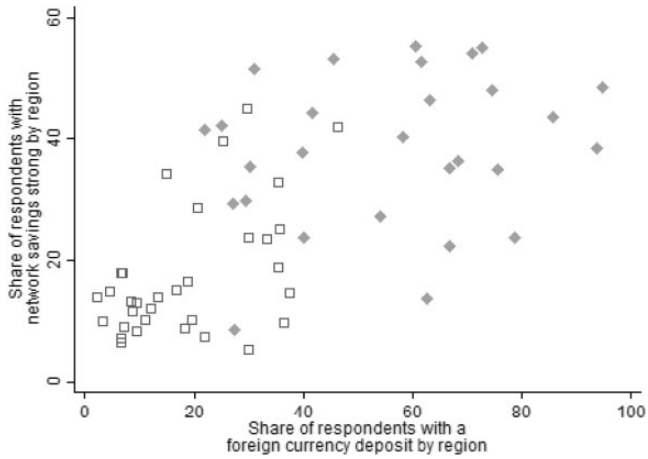



**Figure 5. Network effects and deposit euroization by region.**

*Notes:* The figure shows regional shares of deposits in foreign currency (in %) and the regional share of respondents with '*Network savings strong*' (in %). The squares denote regions in countries with a low degree of euroization (Czech Republic, Poland Hungary). The diamonds denote regions in countries with a high degree of euroization (Albania, Bulgaria, Bosnia and Herzegovina, Croatia, FYR Macedonia, Romania, Serbia).

*Sources*: OeNB Euro Survey data from 2011 and 2012.

knowledge of three basic financial concepts: (1) compound interest; (2) inflation and real interest; (3) depreciation.[11] The variable *Financial Literacy* takes on the value of 0–3 depending on the number of correct answers to the following three questions:

'*Suppose you had [100 LOCAL CURRENCY] in a savings account and the interest rate was 2% per year. Disregarding any bank fees, how much do you think you would have in the account after 5 years if you left the money to grow? (More than 102 LC/Exactly 102 LC/Less than 102 LC/Do not know/No answer)*'.

'*Suppose that the interest rate on your savings account was 4% per year and inflation was 5% per year. Again, disregarding any bank fees–after 1 year, would you be able to buy more than, exactly the same, or less than today with the money in this account? (More/Exactly the same/Less/Do not know/No answer)'.*

*'Suppose that you have taken a loan in EURO. Then the exchange rate of the [LOCAL CURRENCY] depreciates against the EURO. How does this change the amount of local currency you need to make your loan installments . . . (Increase / Stays the same / Decreases / Don't know / No answer)'.*

The Euro Survey further allows us to control for socioeconomic characteristics of respondents which are likely to affect the demand for foreign currency deposits. Throughout our analysis we control for indicators of *Income* level, income source (*Self-employed, Remittances*) and real asset holdings (*Homeowner*, *Car*). In order to control for

[11] The questions on compound interest and inflation correspond to those uses in several recent studies for OECD countries (see Lusardi and Mitchell, 2011 for an overview) and transition economies (Klapper and Panos, 2011; Beckmann, 2013). The question on exchange rate literacy is new. We thank Sascha Becker for pointing out that the use of the word 'depreciation' might imply that this literacy measure also reflects semantic literacy.

potential transaction costs we account for the self-assessed proximity of the respondent to the nearest bank branch (*Distance to bank*). To account for intra-household hedging of liabilities in local and foreign currency we control for whether the respondent has a local currency or foreign currency loan (*LC loan*, *FC loan*). Finally, we control for the *Age* of the household as well as a self-reported measure of risk tolerance (*Risk averse*). Definitions and summary statistics of all household-level control variables are presented in Appendices A1 and A2.

### 3.7. Crisis experience, current policies and institutions

Several of the countries covered by our sample experienced currency crises during the 1990s. For example, Bulgaria, Croatia, FYR Macedonia, Romania and Serbia all had CPI inflation rates of close to 100% (or higher) for at least 1 year between 1994 and 2001. Figure 6 shows that the instability of domestic monetary policy was associated with sharp depreciations of the respective currencies during the 1990s. The depreciations experienced by many countries in the recent financial crisis (2008–12) seem by comparison rather mild. The monetary instability in Eastern Europe during the 1990s was accompanied by a wave of banking crises. Laeven and Valencia (2012) report a banking crisis for nine countries in our sample during that decade: Albania (1994), Bosnia and Herzegovina (1992–6), Bulgaria (1996–7), Croatia (1998–9), the Czech Republic (1996–2000), Hungary (1991–5), FYR Macedonia (1993–5), Poland (1992–4) and Romania (1990–2).[12]

The Euro Survey provides several indicators of how households experienced the financial crises of the 1990s: All respondents are asked the following question: '*If you think back in time to periods of economic turbulences prior to 2008, e.g. very high inflation, banking crisis or restricted access to savings deposits. At that time did you personally incur a financial loss due to such events?*. . . . *And what about your close relatives. Did they incur a financial loss due to such events*?' The dummy variables *Crisis experience* is one for households which answer positively to the first question. The dummy variable *Crisis experience (relatives)* is one for those who report crisis experience of relatives but no personal crisis experience.[13] The survey further asks households whether they remember periods of high inflation and sharp devaluations of the local currency. The variable *Memory of Inflation* is a dummy variable which is 1 for all households which remember such episodes.

We use two indicators to capture the households' assessments of current government policies and institutions. The variable *Trust in government* is 1 for households which report that they completely or somewhat trust the government and 0 for households which do not trust the government. The variable *Economy better (5-year)* is 1 for households which agree to the statement that 'over the next 5 years the economic situation of my country

[12] The database of Laeven and Valencia (2012) does not include Serbia.
[13] Almost all households who report own experience also report experience of close relatives.

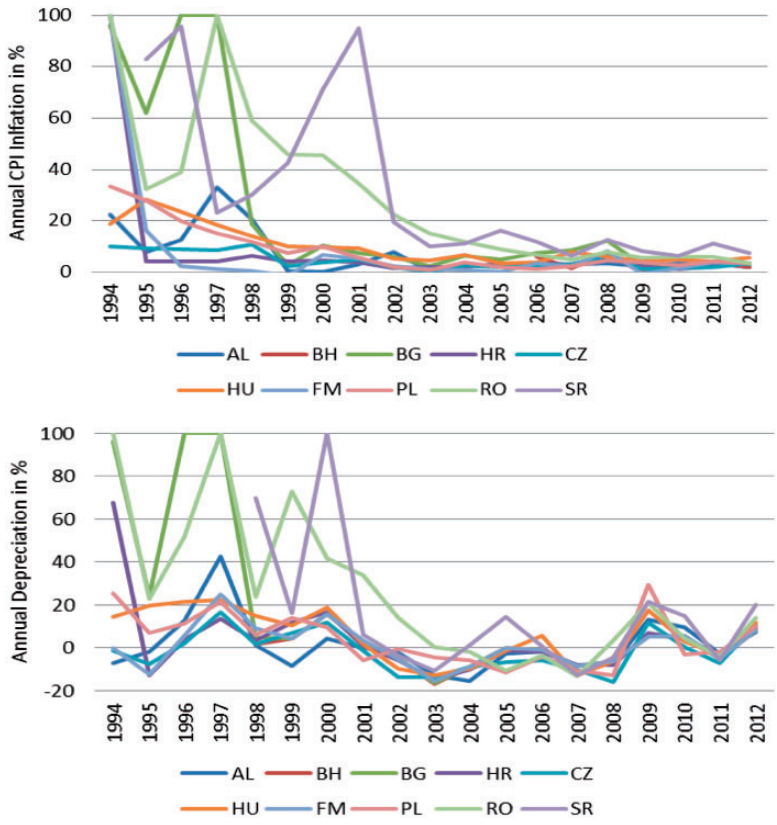



**Figure 6. Inflation and depreciation, 1994–2012.**

*Notes:* This figure shows the development of CPI inflation and exchange rates per country over the period 1994–2012. The top panel displays annual CPI inflation per country (capped at 100%). The bottom panel shows annual depreciation of the local currency vis-à-vis the US dollar (capped at 100%).

*Sources*: World Development Indicators.

will improve'.[14] We use this variable as an indicator of households' trust in (current and future) domestic economic policies.

De Nicolo et al. (2005) document that aggregate deposit dollarization across countries is correlated with the general quality of the institutional framework (rule of law, corruption). The Euro Survey provides two indicators which allow us to capture the respondent's assessment of broad institutional quality. The variable *Trust in police* takes on the value 1 of the respondent reports that he completely or somewhat trusts the police and 0 otherwise. The variable *Cash used to avoid taxes* takes on the value of 1 if the household responds that people in their country often use cash to evade taxes.

[14] To make sure that we are measuring the respondent's outlook on the general economy and not just their personal situation the variable *Financial situation bad* controls for the household's (self-assessed) personal economic situation.

Our data suggests that our respondent-level indicators of past crises do reflect cross-country differences in past monetary performance: the share of respondents which report memories of inflation in our dataset is highest (above 70%) in Bulgaria, Macedonia, Serbia and Romania–all countries which experienced inflation rates close to (or exceeding) 100% during the 1990s (see Figure 6).

Our subjective measures of institutional quality are partly correlated with indicators of political risk as published in the International Country Risk Guide (ICRG). For example, the mean value of *Trust in police* for eight of our sample countries[15] is positively correlated with the ICRG indices for government stability and bureaucratic quality. However, *Trust in police* is not at all correlated with the ICRG subindex for corruption or democratic accountability.[16]

## 4. MONETARY EXPECTATIONS, NETWORK EFFECTS AND DEPOSIT SUBSTITUTION

### 4.1. Monetary expectations and network effects

Table 2 reports our full-sample estimates of the relationship between deposit substitution, monetary expectations and network effects. In columns (1–3) of the table we report linear probability estimates for our preferred indicator of deposit substitution *FC preference*. In columns (4–6) we present robustness tests, employing our alternative indicator of deposit substitution *FC deposit share*. Panel A reports estimates for our indicators of monetary expectations and network effects. Panel B reports estimates for our socioeconomic control variables from the same regression models. In all models we include fixed effects for each region * survey-wave so that our estimates capture how differences in individual monetary expectations affect household-level deposit substitution within a given economic environment.[17]

Panel A of Table 2 documents that deposit substitution at the household level is strongly related to monetary expectations and network effects. The column (1) estimate for *Depreciation (1-year)* points to an economically relevant impact of individual exchange rate expectations: households which expect a depreciation of the local currency within the next year are 10.5 percentage points more likely to prefer foreign currency deposits than households which expect a stable exchange rate or an appreciation of the local currency. By comparison the mean share of households which prefer foreign currency deposits in this sample is 48%. The column (1) estimates for *Exchange rate unpredictable*

[15] We omit Bosnia and Herzegovina and FRY Macedonia due to missing data from ICRG.

[16] In line with this finding, *Trust in police* is also not correlated with the 2011 corruption perception index published by Transparency International.

[17] The survey covers 75 regions in our ten countries so that we can account for local economic conditions and the structure of the banking sector. Brown et al. (2013*b*) show that the use of financial services varies strongly across regions within countries of South-East Europe.

**Table 2. Monetary expectations, network effects and deposit substitution**

| Dependent variable | *FC preference [0,1]* | | | *FC deposit share [0,1,2,3]* | | |
|---|---|---|---|---|---|---|
| Household sample | All | | | With a deposit account | | |
| Model | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A. Coefficients for monetary expectations and network effects | | | | | | |
| Depreciation (1-year) | 0.105*** | 0.108*** | 0.102*** | 0.129** | 0.157** | 0.143** |
| | (0.015) | (0.014) | (0.015) | (0.065) | (0.068) | (0.067) |
| Exchange rate unpredictable (1-year) | 0.007 | | | −0.023 | | |
| | (0.008) | | | (0.027) | | |
| Network savings strong | 0.134*** | 0.132*** | 0.127*** | 0.493*** | 0.505*** | 0.519*** |
| | (0.015) | (0.015) | (0.015) | (0.114) | (0.112) | (0.111) |
| Network payments strong | 0.003 | 0.000 | −0.001 | −0.020 | −0.056 | −0.039 |
| | (0.015) | (0.015) | (0.015) | (0.084) | (0.085) | (0.092) |
| Inflation higher (1-year) | | −0.001 | | | −0.033 | |
| | | (0.014) | | | (0.064) | |
| Inflation unpredictable (1-year) | | −0.001 | | | 0.005 | |
| | | (0.008) | | | (0.027) | |
| Local currency unstable (5-year) | | | 0.054*** | | | 0.058* |
| | | | (0.010) | | | (0.034) |
| EURO unstable (5-year) | | | −0.053*** | | | −0.007 |
| | | | (0.009) | | | (0.046) |
| Panel B. Coefficients for socioeconomic control variables | | | | | | |
| Remittances | 0.113*** | 0.117*** | 0.108*** | 0.452*** | 0.449*** | 0.451*** |
| | (0.019) | (0.018) | (0.017) | (0.111) | (0.109) | (0.111) |
| Self-employed | 0.033 | 0.031 | 0.039* | 0.069 | 0.057 | 0.064 |
| | (0.020) | (0.020) | (0.020) | (0.070) | (0.071) | (0.077) |
| Income high | 0.008 | 0.008 | 0.005 | 0.202** | 0.197** | 0.238** |
| | (0.018) | (0.018) | (0.018) | (0.089) | (0.091) | (0.096) |
| Income middle | 0.019 | 0.018 | 0.015 | 0.118 | 0.111 | 0.118 |
| | (0.013) | (0.013) | (0.013) | (0.094) | (0.097) | (0.103) |
| Income na | 0.048** | 0.047** | 0.044** | 0.183* | 0.175* | 0.219** |
| | (0.021) | (0.020) | (0.020) | (0.094) | (0.097) | (0.108) |
| Car | 0.010 | 0.011 | 0.010 | 0.149** | 0.179** | 0.153** |
| | (0.012) | (0.013) | (0.012) | (0.074) | (0.072) | (0.077) |
| Homeowner | −0.005 | −0.008 | −0.010 | −0.031 | −0.041 | −0.026 |
| | (0.018) | (0.019) | (0.019) | (0.072) | (0.072) | (0.074) |
| LC loan | −0.016 | −0.011 | −0.001 | −0.206** | −0.195** | −0.198** |
| | (0.016) | (0.016) | (0.016) | (0.087) | (0.088) | (0.090) |
| FC loan | 0.078*** | 0.076*** | 0.076*** | 0.058 | 0.037 | 0.060 |
| | (0.020) | (0.019) | (0.019) | (0.085) | (0.087) | (0.080) |
| Distance to bank | −0.001 | 0.000 | 0.001 | −0.019 | −0.020 | −0.024 |
| | (0.004) | (0.004) | (0.004) | (0.020) | (0.020) | (0.021) |
| Education | 0.023* | 0.022* | 0.027* | 0.119 | 0.111 | 0.126* |
| | (0.013) | (0.013) | (0.014) | (0.072) | (0.069) | (0.071) |
| Financial literacy | 0.001 | 0.001 | −0.001 | −0.023 | −0.017 | −0.035 |
| | (0.007) | (0.007) | (0.007) | (0.031) | (0.031) | (0.031) |
| Age | 0.005** | 0.004** | 0.004** | −0.009 | −0.008 | −0.006 |
| | (0.002) | (0.002) | (0.002) | (0.012) | (0.012) | (0.011) |

(*Continued*)

**Table 2. (Continued)**

| Dependent variable | *FC preference [0,1]* | | | *FC deposit share [0,1,2,3]* | | |
|---|---|---|---|---|---|---|
| Household sample | All | | | With a deposit account | | |
| Model | (1) | (2) | (3) | (4) | (5) | (6) |
| Age sq. (×1e-3) | −0.068*** | −0.065*** | −0.063*** | 0.068 | 0.063 | 0.047 |
| | (0.022) | (0.021) | (0.021) | (0.123) | (0.116) | (0.114) |
| Risk averse | 0.012 | 0.011 | 0.004 | 0.058 | 0.016 | 0.018 |
| | (0.019) | (0.019) | (0.018) | (0.092) | (0.086) | (0.088) |
| Mean of dependent variable | 0.48 | 0.48 | 0.48 | 0.90 | 0.90 | 0.90 |
| Method | OLS | OLS | OLS | OLS | OLS | OLS |
| Region * Wave fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.21 | 0.21 | 0.22 | 0.42 | 0.42 | 0.42 |
| No. of households | 10,654 | 10,803 | 10,078 | 2,031 | 2,064 | 1,957 |
| No. of countries | 10 | 10 | 10 | 10 | 10 | 10 |
| No. of regions | 75 | 75 | 75 | 72 | 72 | 72 |
| No. of survey waves | 2 | 2 | 2 | 2 | 2 | 2 |

*Notes:* The dependent variables in this table are *FC preference* (columns 1–3) and *FC deposit share* (columns 4–6). All models report estimates from linear probability models including fixed effects per region * wave. Panel A reports estimates for our indicators of monetary expectations and network effects. Panel B reports estimates for our socioeconomic control variables. Standard errors are reported in parentheses and are adjusted for clustering at the region-wave level. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level, respectively. All variables are defined in Appendix A1.

(1-year) suggest that–controlling for an expected depreciation–the predictability of the exchange rate does not affect deposit substitution.

The column (2) estimates in Table 2 suggest that inflation expectations hardly affect deposit substitution. The coefficients for *Inflation higher (1-year)* and *Inflation unpredictable (1-year)* are economically small and statistically insignificant. This result may seem surprising given the recent evidence which shows that inflation targeting reduces financial dollarization in emerging markets (Lin and Ye, 2013) and that regional variation in consumer price inflation affects deposit dollarization in Russia (Brown et al., 2013*a*). What our evidence suggests is that low inflation and inflation targeting may affect financial dollarization through their effect on expected exchange rates as opposed to their effect on domestic inflation per se.

The column (3) estimates for *Local currency unstable (5-year)* and *Euro unstable (5-year)* show that long-term trust in the stability of the local currency and the Euro strongly affect deposit substitution. Households which view their local currency as not at all trustworthy over the next five years (*Local currency unstable* = 2) are 10.8 percentage points more likely to prefer foreign currency deposits than those which view their local currency as very trustworthy (*Local currency unstable* = 0). Similarly, households which view the Euro as not trustworthy over the next 5 years (*Euro unstable* = 2) are 10.4 percentage points less likely to prefer foreign currency deposits than households which view the Euro as very trustworthy (*Euro unstable* = 0).

In columns (1–3) of Table 2 (Panel A) the estimated coefficients for *Network savings strong* are positive, statistically significant and sizeable in terms of economic magnitude: households which agree that it is common to hold foreign currency savings in their country are 13 percentage points more likely to prefer foreign currency deposits than households which do not agree to the respective statement. We take this as evidence that in addition to the role of monetary expectations there are strong network effects driving household demand for foreign currency as a medium of storage.[18]

The insignificant estimates for *Network payments strong* suggest that transaction costs in payments do not affect the demand for foreign currency deposits. This result is not that surprising seeing that *FC preference* captures households' preferences for storing a sizeable volume of wealth (2 months average wage) which arguably exceeds households' requirements for regular payments. Valev (2012), by contrast, reports evidence suggesting that network effects in payments do affect the preferences of households for holding cash in foreign currency.

In columns (4–6) of Table 2 we examine whether the relation between monetary expectations, network effects and deposit substitution is confirmed in estimates of actual foreign currency deposit holdings for those households which have a deposit account (*FC deposit share*). The results displayed in Panel A of the table suggest that this is the case. The estimated coefficients for *Depreciation (1-year)* and *Local currency unstable (5-year)* are statistically significant and economically large, confirming that medium-term and long-term expectations regarding local currency stability affect deposit substitution. The positive and significant coefficient for *Network savings strong* confirms that deposit substitution by individual households is associated with the perceived use of foreign currency savings in the country.

### 4.2. Financial sophistication and socioeconomic controls

Panel B of Table 2 reports the estimates for our socioeconomic control variables. The results suggest that the demand for foreign currency deposits is strongly related to household income sources and income levels. Incoming payments in foreign currency are strongly correlated with deposit substitution. The regular receipt of cross-border *Remittances* increases preferences for foreign currency deposits by 11 percentage points (columns 1–3). This significant effect of remittances is confirmed in our estimates of shares of foreign currency deposits among those households with a deposit account (columns 4–6). Self-employed households and households with higher income (including those who do not report their income) are also more likely to prefer/hold foreign

[18] In unreported robustness tests we show that the estimated coefficient for *Network savings strong* is robust when estimated in the sample of households which do not have a savings account. This finding suggests that the positive correlation between *Network savings strong* and *FC deposit preference* is not driven by a self-serving bias.

currency deposits. We also find some evidence that households with higher wealth (as proxied by *Car* ownership) are more likely to hold foreign currency deposits.

Panel B estimates also document a nonlinear relationship between household age and preferences for foreign currency deposits: the estimate for *Age* is significant and positive, while the estimate for *Age squared* is significant and negative. The magnitude of the two coefficients suggest that the marginal effect of age on preferences for foreign currency deposits is positive for respondents of age 18–66 and negative for older respondents. We find no evidence for an association between self-reported risk preferences (*Risk averse*) and preferences for foreign currency deposits.

In Panel B of Table 2 we find mixed evidence for an association between deposit substitution and financial sophistication of the household. Households with high levels of education are 3 percentage points more likely to prefer foreign currency deposits than households with low education levels (columns 1–3). However, we find no correlation between *Financial Literacy* of the household and preferences for foreign currency deposits. The latter result is surprising given that several recent studies have documented a positive correlation between financial literacy and the use of more sophisticated financial products (Van Rooij et al., 2011) and financial diversification (Guiso and Jappelli, 2009). Table 3 therefore explores the relation between financial sophistication and deposit substitution in more detail.

As a benchmark for our investigation into the role of financial sophistication, column (1) of Table 3 replicates the column (1) estimates of Table 2. In column (2) of Table 3 we then drop household-level indicators of monetary expectations. The reason for doing this is that the column (1) estimates omit a large number of respondents (1,613) who did not answer the questions on monetary expectations. Our data show that these households are significantly less financial sophisticated (as measured by *Financial literacy*), so that the column (1) results may be subject to selection bias.[19] However, when we include these households in our sample, we still fail to find a significant correlation between financial literacy and foreign currency preferences.

In column (3–4) of Table 3 we examine to what extent financial sophistication of households affects the role of monetary expectations and network effects in shaping the demand for foreign currency deposits. We interact our indicators of monetary expectations and network effects with the variable *Financial Literacy* (column 3) and *Education* (column 4). We conjecture that the assessment of future monetary conditions will have a stronger impact on deposit substitution among financially sophisticated households than among less sophisticated households. The column (3–4) estimates show that this is the case: the estimated coefficient *Financial Literacy * Depreciation (1-year)* is positive and

[19] Respondents who did not answer the questions on exchange rate expectations gave, on average, 1.27 correct answers to the three literacy questions. The respective number is 1.77 for respondents who did answer the questions on exchange rate expectations. This difference is statistically significant with a *P*-value of less than 0.01.

**Table 3. Financial sophistication and deposit substitution**

| Dependent variable | *FC preference* | | | |
|---|---|---|---|---|
| Sample | All | All | All | All |
| Model | (1) | (2) | (3) | (4) |
| Depreciation (1-year) | 0.105*** | | 0.046* | 0.066*** |
| | (0.015) | | (0.023) | (0.023) |
| Exchange rate unpredictable (1-year) | 0.007 | | 0.030** | −0.002 |
| | (0.008) | | (0.014) | (0.016) |
| Network savings strong | 0.134*** | 0.130*** | 0.109*** | 0.111*** |
| | (0.015) | (0.015) | (0.028) | (0.026) |
| Network payments strong | 0.003 | 0.004 | 0.03 | 0.017 |
| | (0.015) | (0.015) | (0.026) | (0.024) |
| Education | 0.023* | 0.024** | 0.023* | −0.022 |
| | (0.013) | (0.011) | (0.013) | (0.031) |
| Financial literacy | 0.001 | 0.006 | 0.005 | 0.001 |
| | (0.007) | (0.006) | (0.014) | (0.007) |
| *Financial literacy** | | | | |
| *Depreciation (1-year)* | | | 0.033*** | |
| | | | (0.012) | |
| *Exrate unpredictable (1-year)* | | | −0.013* | |
| | | | (0.007) | |
| *Network savings strong* | | | 0.013 | |
| | | | (0.013) | |
| *Network payments strong* | | | −0.015 | |
| | | | (0.013) | |
| *Education ** | | | | |
| *Depreciation (1-year)* | | | | 0.051** |
| | | | | (0.025) |
| *Exchange rate unpredictable (1-year)* | | | | 0.013 |
| | | | | (0.016) |
| *Network savings strong* | | | | 0.031 |
| | | | | (0.025) |
| *Network payments strong* | | | | −0.018 |
| | | | | (0.024) |
| Mean of dependent variable | 0.48 | 0.47 | 0.48 | 0.48 |
| Method | OLS | OLS | OLS | OLS |
| Region*Wave fixed effects | Yes | Yes | Yes | Yes |
| Household controls | Yes | Yes | Yes | Yes |
| Adjusted R2 | 0.21 | 0.21 | 0.21 | 0.21 |
| # Households | 10,654 | 12,239 | 10,654 | 10,654 |
| # countries | 10 | 10 | 10 | 10 |
| # regions | 75 | 75 | 75 | 75 |
| # survey waves | 2 | 2 | 2 | 2 |

*Notes:* The dependent variable in this table is *FC preference*. All models report estimates from linear probability models including fixed effects per region*wave. All models include the following household control variables: *Income, Self-employed, Age, Homeowner, Car, Risk averse, Remittances, LC loan, FC loan, Distance to bank*. Standard errors are reported in parentheses and are adjusted for clustering at the region*wave level. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level, respectively. All variables are defined in Appendix A1.

significant in column (3). The magnitude of the interaction term suggests that the impact of an expected depreciation of foreign currency preferences is three times higher among households with a financial literacy score of three than among households with a financial literacy score of zero (14.6 versus 4.1 percentage points). In line with this finding the

column (4) results show a positive and significant estimate of the interaction term *Education high * Depreciation (1-year)*. The column (3) results also show that exchange rate volatility [*Exchange rate unpredictable (1-year)*] impacts stronger on deposit substitution among financially literate households.

The evidence by Hong et al. (2004) on social interaction and household investment behavior suggests that the role of network effects in deposit substitution may also be stronger among the more financially sophisticated households. However, our column (3-4) estimates in Table 3 do not show a stronger impact of network effects among more financially sophisticated households. The estimated coefficient for the interaction term *Network savings strong * Financial Literacy* (column 3) and *Network savings strong * Education* (column 4) are both economically weak and statistically insignificant.

### 4.3. The role of the exchange rate regime and aggregate euroization

In this section we examine whether the impact of monetary expectations and network effects on deposit substitution documented in our full sample (see Table 2) varies according to the exchange rate regime of a country and the degree of aggregate euroization within the country. It is likely that the impact of exchange rate expectations on deposit substitution differs between countries with flexible exchange rates as opposed to countries with a pegged currency: in countries with a pegged currency the likelihood of depreciation is lower than in countries with a flexible exchange rate (see Figure 4). However, the magnitude of a depreciation is potentially larger for pegged currencies if a depreciation does take place. We therefore conjecture that the impact of an expected depreciation on deposit substitution should be stronger in countries with a pegged exchange rate than in countries with a flexible exchange rate.

Our sample covers six countries with flexible exchange rates (Albania, Czech Republic, Hungary, Poland, Romania and Serbia), while four countries maintain a currency board or a (quasi-)peg (Bosnia and Herzegovina, Bulgaria, Croatia and FYR Macedonia). In Table 4, columns (1–2) we replicate our model from Table 2 (column 1) separately for these two sets of countries. The results show that monetary expectations affect deposit substitution both in countries with flexible exchange rates (column 1) and countries with pegged exchange rates (column 2). However, an expected depreciation of the local currency has a much stronger impact on deposit substitution in countries with pegged currencies. Comparing the point-estimates of *Depreciation (1-year)* in column (1) to that in column (2) we see that an expected depreciation increases preferences for foreign currency deposits more than twice as much in countries with a peg (16 percentage points) than in countries with a flexible exchange rate (6 percentage points).[20] Thus while less households expect a depreciation in countries with a peg (see Figure 4), those

[20] A Chow test rejects the hypothesis that the estimated coefficient of *Depreciation (1-year)* is equal in column 1 versus column 2.

**Table 4. The role of the exchange rate regime and aggregate euroization**

| Dependent variable | *FC preference* | | *FC preference* | | *FC preference* | |
|---|---|---|---|---|---|---|
| Sample | Floating exchange rate | (Quasi-)Peg | Low euroization | High euroization | EU country | Non-EU country |
| Model | (1) | (2) | (3) | (4) | (5) | (6) |
| Depreciation (1-year) | 0.064*** | 0.159*** | 0.062*** | 0.121*** | 0.083*** | 0.122*** |
| | (0.015) | (0.023) | (0.020) | (0.018) | (0.019) | (0.021) |
| Exchange rate unpredictable (1-year) | −0.004 | 0.021 | 0.013 | 0.003 | 0.024** | −0.003 |
| | (0.010) | (0.013) | (0.012) | (0.010) | (0.011) | (0.011) |
| Network savings strong | 0.121*** | 0.147*** | 0.175*** | 0.126*** | 0.181*** | 0.112*** |
| | (0.021) | (0.019) | (0.031) | (0.017) | (0.021) | (0.019) |
| Network payments strong | −0.017 | 0.026 | 0.022 | −0.002 | 0.04 | −0.016 |
| | (0.020) | (0.019) | (0.032) | (0.016) | (0.026) | (0.017) |
| Mean of dependent variable | 0.42 | 0.55 | 0.34 | 0.53 | 0.36 | 0.57 |
| Method | OLS | OLS | OLS | OLS | OLS | OLS |
| Region * Wave fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Household controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.26 | 0.14 | 0.23 | 0.18 | 0.18 | 0.19 |
| No. of households | 5854 | 4800 | 2936 | 7718 | 4501 | 6153 |
| No. of countries | 6 | 4 | 3 | 7 | 5 | 5 |
| No. of regions | 46 | 29 | 31 | 44 | 48 | 27 |
| No. of survey waves | 2 | 2 | 2 | 2 | 2 | 2 |

*Note:* The dependent variable in this table is *FC preference*. In columns (1–2) we report separate estimates for countries with a floating exchange rate regime and a (quasi-) peg. In columns (3–4) we report separate estimates for countries with low aggregate euroization and high aggregate euroization. In columns (5–6) we report separate estimates for EU member countries and non-EU member countries. All models report estimates from linear probability regressions including fixed effects per region-wave. All models include the following household control variables: *Income, Self-employed, Education, Age, Homeowner, Car, Financial literacy, Risk averse, Remittances, LC loan, FC loan, Distance to bank*. Standard errors are reported in parentheses and are adjusted for clustering at the region-wave level. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level, respectively. All variables are defined in Appendix A1.

which do expect a depreciation are much more likely to substitute local for foreign currency deposits. It is often argued that policy makers in highly euroized economies which have a (quasi)-peg in place are constrained in the choice of the exchange rate regime. Any deviation from a peg would result in a strong shift towards foreign currency assets. Our results provide support for this view.

In columns (3-4) of Table 4 we conduct separate estimates for countries with a low level of euroization (Czech Republic, Hungary and Poland) and countries with a high level of euroization (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR Macedonia, Romania and Serbia). We are particularly interested in whether the strong network effects identified in our full sample estimates (see Table 2) are independent of the aggregate level of euroization in a country. We find that the estimates for *Network savings strong* are at least as strong in low-euroization countries as they are in high-euroization countries. This finding confirms our interpretation that the variable *Network savings strong* captures habit effects based on individual experience and is not just a proxy for country-wide financial dollarization. In columns (5–6) we find similar results when we conduct separate estimates for countries which are members of the European Union during our observation period (Bulgaria, Czech Republic, Hungary, Poland, Romania) and non-EU member states (Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, and Serbia).

### 4.4. Robustness checks

Several robustness tests of our main results from Table 2 are reported in the web appendix to this paper. In Appendix W1 we verify that the linear probability model is appropriate for the estimation of our binary dependent variable *FC preference* by replicating the analysis with a non-linear (probit) model (columns 1–4). We also verify that the linear model is appropriate for our ordinal dependent variable *FC deposit share* by replicating the analysis using an ordered probit model (columns 5–8). We find that the estimates from the probit and ordered probit models confirm those from the linear probability model employed in Table 2.

In Appendix W2 we present further robustness checks for our main results displayed in column (1) of Table 2. In column (1) we verify that our main results are robust to excluding regional fixed effects. In column (2) we check whether results are affected by households who live in proximity to the Euro-area by including a measure of the physical distance between the respondent and the Euro-area. Specifically, we use the geo-coordinates of each primary sampling unit in the survey to establish whether the respondent is located within 50 km of the geographical border of the Euro-area or not. Our main results remain unchanged in columns (1–2), while the geographical distance of the household to the Euro-area is insignificant in column (2).[21] In columns (3–4) we

[21] In case we omit regional fixed effects from column (2) the distance to the Euro-area dummy enters significant with a negative sign, implying that households that live closer to this border are less likely to prefer FC deposits.

replicate model (1) from Table 2 for the 2012 and 2011 survey waves separately. The results displayed show that our estimates of *Depreciation (1-year)* and *Network savings strong* are similar for both survey waves. In column (5) we use additional information available in the 2011 survey wave to examine whether individual expectations about future adoption of the Euro affect preferences for foreign currency deposits. Specifically the 2011 wave asked respondents 'When, in which year, do you think the Euro will be introduced in [YOUR COUNTRY]?'. The column (5) results show that households which expect the Euro to be adopted sometime in the future (as opposed to never) are more likely to prefer foreign currency deposits. However, controlling for expected Euro adoption does not affect our estimates for exchange rate expectations or network effects.

In Appendix W3 we verify that our main findings are robust across countries. We replicate model (1) from Table 2 for each country separately. The estimated coefficient for *Depreciation (1-year)* is statistically significant and economically large for seven out of ten sample countries (Albania, Poland and Hungary are the notable exceptions). The estimate for *Network savings strong* is statistically significant and economically large for nine out of ten countries.

In Appendix W4 we check that the network effect estimated in Table 2 is not driven by a self-serving bias. Column (1) repeats our full-sample estimates as displayed in column (1) of Table 2. Column (2) replicates that model but for the subsample of households which do not have a foreign currency savings account. The results show that the estimated coefficient for *Network savings strong* is only slightly smaller in this subsample, suggesting that it is not driven by a self-serving bias. In columns (3) we replace the respondent-level indicators of network effects by the average of these indicators across all other respondents in the same primary sampling unit, i.e. the respondent's 'neighbors'. The results show that network effects as captured by the neighbors' perceptions of the use of the Euro for savings (*Neighbours network savings strong*) yield similar estimates to the respondents own perceptions. Again this finding suggests that self-serving biases are not driving the estimated network effect. In columns (4–5) of Appendix W4 we examine to what extent our network indicator may be capturing the perceived availability of savings products as opposed to the perceived use of such services by a respondent's peers. In column (4) we report a subsample analysis for respondents who are most likely to be aware of the availability of savings products; i.e. those who have a deposit account and live in a town with a bank branch. In column (5) we report a subsample analysis for respondents which are least likely to be aware of the availability of savings products; i.e. those who do not have a deposit account and live in a town without a bank branch. Our large, positive and significant estimate for *Network savings strong* is confirmed in both subsamples, suggesting that the indicator is not mainly capturing perceptions about the availability of savings products.

Finally, in Appendix W5 we have verified that results of Table 2 are unaffected if we employ separate dummy variables instead of categorical variables for *Exchange rate unpredictable (1-year)*, *Local currency unstable (5-year)* and *EURO unstable (5-year)*.

## 5. THE ROLE OF PAST CRISES, POLICIES AND INSTITUTIONS

Our results so far document that household-specific exchange rate expectations as well as network effects strongly affect the demand for foreign currency deposits. In this section we turn to the second part of our empirical framework and examine how monetary expectations and the demand for foreign currency deposits are related to individual experience of past financial crises as well as to respondents' assessments of current policies and institutions.

In Table 5 column (1) we relate a measure of exchange rate expectations *Depreciation (1-year)* to indicators of crises experience (*Crisis experience, Crisis experience relatives, Memory of inflation*) as well as the assessment of current government policies and institutions (*Trust in Government, Economy better, Cash used to avoid taxes*).

Our estimates support the conjecture that hysteresis effects are present, i.e. that the experience of past financial crises has a persistent effect on exchange rate expectations of households. Respondents who had personally incurred losses during crises in the 1990s are 5 percentage points more likely to expect a depreciation of the local currency over the next twelve months, while households which remember periods of high inflation are 5.5 percentage points more likely to expect depreciation. Both of these effects are sizeable, given that 42% of the underlying sample expect a depreciation over the next year. The finding that only personal losses and not losses of close relatives affect current monetary expectations suggest that our measures of crisis experience are not just picking up a general negative attitude towards past and current economic conditions.

The column (1) estimates also show that household-level trust in current policies and institutions strongly affect monetary expectations. Households which trust their government are 4.6 percentage points less likely to expect depreciation over the next 12 months. Households which expect the economic situation in their country to improve over the next 5 years are 10 percentage points less likely to expect depreciation.

The column (1) results of Table 5 confirm that the monetary expectations of households are correlated with past financial crises, current policies and institutions. This finding raises the question of whether our initial estimates of the impact of monetary expectations (and network effects) on deposit substitution (see Table 2) are subject to an omitted variable bias: the estimated impact of expected depreciation on foreign currency deposit preferences may actually be driven by the (in Table 2 omitted) effect of past financial crises. In column (2) of Table 5 we account for possible omitted variable bias by estimating an enhanced model: we add our indicators of past crises, current policies and institutions to our initial specification in column (1) of Table 2.

The regression results for the enhanced model in column (2) of Table 5 suggest that our initial estimates of the role of monetary expectations and network effects are hardly subject to omitted variable bias: the estimated coefficients for *Depreciation (1-year)* and *Network savings strong* are of a similar economic magnitude and statistical precision as those reported in Table 2. The results however also reveal a significant and economically relevant effect of *Crisis experience* and *Trust in government* on foreign currency deposits, even after controlling for our indicators of monetary expectations and network effects. This

**Table 5. The role of past crises, current policies and institutions**

| Dependent variable | *Depreciation (1 year)* | *FC preference* | *FC preference* | | *FC preference* | |
|---|---|---|---|---|---|---|
| Sample | All | All | Age: below median | Age: above median | At last crisis: young (≤24 years) | At last crisis: old (>24 years) |
| Model | (1) | (2) | (3) | (4) | (5) | (6) |
| Depreciation (1-year) | | 0.094*** | 0.096*** | 0.097*** | 0.105*** | 0.087*** |
| | | (0.016) | (0.018) | (0.022) | (0.023) | (0.017) |
| Exchange rate unpredictable (1-year) | | 0.012 | 0.020* | 0.003 | −0.001 | 0.018 |
| | | (0.011) | (0.012) | (0.014) | (0.016) | (0.011) |
| Network savings strong | | 0.127*** | 0.128*** | 0.128*** | 0.136*** | 0.122*** |
| | | (0.017) | (0.018) | (0.025) | (0.029) | (0.017) |
| Network payments strong | | 0.008 | 0.023 | −0.008 | −0.018 | 0.022 |
| | | (0.020) | (0.024) | (0.026) | (0.029) | (0.022) |
| Crisis experience | 0.050*** | 0.047** | 0.047* | 0.040 | 0.020 | 0.059** |
| | (0.018) | (0.020) | (0.026) | (0.032) | (0.035) | (0.026) |
| Crisis experience relatives | 0.007 | 0.026 | 0.027 | 0.030 | 0.010 | 0.040 |
| | (0.019) | (0.022) | (0.031) | (0.028) | (0.031) | (0.026) |
| Memory of inflation | 0.055*** | 0.019 | 0.012 | 0.022 | 0.011 | 0.020 |
| | (0.013) | (0.016) | (0.023) | (0.023) | (0.025) | (0.020) |
| Cash used to avoid taxes | −0.003 | −0.011 | −0.018 | −0.000 | 0.004 | −0.015 |
| | (0.014) | (0.018) | (0.023) | (0.024) | (0.028) | (0.021) |
| Trust in government | −0.046*** | −0.055*** | −0.059** | −0.049** | −0.060** | −0.052** |
| | (0.017) | (0.018) | (0.025) | (0.025) | (0.026) | (0.022) |
| Trust in police | −0.016 | 0.026 | 0.026 | 0.017 | 0.015 | 0.027 |
| | (0.015) | (0.018) | (0.023) | (0.025) | (0.026) | (0.021) |
| Economy better (5 years) | −0.103*** | 0.027* | 0.021 | 0.032 | 0.035 | 0.025 |
| | (0.015) | (0.016) | (0.020) | (0.024) | (0.029) | (0.020) |
| Mean of dependent variable | 0.42 | 0.45 | 0.43 | 0.48 | 0.46 | 0.45 |
| Method | OLS | OLS | OLS | OLS | OLS | OLS |
| Region*Wave fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Household controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.22 | 0.21 | 0.22 | 0.21 | 0.20 | 0.22 |
| No. of households | 7,381 | 6,428 | 3,335 | 3,093 | 2,317 | 4,111 |
| No. of countries | 10 | 10 | 10 | 10 | 10 | 10 |
| No. of regions | 75 | 74 | 72 | 74 | 73 | 73 |
| No. of survey waves | 2 | 2 | 2 | 2 | 2 | 2 |

*Notes:* The dependent variables in this table are *Depreciation (1 year)* (column 1), and *FC preference* (columns 2–6). Columns (1–2) are estimated on the full sample of households without missing data. Columns (3–4) report estimates for households with below versus above (country-specific) median age. In columns (5–6) we report estimates for households with an age of 24 years or below versus more than 24 years at the time of the last crisis (annual inflation rate larger than 20%).All models report estimates from linear probability models including fixed effects per region-wave. All models include the following household control variables: *Income, Self-employed, Education, Age, Homeowner, Car, Financial literacy, Risk averse, Remittances, LC loan, FC loan, Distance to bank, Trust in Police, Financial situation bad.* Standard errors are reported in parentheses and are adjusted for clustering at the region-wave level. ***, **, * denote significance at the 0.01, 0.05 and 0.10-level, respectively. All variables are defined in Appendix A1.

finding stands in contrast to our empirical framework presented in Figure 2, which does not account for a direct effect of past crises or institutions on deposit substitution. One explanation for this finding is that our measures of monetary expectations, network effects and relevant household characteristics (risk aversion, financial literacy) are imprecisely measured and correlated with these 'background' variables.

We conclude our analysis with an examination of how the determinants of deposit substitution vary across household cohorts. Is the impact of past financial crises and network effects on deposit substitution stronger among older cohorts, while current policies and monetary expectations have a stronger effect among younger cohorts? If so what does this imply for policy makers in the region? In columns (3–6) of Table 5 we estimate our enhanced model (see column 3) separately for young versus older cohorts. In columns (3–4) the sample is split based on the median age of respondents in each country. In columns (5–6) we split households based on whether they were younger or older than 24 in the year that the country last experienced a monetary crisis.[22]

Surprisingly, the results displayed in columns (3–6) of Table 5 show that the determinants of deposit substitution hardly vary between cohorts. Monetary expectations and the assessment of current policies seem to be just as important determinants of deposit substitution among the old as they are among the young: the positive coefficients for *Depreciation (1-year)* and negative coefficient for *Trust in government* are similar in terms of statistical significance and economic magnitude among young and older households. Moreover, network effects and crisis experience do not impact stronger on deposit substitution for older households compared to younger households. The positive coefficient of *Network savings* is almost identical across all four columns. Moreover, the positive coefficient of *Crisis experience* does not differ significantly between young and old households.[23]

## 6. POLICY CONCLUSIONS

Policymakers agree that the euroization of bank deposits in Eastern Europe hinders effective monetary policy and increases financial sector fragility. However, they have divergent views on how best to deal with deposit euroization in the region. Some emphasize the need for 'dedollarization' and see a credible monetary policy regime as the path to reducing deposit euroization. Others view deposit euroization as an inevitable heritage of past financial crises, and thus embrace a full adoption of the Euro.

Our findings suggest that deposit euroization in Eastern Europe can be at least partly tackled by prudent monetary policy—we show that the demand of households for foreign currency deposits partly driven by a distrust in the stability of their domestic currency. Monetary expectations, in turn, are related to household trust in the policies and institutions of their country. Both can be influenced by policymakers. However, our findings also suggest that prudent monetary policy may not be sufficient to achieve de-euroization across the region. We confirm that the holding of foreign currency deposits has become a 'habit' in the region and that the financial crises of the 1990s continue to have a significant impact on monetary expectations and deposit substitution.

[22] We define a year of monetary crisis as a year with CPI Inflation exceeding 20% (see Figure 5).

[23] Chow tests do not reject the hypothesis that the coefficients for *Crisis experience* are identical in columns (4-5) and columns (6-7).

Can policymakers deal with this hysteresis effect by implementing targeted policies in the field of financial and economic education? Our results suggest that financial education may contribute to de-euroization in countries with prudent monetary policy: financially literate households are more likely to base their choice of currency on monetary expectations.

Should policymakers just sit back and wait until the older generation which experienced the 1990s crises no longer account for the majority of bank deposits? Our results suggest that the euroization of bank deposits is unlikely to decline as the banking sector becomes increasingly dominated by younger cohorts: the impact of network effects and past crises on foreign currency deposit demand hardly differs across cohorts.

Could market-based demand side reforms–such as the development of local currency capital markets–speed up the process of de-euroization? Our analysis suggests not as the widespread use of the Euro among retail savers is not driven by a lack of local currency investment opportunities: households in Central, Eastern and South eastern Europe have broad access to a wide range of savings products in foreign and local currency. Moreover, recent cross-country survey evidence shows that only a small share of households in Eastern (and Western) Europe participates in financial markets (European Central Bank, 2013). We can therefore safely assume that the relevant investment spectrum for the overwhelming majority of households in the region are–the amply available–bank savings products.

Could financial regulation such as higher liquidity provisions for foreign currency deposits or capital provisions for foreign currency loans foster the de-euroization of bank deposits? Our evidence suggests that supply side interventions is unlikely to affect the euroization of savings as the use of foreign currency deposits is largely demand driven. We show that the observed share of foreign currency deposits among households with a deposit account coincides with the stated preferences of these households for foreign currency savings. Moreover, we show that foreign currency preferences and the relation between monetary expectations and these preferences are similar among households with and without deposit accounts. Thus, in accordance with Stix (2013) our results suggest that supply side interventions which discourage the provision of foreign currency savings products could encourage the use of other foreign currency denominated financial assets, like foreign currency cash, rather than local currency bank deposits.

## Discussion

### Sascha O. Becker

University of Warwick & UCLA (and CAGE, CEPR, CESIfo, Ifo and IZA)

This paper investigates a topic which has not received enough attention in (Western) European policy circles, but is clearly of high importance in many eastern European

countries: Euroization. In all eastern European non-Euro countries, large shares of the population hold bank deposits in Euro-denominated accounts. This poses a major challenge for monetary policy in eastern Europe because those accounts are not directly affected by the monetary policy instruments in the hands of the domestic central banks.

The paper provides a comprehensive overview of the factors behind Euro bank deposit holdings. The authors do a very careful job at constructing and exploring a rich survey dataset, collected by the Austrian Central Bank. The paper is largely descriptive in the sense that it does not exploit any natural or quasi-natural experiment, but the richness of stylized facts makes it an important contribution for policymakers.

The survey covers respondents in ten countries in eastern Europe. The analysis shows that many households distrust the stability of their domestic currency. This is largely not only driven by their view of current policies and institutions, but also by households' experiences of financial crises in the 1990s.

Furthermore, many households holding bank deposits in Euros (rightly or wrongly) perceive this as the norm in their country. The authors discuss this point under the heading of network effects. I am not sure that label is perfect fit, given the survey question which asks respondents to state whether (or not) it is very common to hold foreign currency deposits. The authors are careful to note that what they call network effects are not peer effects, whereby (actual) Euro bank deposit holdings of friends or business partners influence Euro bank deposits of the survey respondents themselves. Also, the authors point out that survey respondents may extrapolate from their own Euro bank deposit holdings and state that this is what everyone does. So, they give two due caveats. Their reason to classify these results as evidence of network effects is two-fold: first, the risk of a local currency depreciation is higher if more other households hold their savings in foreign currency. This point is well taken and–although not involving the direct interaction between 'nodes' in the network (as in the context of social networks), it is true that the value of holding Euro bank deposits increases in the number of others doing the same. This is pretty much a political economy argument whereby fiscal and monetary policymakers will find it increasingly hard to ignore the preferences of those holding Euro bank deposits. The second argument the authors give is that the utility derived from using foreign currency for transactions increases with the share of other people using foreign currency. Again, the point as such is well taken, but unless citizens also use foreign currency in day-to-day interactions (as opposed to just storingcurrency in their bank account), it does not strike me as evidence of network effects. Interestingly, the authors find that households that live closer to the Euro area border are less likely to prefer foreign currency deposits. If foreign currency deposits and day-to-day use of currency were positively correlated, one would have expected the opposite.

I would have been curious to see some more about the regional pattern of foreign currency holdings. In the majority of the paper, the authors use fixed effects by region and year to take out heterogeneity along the regional dimension. This is good and bad at the same time. While allowing the authors to focus on household level variation within regions, it also takes out potentially interesting insights into the regional drivers of

foreign currency holdings. It would have been nice to link in region-specific variables, from national census data, as additional controls.

Finally, in terms of policy implications, the authors suggest that while policymakers in eastern Europe can try to build up trust in their policies and institutions, their hands are tied whenever a large enough share of the population has already chosen to have foreign currency holdings, because of the 'network' effect. This seems to only leave two exit routes from euroization: regulation aimed at reducing the availability of foreign currency bank deposits or full-scale Euro adoption. The future will show.

## Banu Demir
Bilkent University

Financial dollarization/euroization is an old but still-alive debate. The interest of both researchers and policymakers in the topic arises primarily from the difficulties associated with dollarization: dollarization may undermine the effectiveness of the monetary policy and intensify the unwanted effects of exchange rate depreciation. So far the literature has assessed the determinants and effects of dollarization mostly at the aggregate level (e.g. Levy-Yeyati, 2006). The question of why households hold foreign-exchange deposits has remained unanswered: Is it a habit, or a conscious decision? By answering this question, the authors make a valuable contribution to the literature.

This paper uses household-level survey data from ten countries to study deposit euroization in Central, Eastern and Southeastern Europe. By providing the first household-level analysis of dollarization, the paper tries to identify different motives behind financial euroization and draws policy conclusions. The results suggest that deposit euroization is driven by a combination of people's perception of macroeconomic outlook and past experience. Because of the dependence of the decision on past experience, implementing better macroeconomic policies could only partly reverse the euroization trend. In particular, such policies might not remove the hysteresis factor. Given these robust findings and resulting policy implications, the paper opens the black box of financial dollarization. Future work might usefully include extending the dataset to ask new and more detailed questions about the drivers and consequences of financial dollarization at the microlevel.

One interesting direction for future research might be to investigate the role of country heterogeneity in financial euroization. The region under consideration in the empirical analysis consists of countries with different characteristics. So one could be curious to know how deposit euroization interacts with country-level characteristics. Currently, the paper includes region-wave fixed effects to control for country heterogeneity. Unearthing new stylized facts about deposit euroization would be possible if the survey was repeated in the future.

Another interesting extension would be to use a policy change/quasi-natural experiment to improve the identification of the effects estimated in the paper. For instance, the

empirical findings reported in the paper suggest that euroization observed in the Central, Eastern and Southeastern Europe is a combination of habit and conscious choice. One could investigate whether there exists a policy change that happened between two waves, which can be used to better identify the effect of current conditions versus past experience.

Last but not least, the paper could be extended to include a more thorough analysis of the potential effects of de-euroization under various potential policy responses. This would have useful implications for the feasibility and desirability of such policies.

## Panel discussion

Michalis Haliassos mentioned the measure of network effects used in the paper and pointed out that it might be related to two elements. One is awareness and the other is the extent of interaction with others about foreign deposits. He said it would be interesting to distinguish the two empirically. Sergei Guriev said households may use foreign currency deposits for hedging purposes and that it would be interesting to see this in the data. Nicola Fuchs-Schündeln asked whether Euro accounts are available to everyone. Refet Gürkaynak wondered about the possibility of a prediction exercise. As a country converges in its demographics and education to France or Germany, he asked how euroization would change. Replying to the discussants' comments, Helmut Stix clarified that the survey is a representative one. In response to suggestions on having regional information, he said that it would be great to have this information but it is hard to get it so they choose to use regional dummies to control for this source of heterogeneity. Information on foreign currency liabilities of households is available from the survey and could be used to examine whether households are hedging corresponding currency risk with foreign currency deposits Although no systematic data on supply side conditions are available, anecdotal evidence suggests that foreign currency deposits are readily available for depositors. Martin Brown clarified that the lack of cohort effects in the extent of preferences for foreign currency savings suggests that euroization will not disappear by demographic force alone.

### SUPPLEMENTARY DATA

Supplementary data are available at *Economic Policy* through Oxford Journals Online.

## APPENDIX A1. VARIABLE DEFINITIONS AND SOURCES

| Variable name | Definition | Source |
|---|---|---|
| **Panel A** | | |
| *Deposit substitution* | | |
| FC preference | Dummy = 1 if household would prefer to save (2 months average wages) in foreign currency, 0 otherwise. Based on question 'Suppose you had [COUNTRY-SPECIFIC VALUES correspond to 2 times average monthly salary] [LOCAL CURRENCY] to deposit in a savings account. Would you choose to deposit this amount in. . .' ([LOCAL CURRENCY], Euro, US dollar, Swiss franc, other foreign currency) | Euro Survey |
| FC deposit share | Categorical variable measuring the portfolio share of FC in total deposits. = 0 if household has no foreign currency deposit account (but a local currency deposit account), = 1 if the FC share ranges from 1 to 40%, = 2 if the FC share ranges from 41 to 60%, = 3 if the FC share ranges from 61 to 100% | Euro Survey |
| *Monetary expectations and network effects* | | |
| Depreciation (1-year) | Dummy = 1 if household expects a depreciation, rather than an appreciation or the same exchange rate over the next year | Euro Survey |
| Exchange rate unpredictable (1-year) | Categorical variable measuring if household predicts exchange rate over the next year to be very predictable (0), quite predictable (1), quite unpredictable (2) or very unpredictable (3) | Euro Survey |
| Inflation higher (1-year) | Dummy = 1 if household expects higher inflation, = 0 if the household expects Lower inflation or no change in inflation over the next year | Euro Survey |
| Inflation unpredictable (1-year) | Categorical variable measuring if household predicts development of prices over the next year to be very predictable (0), quite predictable (1), quite unpredictable (2) or very unpredictable (3) | Euro Survey |
| Local currency unstable (5-year) | Derived from consent to statement 'Over the next 5 years, the [LOCAL CURRENCY] will be very stable and trustworthy' (6 point Likert scale from | Euro Survey |

(*Continued*)

**Appendix A1. (continued)**

| Variable name | Definition | Source |
|---|---|---|
| | strongly agree to strongly disagree). Categorical variable = 0 (strongly agree, agree), 1 (somewhat agree, somewhat disagree), 2 (disagree, strongly disagree) | |
| EURO unstable (5-year) | Derived from consent to statement 'Over the next 5 years, the Euro will be very stable and trustworthy' (6 point Likert scale from strongly agree to strongly disagree). Categorical variable = 0 (strongly agree, agree), = 1 (somewhat agree, somewhat disagree), = 2 (disagree, strongly disagree) | Euro Survey |
| Network savings strong | Derived from consent to statement 'In [MY COUNTRY] it is very common to hold foreign currency deposits' (6-point Likert scale from strongly agree to strongly disagree). Dummy = 1 (strongly agree, agree), 0 otherwise | Euro Survey |
| Network payments strong | Derived from consent to statement 'In [MY COUNTRY] it is very common to make certain payments in Euro' (6-point Likert scale from strongly agree to strongly disagree). Dummy = 1 (strongly agree, agree), 0 otherwise | Euro Survey |
| Neighbors network savings (payments) strong | Share of households with *Network savings strong* (*Network payments strong*). The share refers to the share at the primary sample unit. For the calculation of the share the household itself is excluded | Euro Survey |
| **Panel B** | | |
| *Past crises, policies and institutions* | | |
| Crisis experience | Derived from 'If you think back in time to periods of economic turbulences that happened prior to 2008, e.g. very high inflation, banking crisis or restricted access to savings deposits. At that time, did you personally incur a financial loss due to such events?' Dummy = 1 if 'Yes', 0 if 'No, I had no savings then' and 'No, I did not incur a financial loss' | Euro Survey |
| Crisis experience (relatives) | Derived from 'And what about your close relatives? Did they incur a financial loss due to such events?' Dummy = 1 if household report crisis experience of relatives but no own crisis experience, 0 = otherwise | Euro Survey |
| Memory of inflation | Derived from statement 'I remember periods of high inflation during which the value of the [LOCAL CURRENCY] dropped sharply' (6-point Likert scale from strongly agree to strongly disagree). Dummy = 1 if household strongly agrees, agrees or somewhat agrees, 0 otherwise | Euro Survey |

(*Continued*)

**Appendix A1. (continued)**

| Variable name | Definition | Source |
|---|---|---|
| Trust in government | Dummy = 1 if household trusts completely or somewhat trusts the government, 0 otherwise ('neither trust nor distrust', 'somewhat distrust' or 'do not trust at all') | Euro Survey |
| Trust in police | Dummy = 1 if household trusts completely or somewhat trusts the police, 0 otherwise ('neither trust nor distrust', 'somewhat distrust' or 'do not trust at all') | Euro Survey |
| Cash used to avoid taxes | Derived from consent to statement 'In [MY COUNTRY], it is very common that people pay cash to avoid taxes' (6-point Likert scale from strongly agree to strongly disagree). Dummy = 1 if household strongly agrees, agrees or somewhat agrees, 0 = otherwise | Euro Survey |
| Economy better (5-year) | Derived from consent to statement 'Over the next 5 years, the economic situation of [MY COUNTRY] will improve' (6-point Likert scale from strongly agree to strongly disagree). Dummy = 1 if household strongly agrees, agrees or somewhat agrees, 0 = otherwise | Euro Survey |
| *Financial sophistication and socioeconomic controls* | | |
| Financial literacy | Number of correct responses to the following three questions: 'Suppose you had [100 LOCAL CURRENCY] in a savings account and the interest rate was 2% per year. Disregarding any bank fees, how much do you think you would have in the account after 5 years if you left the money to grow? (More than 102 LC/ Exactly 102 LC/Less than 102 LC/Do not know/No answer)'. 'Suppose that the interest rate on your savings account was 4% per year and inflation was 5% per year. Again, disregarding any bank fees–after 1 year, would you be able to buy more than, exactly the same, or less than today with the money in this account? (More/Exactly the same/Less/Do not know/No answer)'. 'Suppose that you have taken a loan in EURO. Then the exchange rate of the [LOCAL CURRENCY] depreciates against the EURO. How does change the amount of local currency you need to make your loan installments. . .(Increase/Stays the same/Decreases/Don't know/No answer)' | Euro Survey |
| Education | Dummy = 1 if education is higher than primary or lower secondary education (as defined by ISCED 1997), 0 otherwise | Euro Survey |

(*Continued*)

**Appendix A1. (continued)**

| Variable name | Definition | Source |
|---|---|---|
| Age | Age of respondent in years | Euro Survey |
| Income | Household income: low, middle, high or n/a | Euro Survey |
| Risk averse | Dummy = 1 if household prefers safe to risky investment, 0 = otherwise. | Euro Survey |
| Self-employed | Dummy = 1 if household is self-employed, 0 = otherwise | Euro Survey |
| Remittances | Dummy = 1 if household receives remittances from abroad, 0 = otherwise | Euro Survey |
| Car | Dummy = 1 if household owns a car, 0 = otherwise | Euro Survey |
| Homeowner | Dummy = 1 if household owns its residence, 0 = otherwise | Euro Survey |
| FC loan, LC loan | Dummy = 1 if household has a foreign currency (local currency) loan, 0 = otherwise | Euro Survey |
| Distance to bank | Derived from statement 'For me, it takes quite a long time to reach the nearest bank branch' (6-point Likert scale from strongly agree to strongly disagree). Categorical variable ranging from 1 (strongly disagree) to 6 (strongly agrees) | Euro Survey |
| Distance to Euro Area <50 km | Dummy = 1 if household's primary sample unit is located within 50 km of the Euro area border | Euro Survey |
| Euro adoption | Dummy = 1 if household expects Euro adoption ('When, in which year, do you think the Euro will be introduced in [YOUR COUNTRY]?'), 0 if households answers never. *Euro adoption don't know*: Dummy = 1 if household answers don't know | Euro Survey |
| Financial situation bad | Derived from consent to statement 'Currently, the financial situation of my household is good' (6-point Likert scale from strongly agree to strongly disagree). Dummy = 1 if household strongly disagrees, disagrees or somewhat disagrees, 0 = otherwise | Euro Survey |
| Exchange rate regime and aggregate euroization | | |
| Peg or quasi-peg | Dummy = 1 if Bulgaria (BG), Bosnia and Herzegovina (BH), Croatia (HR), FYR Macedonia (FM) | National central banks |
| Floating exchange rate regime | Dummy = 1 if Czech Republic (CZ), Hungary (HU), Poland (PL), Albania (AL), Romania (RO), Serbia (SR) | National central banks |
| Euroization low | Dummy = 1 if Czech Republic, Hungary, Poland | National central banks |

## APPENDIX A2. DESCRIPTIVE STATISTICS

| Variable name | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| *Deposit substitution* | | | | | |
| FC preference | 14268 | 0.461 | 0.498 | 0 | 1 |
| FC deposit share | 2534 | 0.865 | 1.249 | 0 | 3 |
| *Monetary expectations and network effects* | | | | | |
| Depreciation (1-year) | 15412 | 0.455 | 0.498 | 0 | 1 |
| Exchange rate unpredictable (1-year) | 14401 | 1.406 | 0.866 | 0 | 3 |
| Inflation higher (1-year) | 15148 | 0.413 | 0.492 | 0 | 1 |
| Inflation unpredictable (1-year) | 14872 | 1.364 | 0.931 | 0 | 3 |
| Local currency unstable (5-year) | 14125 | 1.201 | 0.669 | 0 | 2 |
| EURO unstable (5-year) | 13959 | 0.906 | 0.691 | 0 | 2 |
| Network savings strong | 13367 | 0.320 | 0.467 | 0 | 1 |
| Network payments strong | 14239 | 0.257 | 0.437 | 0 | 1 |
| Neighbors network savings strong | 15073 | 0.312 | 0.307 | 0 | 1 |
| Neighbors network payment strong | 15305 | 0.250 | 0.288 | 0 | 1 |
| *Crisis experience, policies and institutions* | | | | | |
| Crisis experience | 13558 | 0.136 | 0.343 | 0 | 1 |
| Crisis experience relatives | 10322 | 0.125 | 0.331 | 0 | 1 |
| Memory of inflation | 13600 | 0.608 | 0.488 | 0 | 1 |
| Trust in government | 15177 | 0.239 | 0.426 | 0 | 1 |
| Trust in police | 15223 | 0.382 | 0.486 | 0 | 1 |
| Cash used to avoid taxes | 13331 | 0.628 | 0.483 | 0 | 1 |
| Economy better (5 year) | 14734 | 0.308 | 0.462 | 0 | 1 |
| *Financial sophistication and socioeconomic controls* | | | | | |
| Financial literacy | 14895 | 1.766 | 1.052 | 0 | 3 |
| Education | 15313 | 0.757 | 0.429 | 0 | 1 |
| Age | 15412 | 46.111 | 15.187 | 19 | 98 |
| Income high | 15412 | 0.264 | 0.441 | 0 | 1 |
| Income middle | 15412 | 0.247 | 0.431 | 0 | 1 |
| Income na | 15412 | 0.206 | 0.404 | 0 | 1 |
| Risk averse | 14092 | 0.850 | 0.357 | 0 | 1 |
| Self-employed | 15367 | 0.072 | 0.259 | 0 | 1 |
| Remittances | 15266 | 0.079 | 0.270 | 0 | 1 |
| LC loan | 15412 | 0.132 | 0.339 | 0 | 1 |
| FC loan | 15412 | 0.117 | 0.322 | 0 | 1 |
| Car | 15412 | 0.606 | 0.489 | 0 | 1 |
| Homeowner | 15412 | 0.866 | 0.340 | 0 | 1 |
| Distance to bank | 14658 | 2.881 | 1.589 | 1 | 6 |
| Distance to Euro Area <50 km | 15412 | 0.219 | 0.413 | 0 | 1 |
| Euro adoption | 6878 | 0.530 | 0.499 | 0 | 1 |
| Euro adoption don't know | 6878 | 0.292 | 0.455 | 0 | 1 |
| Fin. situation bad | 15136 | 0.676 | 0.468 | 0 | 1 |

*Note:* This table provides (unweighted) summary statistics for all variables in our analysis. Variable definitions are provided in Appendix A1.

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