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What is Driving Financial Dollarization in Transition Economies? A Dynamic Factor Analysis

By

Narayan K. Kishor and Kyriakos C. Neanidis

Centre for Growth and Business Cycle Research, Economic Studies,
University of Manchester, Manchester, M13 9PL, UK

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Narayan K. Kishor* and Kyriakos C. Neanidis†

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Abstract

This paper investigates the impact of institutions on the dollarization of the domestic banking system by using a unique policy experiment: the accession process of countries to the European Union (EU). Using a dynamic factor model, we decompose fluctuations in financial dollarization for 24 transition economies into a world factor, an EU factor, and country-specific factors. The EU factor, which proxies for improvements in institutions under the set criteria for eventual membership, reveals the importance of institutions for the extent of financial dollarization over time. The results also indicate the asymmetric impact of improved institutions on the domestic bank's balance sheets by inducing higher loan dollarization and lower deposit dollarization. The relative importance of the EU factor to the financial dollarization of a country is associated with the degree of comovement of its business cycle with that of the EU.

Keywords: financial dollarization; institutions; European Union

JEL Classification Numbers: E44; F33; G20; N24

*Department of Economics, University of Wisconsin–Milwaukee, Milwaukee, WI 53201, USA. E-mail: kishor@uwm.edu

†Corresponding author. Economics, University of Manchester and Centre for Growth and Business Cycle Research, Manchester M13 9PL, United Kingdom. Tel: 0044 161 275 4832; Fax: 0044 161 275 4812; Email: kyriakos.neanidis@manchester.ac.uk

1 Introduction

In recent years, considerable attention has been given to the examination of the causal factors of financial dollarization (FD). This increased effort is an outcome of the perceived role of FD as a trigger mechanism for balance of payments and financial crises, and overall macroeconomic instability, in the light of exchange rate swings. The reasoning is that large depreciations reduce the net worth of banks and firms with (unhedged) foreign-currency-denominated liabilities, so that FD can lead to sharp contractions in output. The literature has converged to the importance of a set of variables as determinants of FD, with institutional quality featuring as prominent amongst them. This paper contributes to the literature by further corroborating the significance of institutions for the level of FD by exploiting a unique historical policy experiment: participation to the European Union (EU).

The theories that explain the level and persistence of FD can be summarized by the currency substitution view, the asset portfolio view, the market failure view, and the institutional view.[1] As it concerns the latter, the quality of institutions can influence FD through a variety of channels. First, short-sighted monetary policymakers may create an inflation surprise in order to stimulate output growth. If this policy persists, higher inflation, by eroding the value of the domestic currency, induces agents to switch into foreign currency holdings. Second, fiscal policymakers looking for easy ways to generate revenue may put pressure on monetary authorities to "run the presses," the result being higher levels of seigniorage, inflation and dollarization. Third, to the extent that weak institutions detract from the credibility of a commitment not to bail out foreign-currency debtors in the event of a sudden devaluation, they may compound the mispricing associated with implicit government guarantees (Levy-Yeyati, 2006). Lastly, weak institutions may also raise concerns about the enforcement of property rights and the prevalence of the rule of law. All these mechanisms point to the view that high institutional quality can reduce the degree of FD by enhancing the credibility of a government and encouraging confidence in the domestic

[1] A detailed description of the underlying intuition of these theories can be found in the surveys of De Nicoló et al. (2005) and Levy-Yeyati (2006).

currency.

These views are reflected in a number of empirical studies that have used various measures of institutional quality to examine its impact on deposit dollarization. Amongst the first studies that assessed the role of institutional quality are De Nicoló et al. (2005), Levy-Yeyati (2006), and Rennhack and Nozaki (2006). These studies proxy institutional factors with GDP per capita and, more directly with, indicators of national quality of governance (or institutional development) along various dimensions (Kauffmann et al.,1999): effectiveness of government, political stability, voice and accountability, quality of economic regulation, corruption, and rule of law.[2] In all cases, higher levels of institutional quality have been found to be associated with lower degrees of deposit dollarization.[3]

A more systematic treatment of the relationship between institutions and FD has been conducted in two recent studies by Honig (2009) and Vieira et al. (2012). Honig (2009) uses various types of financial dollarization (deposit, loan, currency mismatch, deposit plus loan) along with a composite measure of government quality (bureaucratic quality, corruption, and law and order) from the International Country Risk Guide (ICRG) to show that improved government quality reduces financial dollarization in all its dimensions. More importantly, he finds that the effect of government quality is retained once inflation and past high-inflation periods are controlled for, implying that the impact of government quality operates complementary to that of inflation. Vieira et al. (2012) support the findings of Honig (2009), as they also show that despite of declines in inflation rates, many countries continue to experience high levels of deposit dollarization, this being an outcome of their poor institutions. In addition, they illustrate that higher deposit dollarization is a rational response of agents in economies ridden with high public debt, as that leads to a high risk of debt default and fuels investor's expectations for domestic currency depreciations and higher future rates of inflation. Thus, current low inflation and high dollarization can co-exist due

[2] Levy-Yeyati (2006) has also used the Country Policy and Institutional Assessment (CPIA) index assembled by the World Bank.

[3] A non-exhaustive list of studies that have generally examined the drivers of unofficial dollarization include Ize and Levy-Yeyati (2003), Arteta (2005), Honig (2005), Honohan (2008), Luca and Petrova (2008), and Rosenberg and Tirpák (2008).

to agents' expectations of higher future inflation rates.[4]

Obviously, the last two papers share a common feature in that they specifically consider the role of institutions for the extent of dollarization. But, at the same time, they proxy the definition of institutions in a different way. Honig (2009) does so in a more direct manner, while Vieira et al. (2012), on top of the direct way, uses the size of the domestic debt, which may be an outcome of reckless fiscal policy, itself a proxy of poor governance.

Our paper also considers the role of institutions on a country's exposure to foreign exchange risk by determining the effect on the unofficial dollarization of the domestic banking system. Our innovation, however, is to use an explicit historical policy decision to proxy for improvements in institutional quality, this being a country's decision to join the EU. The process toward EU membership is composed of three distinct stages, where candidate countries need to progress towards meeting the 'Copenhagen criteria'. These criteria state that a country must achieve (i) stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities; (ii) the existence of a functioning market economy as well as the capacity to cope with competitive pressure and market forces within the Union; and (iii) the ability to take on the obligations of membership including adherence to the aims of political, economic and monetary union. In addition, the path to EU accession requires all prospective members to align their legislation with the body of European law and to pursue price stability as their primary objective of monetary policy (Ecofin, 2000).

The above conditions represent a clear commitment from the candidate countries' governments and monetary authorities in following policies that reflect improved quality of governance and in promoting long-run currency stability. In other words, the objective is to foster institutional development as a way of deepening European integration. For this reason, we argue that the procedure toward EU admission can be used to proxy for institutional improvement, as it signifies an institutional regime shift, and assess potential changes

[4]Neanidis and Savva (2009) have also explored the role of institutions proxied by the ICRG index of corruption. But their analysis refers to short-term variations in FD rather than the levels of FD as typical in the literature.

in financial dollarization. In this way, our analysis complements the works of Honig (2009) and Vieira et al. (2012) in capturing the effect of institutions.

A number of inter-disciplinary studies have examined the link between EU accession, on the one hand, and institutional and macroeconomic outcomes, on the other. Kelley (2004) and Belke et al. (2009) show that pre-membership conditions set by the EU clearly enhance institutional development, while the economic benefits of institutional reform due to EU membership have been estimated to be higher GDP growth of 24%-36% in 25 Central and Eastern European countries (Piazolo, 1999) and increased consumption per capita in Turkey by 9% (Lejour and Mooij, 2005). Neanidis and Savva (2011) have also estimated the effect of inflation uncertainty on the rate of inflation prior to EU accession and during EU accession and entry. Due to the inflationary bias of the authorities prior to accession, nominal uncertainty was found to raise inflation. This positive effect disappeared during EU accession because it offered a strict commitment mechanism to the acceeded countries' monetary authorities to price stability.

For our study, we limit our interest to 24 transition economies in Central and Eastern Europe and the Former Soviet Union for one main reason. It is from this set of countries that some have gone through the EU membership process with a subset having become full members in recent years. Thus, this group of countries represents a natural environment to study our main hypothesis on whether, and how, changes in institutional quality affect FD, defined as deposit and loan dollarization. We identify the impact of higher integration with the EU on the level of FD with the use of a dynamic latent factor model that decomposes fluctuations in FD into the following factors: (i) a world factor, which picks up fluctuations that are common across all transition economies; (ii) an EU factor that captures movements that are common to countries participating in the EU accession process; and (iii) country factors that are specific to each country. Importantly, the model allows us to trace the evolution of each of the factors over time and, thus, examine their separate roles in shaping a country's level of FD.

The empirical evidence indicates that institutional quality, proxied by EU convergence, is

an important determinant of FD. Moreover, it is shown that there has been a rise over time of the relative importance of the EU factor in accounting for fluctuations in both deposit and loan dollarization. The results also point to an asymmetric effect of the EU factor on the two types of banking dollarization, causing lower deposit but higher loan dollarization. Finally, variance decomposition analysis suggests that the relative contribution of the EU factor to the FD in each country can be linked with the country's business cycle synchronization with the EU cycle.

The remainder of the paper is organized as follows. Section 2 describes the empirical methodology and the data. Section 3 presents the findings of the analysis. Section 4 provides the concluding comments.

2 Methodology and Data

The focus of this paper is to answer the following questions: First, what are the major factors driving financial dollarization in transition economies? Are these factors mainly common to all these countries (global), or is there a distinct factor specific to those countries that participate in EU accession arrangements that help shape up their institutional environment? Second, how have these factors evolved as the process of EU membership, and subsequent institutional development, was progressing through its various stages? We use a dynamic factor model, based on Stock and Watson (1991) and Kim and Nelson (1998), to answer these questions. We first describe the data set and then discuss the main features and advantages of our methodological approach.

2.1 Data

Our data set is composed of 24 transition economies located in Central and Eastern Europe and the Former Soviet Union.[5] The sample includes 12 countries affiliated to the EU either as Member States (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland,

[5]The list of transition economies follows the IMF (2000) and the World Bank (2002). We exclude from the list the following Asian economies: Cambodia, China, Laos, and Vietnam. We include Turkey due to its formal association with the EU.

Romania, the Slovak Republic, and Slovenia) or candidate countries (Croatia and Turkey), and 12 countries that are not affiliated to the EU in a formal way (Albania, Armenia, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyz Republic, Macedonia FYR, Moldova, Russia, Serbia, and Ukraine). Formal admission to the EU proceeds in three stages: the first stage represents the start of the negotiation process; the second stage corresponds to the completion of the negotiation process where the EU assigns a date of entry to the negotiating country; and the final stage reflects the date after which full membership is granted. The dates of these stages for the 12 EU-affiliated countries are given in Table 1.[6]

Deposit and loan dollarization constitute our measures of financial dollarization. Following the literature, the former is defined as the ratio of foreign currency deposits to total deposits of residents at domestic banks, while the latter measure of dollarization reflects the ratio of foreign currency loans to total loans of domestic banks to residents. The data are at monthly frequency and primarily drawn from National Central Bank reports and supplemented by data from the IMF's International Financial Statistics. The sample period is the most comprehensive in terms of coverage, containing all available data since the early 1990s and extents all the way to the end of the 2000s.[7]

Table 2a summarizes statistics of deposit and loan dollarization for each of the countries, along with their period coverage and number of observations, by splitting them into two groups: EU-affiliated and non-EU-affiliated. The sample includes a total of 4,116 observations for deposit dollarization and 3,757 for loan dollarization, with the EU-affiliated countries having about 30% more data for both types of dollarization. A few notable characteristics of Table 2a are as follows. First, the degree of dollarization exhibits substantial variation both across and within countries. There are countries, like Armenia, Bulgaria, Georgia, and the Kyrgyz Republic, that have relatively high levels of both types of dollarization, while countries like the Czech Republic and Slovak Republic have low levels. There

[6]Macedonia FYR has not been granted the status of candidate nation because EU accession negotiations have not yet started.

[7]Exceptions are Turkey for which data on deposit dollarization are available since 1986, and the Slovak Republic and Slovenia for which the end-of-period coverage is at the end of 2008 and 2006, respectively, as a way of avoiding the periods after which these countries formally adopted the Euro as their legal tender.

are also countries where dollarization exhibits high variation over time (Armenia, Estonia, Georgia, Turkey), while in others the variations is very small (Bosnia and Herzegovina, Macedonia FYR, Moldova, Poland). Second, for some countries there is a clear mismatch between the levels of foreign currency loans and deposits–see, for instance, Albania, Croatia, Estonia, Serbia. Third, the average levels of both deposit and loan dollarization are lower in the EU-affiliated countries by about 16% and 7% respectively.

One more interesting piece of information appears in Table 2b, where we can observe the average degrees of dollarization for the EU-affiliated nations by dividing the sample into two distinct periods: the pre-EU and post-EU accession periods. The table illustrates that for the majority of the countries, affiliation with the EU has led to lower levels of deposit dollarization (for eight countries) and higher levels of loan dollarization (for nine countries); on average, deposit dollarization declined by 2.5% and loan dollarization rose by 7.5%. The reason for this demarcation, we claim, is that EU accession enhances the credibility of economic reforms in candidate countries through the establishment of institutions common to EU members. A formal evaluation of this hypothesis follows in the next section.

2.2 Model Specification

Dynamic factor models have become a popular econometric tool for quantifying the degree of comovement among financial and macroeconomic time series. The motivation underlying these models is to identify a few common factors that drive fluctuations in large data sets. These factors can capture common fluctuations across the entire data set (i.e., the world) or across subsets of the data (e.g., a particular group of countries). The factor structure is directly motivated by general equilibrium models (see Altug, 1989, and Sargent, 1989). The factors are interpreted as representing the effects of many types of common shocks, such as technology shocks, monetary policy shocks or other, rather than specific types of shocks.

Our objective is to measure the impact of institutions on financial dollarization, where we proxy changes in institutions with the three-stage evolutionary process of EU membership. For this purpose, we construct a model where we decompose financial dollarization into three

factors: (i) a world factor, (ii) an EU factor, and (iii) an individual country factor. The world factor is common across all the countries in the system, whether the country is part of the EU accession process or not. For example, countries not affiliated with the EU, such as Ukraine, will have a world factor, and so will countries that are affiliated with the EU, like the Czech Republic. The EU factor is common across countries that are either candidates for admission into the EU, or are already full members. The portion of financial dollarization that cannot be explained by the latent unobservable (world and EU) factors is the idiosyncratic factor which is unique to each country. All dynamic relationships in the model are captured by modeling each of the factors and the idiosyncratic component as autoregressive processes.

Unlike most studies in the literature that focus just on deposit dollarization, we analyze the impact of institutions on both deposit and loan dollarization. This is a more inclusive approach since recent studies have shown that the determinants of deposit and loan dollarization may differ (see, for instance, Neanidis and Savva, 2009). Most of the models that use dynamic factor analysis are based on stationary variables (Stock and Watson, 2011), as the use of non-stationary variables may create inference problems. To test whether deposit and loan dollarization are stationary, we perform a Phillips-Perron unit root test on these series for all countries in the sample. Table 3 reports the p-values of the test, which suggest that we cannot reject the null of unit root at all levels of significance for every country except for Ukraine's deposit dollarization. Even in that case, though, there is weak evidence in support of non-stationarity. Therefore we conclude that the levels of both deposit and loan dollarization are non-stationary.[8] For this reason, we will be using the first differences of the financial dollarization series, which are found to be stationary. Note, however, that even though our dynamic factor model is estimated in first differences, we can extract the *level* of the unobserved (world, EU, and country-specific) factors that are of interest to us. Below we explain this methodology.

Suppose ΔFD_{it} stands for the change in financial dollarization (i.e., change in foreign

[8] Other unit root tests like Ng-Perron and ERS also do not reject the null of unit root at conventional significance levels.

currency deposits or loans) for country i at time period t. We can decompose this variable into three components

$$\Delta FD_{it} = C_t + \theta_i EU_t + \eta_{it}, \tag{1}$$

where C_t is the world factor and estimates the impact of macroeconomic developments in the world economy on financial dollarization in country i at time t. For example, if there is a world wide panic which would increase dollarization across all countries, it would be captured by an increase in C_t. In the same spirit, EU_t denotes the EU factor that captures movements in FD that are common only to countries affiliated with the EU. The coefficient θ_i, known as factor loading, is a dummy variable set to one if country i has either begun the accession process, or is already a member of the union. Naturally, $\theta_i = 0$ for non-EU-affiliated countries in the sample. Finally, η_{it} is an idiosyncratic component, which is unique to each country. This idiosyncratic component reflects fluctuations in FD that can be explained by individual country characteristics.

Since the two factors and the idiosyncratic component are unobserved, we need to specify a dynamic structure for their identification. To this end, we follow the dynamic factor model of Stock and Watson (1991) and assume an AR(1) process for all three components.[9] They are specified as

$$C_t = \phi C_{t-1} + \epsilon_t, \ \epsilon_t \tilde{} iid \ N(0, \sigma_\epsilon^2), \tag{2}$$

$$EU_t = \beta EU_{t-1} + \eta_t, \ \eta_t \tilde{} iid \ N(0, \sigma_\eta^2), \text{ and} \tag{3}$$

$$\eta_{it} = \psi_i \eta_{it-1} + \upsilon_{it}, \ \upsilon_t \tilde{} iid \ N(0, \sigma_{\upsilon_i}^2), \tag{4}$$

where the innovation terms in equations (2)-(4), ϵ_t, η_t, and υ_{it}, are mutually orthogonal across all equations and countries in the system.

[9] The autoregressive processes can, in principle, be of different order. For simplicity and parsimony, however, we restrict them to be of order one. Since we are using monthly differenced data, this should capture most spillovers across countries. In fact, if we fit an ARIMA model on the first-differenced financial dollarization series, the AR(1) model seems to suffice for all of the countries in our sample.

To disentangle the importance of the various factors, we can cast the dynamic factor model given by equations (1)-(4) into a state-space framework. For the sake of simplicity, suppose $i = 3$, and the three countries are the Czech Republic, Slovenia, and Ukraine. Here $\theta_i = 0$ for Ukraine $\forall t$, while $\theta_i = 1$ for the Czech Republic and Slovenia from March 1998 onwards (see Table 1). In this framework, the measurement equation (1) takes the following form

$$\begin{bmatrix} \Delta FD_{1t} \\ \Delta FD_{2t} \\ \Delta FD_{3t} \end{bmatrix} = \begin{bmatrix} 1 & \theta_1 & 1 & 0 & 0 \\ 1 & \theta_2 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix} \cdot \begin{bmatrix} C_t \\ EU_t \\ \eta_{1t} \\ \eta_{2t} \\ \eta_{3t} \end{bmatrix}, \tag{5}$$

while the state-space representation of the transition equations (2)-(4) is set up as

$$\begin{bmatrix} C_t \\ EU_t \\ \eta_{1t} \\ \eta_{2t} \\ \eta_{3t} \end{bmatrix} = \begin{bmatrix} \phi_1 & 0 & 0 & 0 & 0 \\ 0 & \beta_1 & 0 & 0 & 0 \\ 0 & 0 & \psi_1 & 0 & 0 \\ 0 & 0 & 0 & \psi_2 & 0 \\ 0 & 0 & 0 & 0 & \psi_3 \end{bmatrix} \cdot \begin{bmatrix} C_{t-1} \\ EU_{t-1} \\ \eta_{1t-1} \\ \eta_{2t-1} \\ \eta_{3t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_t \\ \eta_t \\ \upsilon_{1t} \\ \upsilon_{2t} \\ \upsilon_{3t} \end{bmatrix}. \tag{6}$$

Since for identification the shocks in equations (2)-(4) are assumed to be independent, the variance-covariance matrix for the shocks, in this simple three-country model, takes the following form

$$\Omega = \begin{bmatrix} \sigma^2_{\epsilon} & 0 & 0 & 0 & 0 \\ 0 & \sigma^2_{\eta} & 0 & 0 & 0 \\ 0 & 0 & \sigma^2_{\upsilon_1} & 0 & 0 \\ 0 & 0 & 0 & \sigma^2_{\upsilon_2} & 0 \\ 0 & 0 & 0 & 0 & \sigma^2_{\upsilon_3} \end{bmatrix}. \tag{7}$$

To achieve identification in this dynamic factor model, we assume zero covariance across shocks to the world, the EU and the idiosyncratic factors (see, for details, Morley et al., 2003). In our analysis, we generalize this three-country model into our sample of 24 countries, where as indicated earlier 12 countries fall into the EU membership criteria and the remaining 12 countries are not affiliated with the EU. The above state-space model is estimated using maximum likelihood via the Kalman filter.

The model is estimated in first differences with demeaned variables. To extract the level of the world and the EU factors, we follow Harvey (1989) as described in Kim and Nelson

(2000). If L_t is the level of the factor we are interested in extracting, we can write the filtered estimate $L_{t|t} = L_{t|t-1} + \Delta l_{t|t} + \delta$. Here $\Delta l_{t|t}$ is the first difference of the factor L_t, while δ is the mean of $\Delta l_{t|t}$. δ can be estimated using the formula $\delta = W(1)\Delta FD_t$, where ΔFD_t is the vector that contains the FD variables for each country and $W(1) = (I - (I - KH)F)^{-1}K$. Here K is the steady state Kalman gain derived from the Kalman filter recursion and H is the loading on the state vector in the measurement equation.[10]

2.2.1 Variance Decomposition

We use variance decompositions to measure the relative contributions of the world, EU, and country-specific factors to changes in FD in each country. This provides an empirical assessment of how much of a country's fluctuations in FD are associated with world fluctuations or EU-related fluctuations. We estimate the share of the variance of deposit and loan dollarization attributable to each of the two factors and the idiosyncratic component. Because the world, EU and country-specific latent factors are by construction orthogonal to each other, it is possible to perform variance decomposition for these three components in the dynamics of ΔFD based on equation (1), which can be rewritten as

$$var(\Delta FD_{it}) = var(C_t) + var(\theta_i EU_t) + var(\eta_{it}), \tag{8}$$

or

$$var(\Delta FD_{it}) = \frac{\sigma_\epsilon^2}{1-\phi^2} + \frac{\theta_i^2 \sigma_\eta^2}{1-\beta^2} + \frac{\sigma_{\upsilon_i}^2}{1-\psi_i^2}. \tag{9}$$

The last term in equation (9) represents the variance of ΔFD associated with country-specific developments. As a result, the fraction of volatility due to, say, the EU factor would be

$$\frac{\frac{\theta_i^2 \sigma_\eta^2}{1-\beta^2}}{var(\Delta FD_{it})}, \tag{10}$$

[10]Note that equations (5) and (6) can be written as $\Delta FD_t = H\beta_t$ and $\beta_t = F\beta_{t-1} + \upsilon_t$. For details see Kim and Nelson (2000), pages 52-53.

which suggests that the share of each factor depends on its relative variance as well as the relative persistence of its autoregressive parameter.

2.2.2 Advantages of Dynamic Factor Models

As described in the Introduction, there is a rich literature that examines the determinants of unofficial dollarization. In their majority, these studies rely on panel data econometric techniques to isolate the effect of the variable(s) of interest. This requires that the model specification controls for all variables that are potentially correlated with dollarization. Given, however, the complexity of this task and the lack of data for plausible determinants, it is not unlikely that analyses based on such techniques may be subject to a mis-specification bias. A main advantage of our dynamic factor approach is that we do not have to control for every determinant separately as these are controlled for with the unobservable latent factors. Thus, as long as our parametric structure is correct, our approach yields significant efficiency gains. In dealing with mis-specification in our model, we estimate variations of the benchmark model and show that changes have no impact on the baseline findings.

The estimated factors in our model–world, EU, country–reflect elements of commonality of fluctuations in different dimensions of the FD data. The importance of studying all these factors in one model is that they identify the common components and, at the same time, detect how each country responds to these components. Moreover, since the factors are extracted simultaneously, we can assign a degree of relative importance to each factor through the decomposition analysis. As an outcome, one can identify and assess the role of institutions, proxied by the EU factor, on fluctuations in FD.

The factor model is well suited to studying the joint properties of fluctuations in both deposit and loan dollarization. Using both types of financial dollarization allows us to derive in a robust way its overall association with the institutional environment. Furthermore, this technique allows estimating the evolution of the effect of interest over time. In this way, we can identify changes or breaks in the relationship between institutions and FD during the examined period of time. Importantly, such regime shifts can be traced back to changes in

policies and, thus, offer intuitive interpretations and policy recommendations.

Finally, at a more technical level, the class of dynamic factor models we use (see Stock and Watson, 1991) allow eliminating idiosyncratic shocks and estimating common factors in many variables without running into scarce degrees of freedom problems. Such models also mitigate the need for strong assumptions necessary for structural models.

3 Empirical Results

In this section, we examine the evolution of the various factors and analyze their ability to track changes in financial dollarization in our sample. We then examine the sources of fluctuations across factors using variance decompositions.[11]

3.1 Evolution of the World and EU Factors

Figure 1 displays the dynamics in deposit and loan dollarization that are associated with developments common to all 24 transition countries, i.e., the world factor. This factor appears not to have influenced the time profile of deposit dollarization during the period of investigation. That is to say, developments common to all transition economies have not had a meaningful effect on the size of foreign currency deposits in the banking system. At the same time, the world factor has had a negative impact on the level of loans offered in foreign currency and became more pronounced after the year 1998.

What common developments in transition economies could account for this diverse effect on the two types of dollarization? The behavior of the world factor is consistent with an important stylized fact pertaining to the increased level of financial integration in transition economies since the early 1990s. This is illustrated in Figure 2, where the average volume of international financial flows has almost tripled between 1990 and 2007 (Lane and Milesi-Ferretti, 2007). The role of financial integration for the financial dollarization of transition

[11] We have verified the robustness of the results by doing some sensitivity experiments. These included running the model with (i) the 12 EU-affiliated countries only, and (ii) a variable that captures the mismatch between loans and deposits in foreign currency, rather than with each type of dollarization separately. The results of these experiments are available upon request.

economies has been first articulated by Neanidis and Savva (2009). Their argument goes as follows.

Depositors and financial institutions in transition economies hold deposits and issue loans, respectively, in foreign currencies as a way of minimizing their portfolio risk in order to shield themselves against exchange rate fluctuations and seek for the highest expected rates of asset return. Naturally, the behavior of the two types of agents is driven by the different set of options available to them. Greater financial integration allows banks to have greater accessibility to foreign financial markets and instruments of diversifying currency risk in their asset portfolios compared to depositors. This means that financial integration provides banks with the opportunity to substitute foreign assets for foreign currency loans as a way of optimally reallocating their asset portfolio; this leads to lower loan dollarization, markedly so after 1998 when financial integration jumped to new heights. Depositors, on the other hand, have only limited direct access to international financial markets so that their opportunity for portfolio diversification is restricted. As a result, financial integration has no discernible effect on deposit dollarization. Thus, the common world factor that drives developments in financial dollarization is associated to financial integration.[12]

The EU factor is orthogonal to the world factor by construction and, as we discussed earlier, any common shocks affecting all countries will be picked up by the world factor. The EU factor captures any remaining comovement among countries within the group of EU-affiliated nations. The time profile of the EU factor, for both deposit and loan dollarization, is presented in Figure 3. As the first stage of the EU admission process for the early candidate countries started in March 1998 (see Table 1), this year signifies the starting point of the EU factor. A visual inspection of the EU factor shows its antithetical effect on the two types of dollarization: deposit dollarization has declined while loan dollarization rose. Furthermore, the gap between loan and deposit dollarization has widened after the end of 2002, indicated

[12] An additional way to view the limited diversification options of depositors compared to banks is to look at their behavior during the recent financial crisis, which represents a common shock to all countries. Figure 1 shows the increased impact of the world factor on deposit dollarization since 2008, while loan dollarization continued its downward trail.

in Figure 3 by a solid vertical line.

How can we explain these results? The underlying mechanism corresponds to the improvements of a country's institutional environment during periods of EU accession negotiations. Joining the EU leads to convergence with EU institutions and lends credibility to the policy-makers of the candidate country. This reputational effect is an outcome of the country's commitment to responsible monetary policies that promote confidence in monetary stability (Honig, 2009) and sound fiscal policies that ensure the sustainability of the public debt-to-GDP ratio (Vieira et al., 2012). These policies, by contributing to long-run macroeconomic and currency stability, promote faith in the local currency.

According to Honig (2009), higher confidence in the domestic currency would decrease the extent of deposit dollarization because domestic depositors feel less inclined to hold foreign currency as a way of protecting their net wealth. At the same time, currency stability leads private sector borrowers to be more willing to borrow in foreign currency as they expect exchange rate oscillations to be avoided, thus, leading to higher loan dollarization. In the framework of an EU accession process, the decline in loan dollarization is expected to be exacerbated for three additional reasons. First, EU membership leads to higher trade and an increased volume of financial transactions. These activities provide hedging opportunities for firms, as it makes it easier for them to hedge their foreign currency exposure. Second, EU affiliation encourages full access to foreign currency holdings, as prospective EU members will have to lift their restrictions on capital mobility. Third, due to diminishing currency risk, because of a growing Euro-orientation of exchange rate regimes, that derive their credibility from the clause that EU membership will lead to admission to the Economic and Monetary Union (EMU).

These interpretations are fully reflected in the asymmetric effect of the EU factor on deposit and loan dollarization. Moreover, the widening of the gap after 2002 coincides with the second stage of the EU accession process for eight of the countries (Table 1). This period overlap is fully consistent with the view that depositors and creditors acknowledge the commitment and the achievements of their country's policy-makers in following policies

that ensure financial stability, so that the EU factor expands as the country passes from one negotiation stage to the next. Thus, the EU factor becomes progressively more important in accounting for fluctuations in deposit and loan dollarization as the country's policies receive external validation by the EU in terms of improved economic management and institutional development.

3.2 Sources of Financial Dollarization Fluctuations

We now examine the sources of fluctuations in financial dollarization using a variance decomposition. As a measure of the importance of the factors for FD, we present the variance shares attributable to each factor for the world, the EU and the individual country.

Table 4 shows the results for this variance decomposition for deposit and loan dollarization. The results suggest that the world factor accounts for a very small percentage of changes in both the loan and deposit dollarization in almost all countries. This is particularly the case for the EU-affiliated countries where the total variation explained by the world factor ranges from 0.3% to 7.84%. The fraction of variation in financial dollarization fluctuations explained by the world factor in non-EU-affiliated countries is, on average, larger than its EU counterparts, but not substantially so. Some notable exceptions are Bosnia and Herzegovina and Macedonia FYR where the world factor accounts, respectively, for 15% and 13% of the overall variation in deposit dollarization, and 23% and 32% of the volatility in loan dollarization.

Once we account for the world factor, are there any common movements in FD across the group of EU-oriented countries? The results show that, on average, the EU factor plays a greater role in explaining changes in deposit dollarization (31%) than changes in loan dollarization (20%). As compared to the world factor, the EU factor accounts for remarkably larger shares of FD variances in each country, further supporting the role of institutional improvements on the countries' dollarization of the banking system. Table 4 also indicates that the relative importance of the EU factor is neither uniform across the EU-affiliated countries, nor equal between the two forms of dollarization. There is a significant

variation in the role of the EU factor in explaining changes in deposit (loan) dollarization that ranges between 6% and 62% (2.5% and 52%). Typically, however, the countries for which the EU factor explains a high proportion of movements in one type of dollarization, also does for the other. Such cases are represented by the Czech Republic, Poland, the Slovak Republic and Slovenia.[13] It is for these countries that the EU factor is more (or equally) important than the country-specific factor in explaining variations in deposit dollarization.

How can this be explained? There is a long literature investigating the synchronization of business cycles between the euro area and the new members of the EU and its candidate countries. Business cycle convergence is viewed as a key characteristic for the success of the common monetary policy in Europe. One common finding of the studies in this literature is that only a few countries exhibit a high correlation with the euro-area business cycle (Kočenda, 2001; Artis et al., 2004; Firdmuc and Korhonen, 2004; Furceri and Karras, 2006; Savva et al., 2009). These are the same countries for which the EU factor's contribution is the highest: the Czech Republic, Poland, the Slovak Republic and Slovenia. Thus, the relative importance of the EU factor is positively associated with the degree of a country's business cycle synchronization with the EU: the tighter the links of a country with the EU, the more common characteristics they share, including institutions, thus, raising the significance of the EU factor.

Much of the discrepancy between the relative roles of the world and EU factors mirrors changes in the relative importance of country-specific factors, as shown in columns (3) and (6) of Table 4. Clearly, country-specific factors have played, on average, a more important role for the group of countries that has not been involved with EU accession procedures. The greater importance of country-specific factors in these countries, in explaining dynamics in FD, reflect the diverse experiences among transition countries.

[13] On the other side, we have countries like Bulgaria, Latvia, Romania and Turkey, where the EU factor explains a small fraction of variation in both loan and deposit dollarization.

4 Conclusion

This paper addresses the role of institutions for the extent of financial dollarization in transition economies. Even though other studies also focused on the importance of institutions, we approach this issue by paying attention to a unique historical policy experiment that has taken place in Europe during the last fifteen years. This corresponds to the various stages of negotiations that each country has to undergo with the EU for full membership to be granted. This accession process requires candidate countries to improve their institutions and encourage government and monetary authorities alike to adopt sound policies and promote practices of good governance. Thus, the group of transition countries located in Central and Eastern Europe and the Former Soviet Union represent a natural environment to examine whether the road to EU admission has had any impact on unofficial dollarization.

With this objective in mind, we apply a dynamic factor analysis that is particularly well suited to decompose fluctuations in financial dollarization into three components: a world factor, an EU factor, and a country-specific factor. We show that the world factor plays no role for the dynamics of deposit dollarization, but does explain a downward movement in loan dollarization. These results are mainly driven by the increased financial integration of all transition countries with the rest of the world. In addition, we find that the EU factor has an asymmetric impact on dollarization as it raises foreign currency loans and decreases respective deposits. These findings are associated with higher confidence in the domestic currency, expectations of macroeconomic stability, lower currency risk and exchange rate convergence to the Euro.

Our results further suggest the significance of the EU factor in explaining a substantial portion of the variation in unofficial dollarization. For some countries, the role of the EU factor is even more important than the country-specific factor. We propose that this is linked to the degree of a country's business cycle synchronization with the euro area. Overall, our findings confirm the significance of institutional arrangements for financial dollarization.

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Table 1: EU Accession Process Dates

Country	Start of Negotiations	End of Negotiations	Full Membership
Czech Republic	March 1998	December 2002	May 2004
Estonia	March 1998	December 2002	May 2004
Hungary	March 1998	December 2002	May 2004
Latvia	March 1998	December 2002	May 2004
Lithuania	March 1998	December 2002	May 2004
Poland	March 1998	December 2002	May 2004
Slovak Republic	March 1998	December 2002	May 2004
Slovenia	March 1998	December 2002	May 2004
Bulgaria	December 1999	April 2005	January 2007
Romania	December 1999	April 2005	January 2007
Croatia	October 2005		
Turkey	October 2005		

Notes: Macedonia FYR does not appear in the table because EU accession negotiations have not yet started.

It has been a candidate for EU accession since 2005.

Table 2a: Summary Statistics

Country	Deposit Dollarization						Loan Dollarization					
	Mean	Std Dev	Min	Max	Period	Obs	Mean	Std Dev	Min	Max	Period	Obs
EU-affiliated												
Bulgaria	50.35	6.61	30.14	80.15	1995:12–2009:11	167	48.72	12.69	32.27	93.01	1995:12–2009:11	167
Croatia	65.00	6.98	51.89	76.36	1994:6–2009:10	185	14.80	9.45	5.80	39.64	1994:6–2009:11	186
Czech Republic	11.10	2.10	7.14	15.51	1993:1–2009:11	203	11.82	4.84	2.56	22.69	1993:1–2009:11	203
Estonia	27.08	8.71	4.39	41.23	1993:1–2009:11	203	64.82	26.76	4.60	87.10	1993:1–2009:11	203
Hungary	21.25	4.30	14.15	31.07	1992:1–2009:11	215	31.28	17.12	3.99	68.96	1992:1–2009:11	215
Latvia	46.01	6.23	30.00	60.00	1993:1–2009:11	203	64.04	12.22	49.50	93.48	1994:1–2009:11	191
Lithuania	35.68	8.05	21.90	49.03	1993:12–2009:12	193	52.97	11.45	32.71	73.46	1993:12–2009:12	193
Poland	19.54	6.56	9.93	35.82	1993:1–2009:11	203	24.18	5.32	12.14	36.68	1996:12–2009:11	156
Romania	36.42	6.41	25.00	52.73	1993:9–2009:11	195	51.07	12.79	17.17	64.77	1993:12–2009:11	192
Slovak Republic	13.97	2.50	7.45	19.70	1993:1–2008:12	192	13.87	6.22	1.75	22.75	1993:1–2008:12	192
Slovenia	35.66	4.89	28.86	50.35	1991:12–2006:12	181	25.62	13.32	10.41	57.80	1991:12–2006:12	181
Turkey	39.88	11.00	13.84	61.08	1986:1–2009:10	286	31.58	13.99	10.46	50.79	1996:6–2009:11	163
Total EU-affiliated	33.49	6.19	4.39	80.15		2426	36.23	12.18	1.75	93.48		2242
Non-EU-affiliated												
Albania	33.18	5.52	23.51	45.41	1992:12–2010:1	206	69.97	13.95	29.73	84.71	1998:9–2010:1	137
Armenia	64.88	12.58	35.10	82.90	1995:1–2009:10	178	65.86	15.31	36.90	85.36	1998:1–2009:10	142
Belarus	51.60	11.67	34.70	72.43	2000:1–2009:10	118	27.83	7.55	15.54	43.74	2003:1–2009:10	82
Bosnia and Herzegovina	48.73	2.03	43.67	51.56	2005:1–2009:12	60	12.08	2.43	9.63	16.28	2005:1–2009:12	60
Georgia	69.54	14.23	36.00	93.00	1995:1–2009:11	179	70.37	15.95	26.43	88.18	1995:10–2009:11	170
Kazakhstan	44.39	9.92	23.23	64.27	1997:12–2010:1	146	50.27	8.62	31.02	71.90	1996:1–2010:1	169
Kyrgyz Republic	55.43	10.59	23.00	73.00	1996:1–2009:11	167	60.14	13.07	4.28	76.21	1996:1–2009:11	167
Macedonia FYR	51.76	3.62	43.79	57.91	2003:1–2009:12	84	21.38	3.70	14.88	26.06	2003:1–2009:12	84
Moldova	49.53	4.32	41.60	56.69	2001:12–2010:1	98	40.33	2.00	36.34	44.72	2001:12–2010:1	98
Russia	29.79	8.49	12.95	44.63	1995:6–2008:3	154	37.22	11.10	23.53	71.09	1996:12–2009:9	154
Serbia	63.01	4.19	51.47	69.21	2001:12–2009:12	97	18.37	10.14	6.47	36.14	2003:12–2009:12	73
Ukraine	34.73	6.95	10.69	49.94	1993:1–2009:11	203	41.72	8.93	23.35	59.10	1995:1–2009:11	179
Total Non-EU-affiliated	49.71	7.84	10.69	93		1690	42.96	9.39	4.28	88.18		1515

Notes: The end of the coverage period is shorter for the Slovak Republic and Slovenia as both have adopted the Euro as their legal tender in January 2009 and January 2007, respectively. The sources of the data are the IMF (International Financial Statistics) and National Central Bank reports.

Table 2b: Average Deposit and Loan Dollarization in Pre- and Post-accession Periods

EU-affiliated Country	Deposit Dollarization			Loan Dollarization		
	Total	Pre-accession	Post-accession	Total	Pre-accession	Post-accession
Bulgaria	50.35	52.95	49.85	48.72	69.22	44.80
Croatia	65.00	68.03	56.57	14.80	17.53	7.37
Czech Republic	11.10	10.19	11.51	11.82	8.83	13.13
Estonia	27.08	16.45	31.75	64.82	23.66	79.41
Hungary	21.25	24.76	19.41	31.28	13.68	40.51
Latvia	46.01	46.51	45.79	64.04	59.29	65.73
Lithuania	35.68	40.38	34.00	52.97	36.62	58.84
Poland	19.54	27.63	15.99	24.18	14.12	25.24
Romania	36.42	34.36	37.71	51.07	41.44	56.89
Slovak Republic	13.97	12.48	14.68	13.87	6.56	17.35
Slovenia	35.66	40.17	32.47	25.62	25.31	25.84
Turkey	39.88	40.89	34.98	31.58	39.80	13.55
$Total\ EU-affiliated$	33.49	34.57	32.06	36.23	29.67	37.38

Notes: The pre- and post-accession periods correspond to the periods before and after the beginning of negotiations with the EU, as defined in Table 1, column 2.

Table 3: Unit Root Test

Country	Deposit Dollarization	Loan Dollarization
$EU-affiliated$		
Bulgaria	0.44	0.90
Croatia	0.59	0.73
Czech Republic	0.47	0.33
Estonia	0.80	0.92
Hungary	0.73	0.98
Latvia	0.12	0.99
Lithuania	0.65	0.78
Poland	0.82	0.36
Romania	0.25	0.56
Slovak Republic	0.12	0.35
Slovenia	0.54	0.96
Turkey	0.18	0.96
$Non-EU-affiliated$		
Albania	0.89	0.61
Armenia	0.44	0.85
Belarus	0.74	0.66
Bosnia and Herzegovina	0.39	0.62
Georgia	0.55	0.61
Kazakhstan	0.19	0.27
Kyrgyz Republic	0.19	0.82
Macedonia FYR	0.63	0.38
Moldova	0.20	0.29
Russia	0.79	0.48
Serbia	0.58	0.31
Ukraine	0.06	0.46

Notes: values represent p-values based on a Phillips-Perron unit root test.

Table 4: Variance Decompositions

Country	Deposit Dollarization			Loan Dollarization		
	World Factor	EU Factor	Country Factor	World Factor	EU Factor	Country Factor
EU-affiliated						
Bulgaria	1.02	8.08	90.89	0.42	3.51	96.05
Croatia	4.20	33.33	62.45	3.26	26.76	69.97
Czech Republic	5.82	46.10	48.07	6.34	52.08	41.56
Estonia	2.89	22.95	74.14	1.53	12.57	85.89
Hungary	5.19	41.14	53.66	2.71	12.57	75.00
Latvia	0.73	5.80	93.46	1.79	14.75	83.45
Lithuania	2.50	19.84	77.64	1.85	15.19	82.95
Poland	7.84	62.10	30.05	3.47	28.53	67.99
Romania	1.31	10.39	88.29	1.02	8.40	90.57
Slovak Republic	7.02	55.64	37.33	4.45	36.53	59.01
Slovenia	7.00	55.48	37.50	3.43	28.16	68.40
Turkey	1.80	14.26	83.92	0.31	2.55	97.13
Total EU-affiliated	3.94	31.26	64.80	2.55	20.13	77.32
Non-EU-affiliated						
Albania	0.56		99.44	0.21		99.79
Armenia	1.99		98.01	1.56		98.44
Belarus	2.78		97.22	11.50		88.50
Bosnia and Herzegovina	15.59		84.41	22.82		77.18
Georgia	4.65		95.35	0.99		99.01
Kazakhstan	1.24		98.76	0.72		99.28
Kyrgyz Republic	0.80		99.20	0.44		99.56
Macedonia FYR	13.09		86.91	32.02		67.98
Moldova	5.96		94.04	6.83		93.17
Russia	0.78		99.22	0.88		99.12
Serbia	6.04		93.96	13.90		86.10
Ukraine	1.04		98.96	1.55		98.45
Total Non-EU-affiliated	4.54		95.46	7.78		92.22

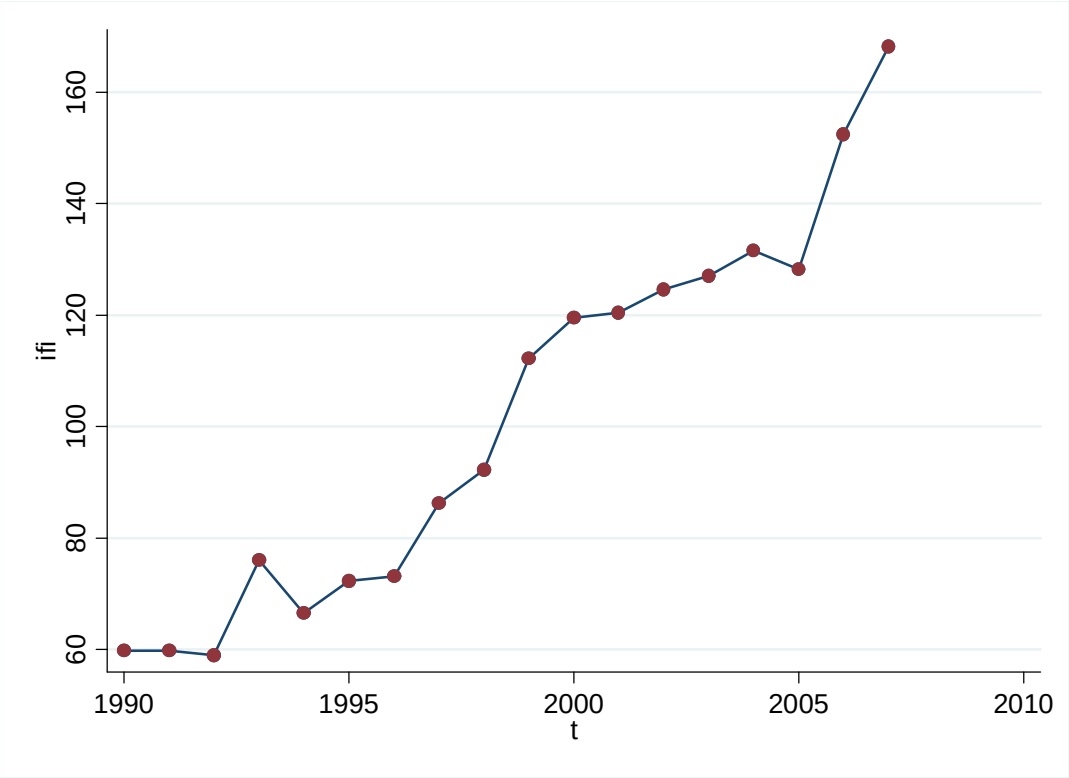
Notes: The variance decomposition is computed for each country. Each cell reports the cross-sectional mean of the variance share attributable to the relevant factor. The cross-sectional means are calculated for our cluster of 24 transition economies.

Figure 1: **World Factor in Deposit and Loan Dollarization**

——— Deposit Dollarization - - - - - - - Loan Dollarization

Notes: The levels of the world factor are plotted above. These levels have been extracted using the methodology described in section 2.

Figure 2: **International Financial Integration in Transition Economies, 1990-2007**



Notes: Volume-based measure of international financial integration as constructed by Lane and Milesi-Ferretti (2007): (total external assets+total external liabilities)/GDP [updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007)].

Figure 3: **EU Factor in Deposit and Loan Dollarization**

——— Deposit Dollarization - - - - - - - Loan Dollarization

Note: The levels of the EU factor are plotted above. These levels have been extracted using the methodology described in section 2.