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WHAT IS DRIVING FINANCIAL DOLLARIZATION IN TRANSITION ECONOMIES? A DYNAMIC FACTOR ANALYSIS

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This paper investigates the impact of institutions on the dollarization of the domestic banking system using a unique policy experiment: the process of accession of countries to the European Union (EU). Using a dynamic factor model, we decompose fluctuations in financial dollarization for 24 transition economies into a common factor, an EU factor, a non-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 to the degree of comovement of its business cycle with that of the EU.

Keywords: Financial Dollarization, Institutions, European Union

1. INTRODUCTION

In recent years, considerable attention has been given to the examination of the causal factors of financial dollarization (FD).[1] 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

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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 in 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.[2] As it concerns the last, the quality of institutions can influence FD through a variety of channels. First, short-sighted monetary policy makers 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 policy makers 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)]. Last, 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 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. Among the first studies that assessed the role of institutional quality were 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 the rule of law.[3] In all cases, higher levels of institutional quality have been found to be associated with lower degrees of deposit dollarization.[4]

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 FD (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 FD in all its dimensions. Vieira et al. (2012) support the findings of Honig (2009), as they also show that despite declines in inflation rates, many countries continue to experience high levels of deposit dollarization, this being an outcome of their poor institutions.[5]

Our paper also considers the effect 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

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being a country's decision to join the EU. Progress toward EU membership is composed of three distinct stages, where candidate countries need to progress toward 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)].

These conditions represent a clear commitment from the candidate countries' governments and monetary authorities in following policies that attain 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 for EU admission can be used to proxy for institutional improvement, as it signifies an institutional regime shift, and to assess potential changes in FD. In this way, our analysis complements the work of Honig (2009) and Vieira et al. (2012) in capturing the effect of institutions.

A number of interdisciplinary studies have examined the link between EU accession, on one hand, and institutional and macroeconomic outcomes, on the other. Kelley (2004) and Schweickert et al. (2011) show that pre-membership conditions set by the EU clearly enhance institutional development, whereas 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. Because of 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 mechanism for commitment to price stability to the acceding countries' monetary authorities.

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 undergone the EU membership process, with a subset having become full members in recent years. Thus, this group of countries represents a natural environment for studying 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 using a dynamic latent factor model that decomposes fluctuations in FD into the following factors: (i) a common factor that picks up fluctuations that are common across all transition economies; (ii) an EU factor that captures movements

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that are common to countries participating in the EU accession process; (iii) a non-EU factor that considers variations common to countries not associated with EU admission; and (iv) 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 and that its level effect has changed over time. The results 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 to the country's business cycle synchronization with the EU cycle.

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

2. DATA AND MODEL

2.1. Data

Our data set is composed of 24 transition economies located in Central and Eastern Europe and the former Soviet Union.[6] The sample includes 12 countries affiliated to the EU either as member states (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia) or candidate countries (Croatia and Turkey), and 12 countries that are not affiliated with the EU in a formal way (Albania, Armenia, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, the 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.[7]

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, whereas the latter measure of dollarization reflects the ratio of foreign currency loans to total loans of domestic banks to residents.[8] The data are at monthly frequency and primarily drawn from National Central Bank reports. The sample period is the most comprehensive in terms of coverage, containing all available data since the early 1990s, and extends all the way to the end of the 2000s.[9]

Table 2 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

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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		

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

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 2 are as follows. First, the degree of dollarization exhibits substantial variation both across and within countries. There are countries, such as Armenia, Bulgaria, Georgia, and the Kyrgyz Republic, that have relatively high levels of both types of dollarization, whereas countries like the Czech Republic and Slovak Republic have low levels. There are also countries where dollarization exhibits high variation over time (Armenia, Estonia, Georgia, Turkey), whereas in others the variation is 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, and 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 3, where we can observe the average degrees of dollarization for the EU-affiliated nations by dividing the sample into two distinct periods: the pre- 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 the 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.

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TABLE 2. Summary statistics

	Deposit dollarization						Loan dollarization					
Country	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		2,426	36.23	12.18	1.75	93.48		2,242
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		1,690	42.96	9.39	4.28	88.18		1,515

2.2. Model Specification

Our objective is to measure the impact of institutions on financial dollarization. We proxy changes in institutions with the three-stage evolutionary process of EU membership. For this purpose, we construct a model where we decompose FD into four factors: (i) a common factor, (ii) an EU factor, (iii) a non-EU factor, and (iv) an individual country factor. The common factor is common across all the countries in the system, whether the country is going through the EU accession process or not. For example, countries not affiliated with the EU, such as Ukraine, will have a common factor, and so will countries that are affiliated with the EU, like the Czech Republic. The EU factor is common across countries that either are candidates for admission into the EU, or are already full members, whereas the non-EU factor is common for those countries that have not formally engaged with EU accession procedures. The portion of FD that cannot be explained by the latent unobservable (common, EU, and non-EU) factors is the idiosyncratic factor that

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TABLE 3. Average deposit and loan dollarization in pre- and post-accession periods in EU-affiliated countries

	Deposit dollarization			Loan dollarization		
Country	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

Note: 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.

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.

Most of the models that use dynamic factor analysis are based on stationary variables [Stock and Watson (2011)], as the use of nonstationary variables may create inference problems. To test whether deposit and loan dollarization are stationary, we perform Ng–Perron unit root tests on both series for all countries in the sample. Table 4 reports the Mza statistic of the test, with the number of lags based on the SIC criterion. With the 5% critical value determined at −8.1, the test suggests that we cannot reject the null of a unit root at all levels of significance for every country. Therefore we conclude that the levels of both deposit and loan dollarization are nonstationary.[10] 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 levels of the four unobserved factors of interest to us. In the following we explain this approach.

Suppose $\Delta \mathrm{FD}_{it}$ stands for the change in FD (i.e., the change in foreign currency deposits or loans) for country i at time period t. We can decompose this variable into four components,

$$\Delta \mathrm{FD}_{it} = \alpha_i C_t + \theta_i \mathrm{EU}_t + \lambda_i \mathrm{NEU}_t + \eta_{it}, \quad (1)$$

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TABLE 4. Unit root test

Country	Deposit dollarization	Loan dollarization
	EU-affiliated	
Bulgaria	0.24	−1.51
Croatia	−1.34	0.63
Czech Republic	−2.96	−1.64
Estonia	−0.91	0.39
Hungary	−0.93	1.96
Latvia	−0.63	1.49
Lithuania	−2.03	−0.65
Poland	2.08	0.66
Romania	−7.86	0.15
Slovak Republic	−0.93	0.62
Slovenia	0.28	−3.06
Turkey	−0.60	1.56
	Non-EU-affiliated	
Albania	−1.86	0.13
Armenia	−2.90	−1.62
Belarus	−1.07	1.23
Bosnia and Herzegovina	−5.68	−0.10
Georgia	−1.30	−0.79
Kazakhstan	−0.82	−2.16
Kyrgyz Republic	−1.45	0.25
Macedonia FYR	−2.83	−0.24
Moldova	−4.92	−5.21
Russia	−1.36	−2.62
Serbia	−0.11	1.10
Ukraine	−0.99	0.49

Note: Values represent the Mza statistic based on an Ng–Perron unit root test (the 5% critical value is −8.1)

where C_t is the common factor that estimates the impact of macroeconomic developments in all transition economies on the FD of country i at time t. For example, if there is a common shock that would increase dollarization across all transition 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, whereas NEU_t represents the factor that is common only to non-EU countries. This distinction allows to explicitly consider differences in the impact of FD due to EU accession. Moreover, the inclusion of the non-EU factor allows a symmetric treatment of transition countries not affiliated with the EU, to control for potentially higher volatility not being due to an idiosyncratic component. Coefficients α_i, θ_i, and λ_i are the factor loadings on the common factor, the EU factor, and the non-EU factor, respectively.[11] These factor loadings reflect the degree to which variation in FD can be explained by

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each of the factors. 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.

Because the three 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 four components.[12] They are specified as

$$C_t = \phi C_{t-1} + \epsilon_t,\ \epsilon_t \tilde{}\text{i.i.d. } N\left(0, \sigma_\epsilon^2\right), \tag{2}$$

$$EU_t = \beta EU_{t-1} + \nu_t,\ \nu_t \tilde{}\text{i.i.d. } N\left(0, \sigma_\nu^2\right), \tag{3}$$

$$NEU_t = \gamma NEU_{t-1} + \omega_t,\ \omega_t \tilde{}\text{i.i.d. } N\left(0, \sigma_\omega^2\right), \tag{4}$$

$$\eta_{it} = \psi_i \eta_{it-1} + \upsilon_{it},\ \upsilon_{it} \tilde{}\text{i.i.d. } N\left(0, \sigma_{\upsilon_i}^2\right), \tag{5}$$

where the innovation terms in equations (2)–(5), ϵ_t, ν_t, ω_t, and υ_{it}, are mutually orthogonal across all equations and countries in the system.

The model is estimated in first differences with demeaned variables. To extract the level of the four factors, we follow Harvey (1989) as described in Kim and Nelson (1998, 1999). 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, whereas δ is the mean of $\Delta l_{t|t}$. δ can be estimated using the formula $\delta = W(1)\Delta \mathrm{FD}_t$, where $\Delta \mathrm{FD}_t$ 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.

Further, we measure the relative contributions of each of the four factors to changes in FD in each country with variance decomposition analysis. This provides an empirical assessment of how much of a country's fluctuations in FD are attributable to each of the three factors and to the idiosyncratic component. Because the common, EU, non-EU, and country-specific latent factors are by construction orthogonal to each other, it is possible to perform variance decomposition for these components in the dynamics of ΔFD based on equation (1), which can be rewritten as

$$\mathrm{var}(\Delta \mathrm{FD}_{it}) = \mathrm{var}(\alpha_i C_t) + \mathrm{var}(\theta_i \mathrm{EU}_t) + \mathrm{var}(\lambda_i \mathrm{NEU}_t) + \mathrm{var}(\eta_{it}), \tag{6}$$

or as

$$\mathrm{var}(\Delta \mathrm{FD}_{it}) = \frac{\alpha_i^2 \sigma_\epsilon^2}{1-\phi^2} + \frac{\theta_i^2 \sigma_\nu^2}{1-\beta^2} + \frac{\lambda_i^2 \sigma_\omega^2}{1-\gamma^2} + \frac{\sigma_{\upsilon_i}^2}{1-\psi_i^2}. \tag{7}$$

The last term in equation (7) 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

$$\frac{\frac{\theta_i^2 \sigma_\nu^2}{1-\beta^2}}{\mathrm{var}(\Delta \mathrm{FD}_{it})}, \tag{8}$$

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

To disentangle the importance of the various factors, we can cast the dynamic factor model given by equations (1)–(5) into a state-space framework. Following the literature, we assume zero covariance across shocks to the common, the EU, the non-EU, and the idiosyncratic factors.[13] The preceding state-space model is estimated using maximum likelihood via the Kalman filter. There are, however, two concerns with regard to its identification. First, the signs of the factor loadings and of the corresponding latent factors cannot be identified separately. Second, the scales of those latent factors cannot be uniquely identified. We deal with the signs by imposing the condition that at least one factor loading is positive. In particular, we assume that the common factor has positive loading on FD in Poland. A further assumption is that the EU factor has positive loading in Poland and the non-EU factor has positive loading in Russia. Finally, to adjust the scale, we assume a unit innovation variance for all factors.[14]

In sum, the factor model we use is well suited to studying the joint properties of fluctuations in both deposit and loan dollarization. Using both types of FD allows us to derive in a robust way its overall association with the institutional environment. Furthermore, this technique allows estimation of 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.

3. EMPIRICAL RESULTS

In this section, we examine the evolution of the various factors and analyze their ability to track changes in FD in our sample. We then examine the sources of fluctuations across factors, using variance decompositions.[15]

3.1. Evolution of the Common, EU, and non-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 common 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 common factor has had a negative impact on the level of loans offered in foreign currency, which became more pronounced after the year 1998.

What common developments in transition economies could account for these diverse effects on the two types of dollarization? The behavior of the common 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

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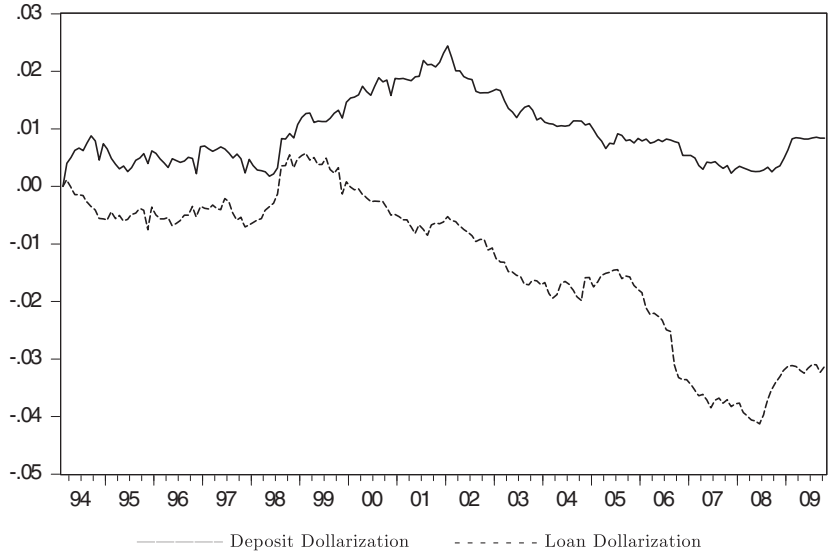

FIGURE 1. Common factor in deposit and loan dollarization. The levels of the common factor are plotted. These levels have been extracted using the approach described in Section 2.

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 in the FD of transition economies was 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 sets of options available to them. Greater financial integration allows banks to have greater access to foreign financial markets and instruments of diversifying currency risk in their asset portfolios than 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 portfolios; 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 factor that drives developments in FD seems to be associated with financial integration.

The EU factor is orthogonal to the common factor by construction and, as we discussed earlier, any common shocks affecting all countries will be picked

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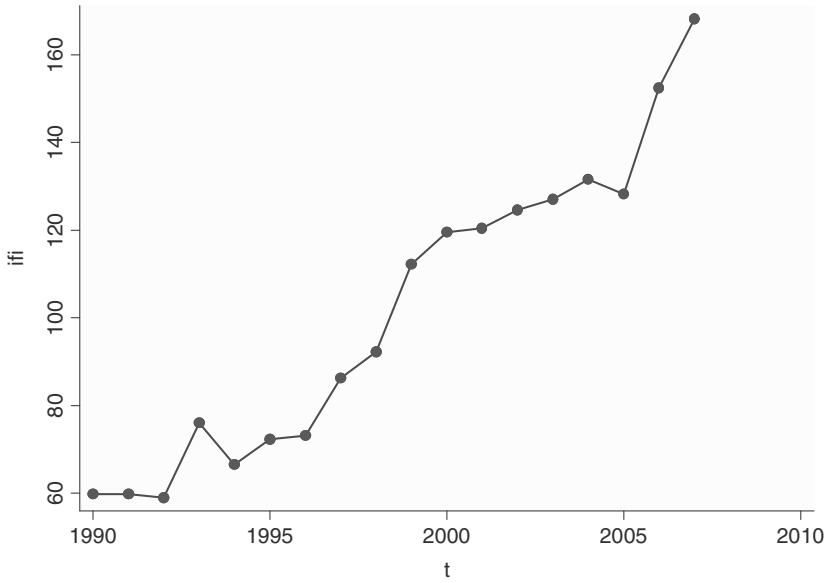

FIGURE 2. International financial integration in transition economies, 1990–2007. Volume-based measure of international financial integration as constructed by Lane and Milesi-Ferretti (2007): (total external assets+total external liabilities)/GDP [updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007)].

up by the common 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, 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, whereas loan dollarization has risen. Furthermore, the gap between loan and deposit dollarization widened after the end of 2002, indicated in Figure 3 by a solid vertical line.

How can we explain these results? The underlying mechanism corresponds to the improvements in 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.

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FIGURE 3. EU factor in deposit and loan dollarization. The levels of the EU factor are plotted. These levels have been extracted using the approach described in Section 2.

According to Honig (2009), higher confidence in the domestic currency would decrease the extent of deposit dollarization because domestic depositors would 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 increase 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 they make 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, there is diminishing currency risk because of a growing Euro-orientation of exchange rate regimes. This is an outcome of the clause that EU membership will eventually lead to admission to the Economic and Monetary Union (EMU).[16]

These views 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 both 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 effect of the EU factor expands as the country passes from one negotiation

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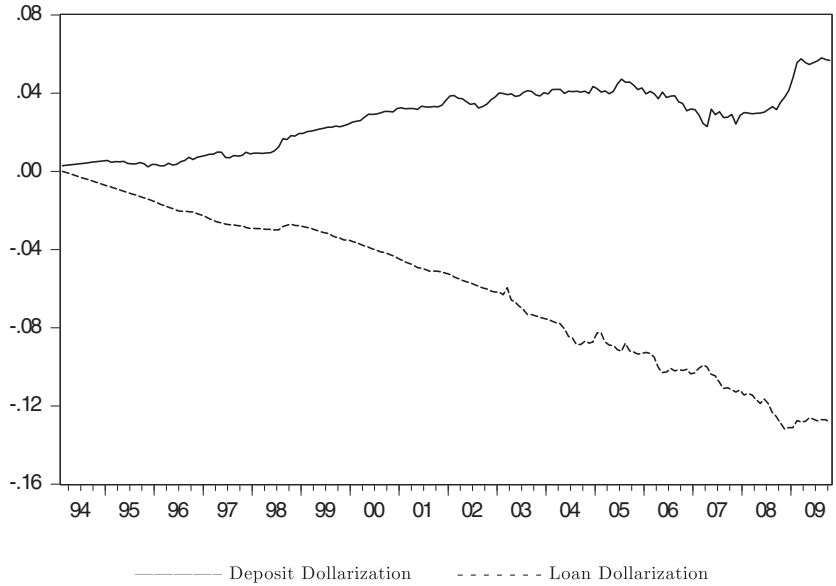

FIGURE 4. Non-EU factor in deposit and loan dollarization. The levels of the non-EU factor are plotted. These levels have been extracted using the approach described in Section 2.

stage to the next. This suggests the importance of EU accession 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.

The preceding interpretation with regard to the EU factor could be put into question if the transition countries that are not affiliated with formal EU admission procedures as a group also exhibited similar patterns in their movements of deposit and loan dollarization. In other words, if the non-EU factor of dollarization matches the comovements already identified for the EU factor, then it becomes difficult to establish that a higher loan dollarization and a lower deposit dollarization are due to greater EU convergence, institutional improvement, and more accountability. An examination of the non-EU factor, however, shown in Figure 4, illustrates a time profile of FD that is very different from that obtained under the EU factor. Conversely to the EU factor, now it is the loan dollarization that declines and the deposit dollarization that rises. These trends appear to be monotonic for the entire time period covered, and thus independent from the admission stages of the EU-affiliated countries. One may be inclined to claim that this is an outcome of a deterioration of the institutional environment in these countries, but it is more likely that the trends in Figure 4 are the result of a greater financial integration of these countries with the rest of the world. This, then, reveals a profile that complements that of the common factor already discussed. Overall, the findings associated to the non-EU factor do not disprove the preceding argument as to the

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underlying intuition for the EU factor results—to the contrary, they offer further support.

3.2. Sources of Financial Dollarization Fluctuations

We now examine the sources of fluctuations in FD using variance decomposition. As a measure of the importance of the factors for FD, we present the variance shares attributable to each factor: common to all transition countries, the EU, the non-EU, and the individual country.

Table 5 shows the results for this variance decomposition for deposit and loan dollarization.[17] The results suggest that the common factor accounts for a small percentage of changes in both the loan and deposit dollarization in almost all countries—between 9 and 11%. This is particularly the case for the EU-affiliated countries, where the total variation explained by the common factor ranges from 1.39% in Bulgaria to 24.06% in the Slovak Republic. Turning to the fraction of variation in FD fluctuations explained by the common factor in non-EU-affiliated countries, this is comparable to that of their EU counterparts. Some notable exceptions are Bosnia and Herzegovina and Macedonia FYR, where the common factor accounts, respectively, for 23.6% and 22.6% of the overall variation in deposit dollarization, and 25.7% and 26.9% of the volatility in loan dollarization.

Once we account for the common 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 (24.1%) than in explaining changes in loan dollarization (19.5%). As compared to the common factor, the EU factor accounts for larger shares of FD variances in all countries but Turkey—twice as large on average—further supporting the role of institutional improvements in the countries' dollarization of the banking system. Table 5 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, which ranges between 4% in Romania and 43% in Croatia and Poland (2% in Turkey and 45% in the Czech Republic). Typically, however, in the countries for which the EU factor explains a high proportion of movements in one type of dollarization, it also does so for the other. Such cases are represented by Croatia, the Czech Republic, Lithuania, Poland, the Slovak Republic, and Slovenia.[18] It is for these countries that the EU factor can be as important as 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

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TABLE 5. Factor variance decompositions

	Deposit dollarization				Loan dollarization			
Country	Common	EU	Non-EU	Country	Common	EU	Non-EU	Country
			EU-affiliated					
Bulgaria	1.75	11.00		87.25	1.39	5.18		93.43
Croatia	11.08	43.17		45.75	13.97	33.12		52.91
Czech Republic	12.69	35.28		52.03	11.08	45.45		43.47
Estonia	5.32	14.80		79.88	5.79	10.54		83.67
Hungary	11.04	30.67		58.29	9.89	18.02		72.09
Latvia	3.48	7.40		89.12	13.15	16.64		70.21
Lithuania	7.15	27.89		64.96	9.29	22.02		68.69
Poland	15.61	43.36		41.03	12.54	22.86		64.60
Romania	4.06	3.84		92.10	3.85	5.55		90.60
Slovak Republic	24.06	33.76		42.18	21.52	30.18		48.30
Slovenia	23.51	32.99		43.50	16.39	23.00		60.61
Turkey	5.74	5.42		88.84	2.98	1.68		95.34
Total EU-affiliated	10.46	24.13		65.41	10.15	19.52		70.33
			Non-EU-affiliated					
Albania	1.65		1.56	96.79	2.02		2.19	95.79
Armenia	5.71		5.40	88.89	12.81		13.90	73.29
Belarus	7.46		7.05	85.49	9.56		59.76	30.68
Bosnia and Herzegovina	23.60		25.01	51.39	25.67		19.66	54.67
Georgia	9.91		9.37	80.72	8.41		9.12	82.47
Kazakhstan	3.20		3.39	93.41	2.56		7.10	90.34
Kyrgyz Republic	2.10		2.01	95.89	3.60		4.03	92.37
Macedonia FYR	22.63		23.98	53.39	26.89		14.30	58.81
Moldova	16.24		12.43	71.33	11.70		7.40	80.90
Russia	2.27		2.14	95.59	7.95		8.62	83.43
Serbia	17.15		13.13	69.72	15.80		24.69	59.51
Ukraine	2.30		2.17	95.53	12.27		13.32	74.41
Total Non-EU-affiliated	9.52		8.97	81.51	11.60		15.34	73.06

a high correlation with the euro-area business cycle [Kočenda (2001); 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: Croatia, the Czech Republic, Lithuania, 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.

Turning to the non-EU factor, Table 5 shows that its average contribution to FD fluctuations for the non-EU affiliates is similar to the contribution of the common factor, ranging from 9 to 15%. For some countries, however, the contribution of this source of fluctuation is even higher, such as Belarus (59%) and Bosnia and Herzegovina (25%). Overall, though, there is a lot of variability in the contribution of the non-EU factor across this set of countries.

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Much of the discrepancy between the relative roles of the common, EU, and non-EU factors mirrors changes in the relative importance of country-specific factors, as shown in columns (4) and (8) of Table 5. Clearly, country-specific factors have played, on average, a more important role for the group of countries that have not been involved with EU accession procedures. The greater importance of country-specific factors in these countries, in explaining dynamics in FD, reflects the diverse experiences among transition countries.

4. CONCLUSION

This paper addresses the effect of institutions on 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 in which to examine whether the road to EU admission has had any impact on unofficial dollarization.

With this objective in mind, we apply dynamic factor analysis, which is particularly well suited to decompose fluctuations in financial dollarization into four components: a common factor, an EU factor, a non-EU factor, and a country-specific factor. We show that the common factor plays no role for the dynamics of deposit dollarization, but does explain a downward movement in loan dollarization. These results seem to be driven by the increased financial integration of all transition countries with the rest of the world. Furthermore, 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. Finally, the non-EU factor shows that non-EU-affiliated countries have jointly followed paths opposite to that of EU-affiliates: lower loans and higher deposits in foreign currency. This further suggests the importance of EU affiliation.

Our results corroborate 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 comparable to that of 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 (the level and composition of) FD.

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NOTES

1. Following the related literature, financial dollarization refers to deposits and loans in all foreign currencies and not just in dollars. The term "dollarization" has prevailed because of the widespread occurence of the phenomenon in Latin America in the 1970s and 1980s, when the U.S. dollar was used in parallel with, or instead of, the national currency as a store of value, unit of account, or medium of exchange in domestic transactions.

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

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

4. A nonexhaustive list of studies that have generally examined the drivers of unofficial dollarization includes Ize and Levy-Yeyati (2003), Honig (2005), Honohan (2008), Luca and Petrova (2008), and Rosenberg and Tirpák (2008).

5. 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 typical in the literature.

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

7. We do not consider the period after countries have adopted the euro as their national currency because this automatically changes the definition of what constitutes foreign currency. In addition, Macedonia FYR does not feature in the table because it has not been granted the status of a candidate nation yet.

8. This definition emphasizes that our measure of dollarization does not refer only to dollar or euro holdings but includes loans and deposits in *every* type of foreign currency.

9. 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.

10. Other unit root tests, such as Phillips–Perron and Elliott–Rothenberg–Stock, also do not reject the null of a unit root at conventional significance levels. We also test for cointegration in deposit and loan dollarization across countries and do not reject the null of no cointegration at all significance levels. These results are available upon request.

11. We do not account separately for each of the three stages of the EU accession process, because our technique allows assessing the dynamic impact of EU affiliation on FD over time, thus capturing each of the stages.

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

13. This assumption, however, may be too restrictive and may lead to overidentification of the model. A more general framework can allow cross-correlation across shocks. For an example of the usefulness of a nonzero correlation in an unobserved component model, see Morley et al. (2003). This general framework is beyond the scope of this paper. But it is worth mentioning that in an appendix (available upon request), we have considered an unobserved component model for loan and deposit dollarization, for each country separately, and have allowed a nonzero correlation between shocks to different components of FD.

14. Our findings are not affected by the choice of Poland and Russia as the countries for which the selected factors have positive loading.

15. 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

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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.

16. Using data on pairwise nominal exchange rates between each country's currency and the U.S. dollar shows that the volatility of the exchange rate (measured by its standard deviation) is *five* times lower for the EU-affiliated countries during their accession period than in their preaccession period and in non-EU-affiliates. This observation offers support for the argument that EU accession reduces currency risks because of the convergence of exchange rate regimes to the euro.

17. We report unconditional variance decomposition results. The results for conditional variance decomposition are very similar, as the persistence parameters of all the factors for both loan and deposit dollarization are very small in magnitude.

18. On the other hand, we have countries such as Bulgaria, Latvia, Romania, and Turkey, where the EU factor explains a small fraction of variation in both loan and deposit dollarization.

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