THE DETERMINANTS OF CURRENCY EUROIZATION IN THE BALKANS

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Abstract

The study aims to explore the euroization phenomenon in the Balkans, or more precisely, the main determinants of currency euroization in the selected seven Balkan countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, North Macedonia, Romania, and Serbia) between 2000 and 2019. Currency euroization is proxied by two variables: foreign currency deposits and foreign currency denominated liabilities to total liabilities. This study has altogether showed that the rates of deposit and liabilities euroization had stayed persistent over a period of 20 years, with very small variations, even during the period of the 2008 crisis and its aftermath. The results of panel data analysis have showed that deposit euroization is influenced by consumer price index, real interest rate and trade openness. For liability euroization, trade openness and real effective exchange rate have proved to be statically significant variables, but with negative and positive effect respectively.

Keywords: Euroization, Balkan economies, foreign currency deposits, foreign currency liabilities, panel data analysis.

JEL: F21, F36

1. Introduction

Economic stability is of great importance for every country, especially for developing and transitional economies. Stability in this case relates to the strength of a country's currency and its course towards other currencies. The stability of the currency affects the price of money (the interest rate), consumption, the holding of deposits in banks, taking out bank loans by citizens and businesses, and of course, foreign direct investments (FDI). Ganić (2013) concludes that foreign banks used a high interest rate spread between host markets in the Balkans and the home European Union (EU) markets, affecting credit growth in the pre-crisis period until 2008. In addition, the inflow of foreign savings from abroad was used as a primary source of credit restoration in the region. Hence, in the Balkans, as in some other regions in the world (i.e., Latin America), a phenomenon persists where people and businesses deposit their money and/or take out loans denoted in a currency other than the official currency of that country. Very often, it is in euros (EUR) or in US dollars (USD), due to the stability and strength of these currencies. The phenomenon is hence called financial euroization (or financial dollarization) and it affects the foreign reserve level and balance of payment (BOP) of the country concerned, as well as the fiscal and monetary policies and measures that the country must employ in its future. It also should not be confused with *de jure* euroization (dollarization), which means introducing the euro (or dollar) as the official currency of the country (Levy-Yeyati 2005).

Euroization is present across the world in almost all developing and transition regions; in other words, those which are economically unstable: South-East Asia, Eastern Europe, Latin America, and central Africa. It is also present in emerging countries like Malaysia or Thailand. The trends of euroization began in the late 1980s and throughout the 1990s, and by the early 2000s, euroization (of deposits) of above 10% was almost equally present on all continents except North America. In all these regions, it was obvious that euroization is persistent and difficult to reverse. Euroization levels of above 30% are harmful for the domestic economy, according to the IMF. Furthermore, high euroization has proved to damage the exchange rate of the domestic currency, and lead to troubles in the domestic banking sector, like in the case of Turkey in 2000, or Argentina in 2002 (Levy-Yeyati 2005). A rise of inflation and monetary instability affected the loss of confidence in local currencies leading to the rise of euroization across transition countries. For

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example, Serbia and Croatia are found to be highly euroized countries, while Romania and North Macedonia have the lowest euroization levels, as measured by the share of forex exchange (FX) liabilities (Ganić 2021).

Aside from hyperinflation, the rise of euroization is attributed to low and unevenly distributed economic growth, as well as to the influence of foreign banks in the newly liberalized markets. Their placement of loans and the holding of deposits in foreign currencies (EUR, USD, or CHF) adversely affect the real interest rate, the exchange rate of the domestic currencies, and the overall price levels (Manjani 2015).

The main objective of this research study is to empirically estimate economic determinants that affect the high level of currency euroization in the seven Balkan countries (Albania, Bosnia and Herzegovina, Croatia, Serbia, North Macedonia, Romania, and Bulgaria). Although most of the local currencies are stable, this study is to help to get the answer why persistence of currency euroization is still high in the Balkans. More precisely, this study aims to answer the question: which of the economic determinants (inflation, CPI, trade openness, and real effective exchange rate (REER)) affect both substitutions on the asset side (FCD euroization) and on the liability side? It should be noted that there are somewhat different considerations for some of the chosen countries, specifically Bulgaria, Croatia and Romania. Apart from being the members of the EU, Romania aspires to join the Eurozone by 2024 (the European Commission 2022), Bulgaria is part of the Exchange rate Mechanism (theEuropean Commission 2022) and Croatia already got the approval of the Council of the EU for their accession to the euro area beginning with January 2023 (the European Central Bank 2022). In order to do so, they must satisfy the economic convergence criteria (the European Council 2020), which in turn means monetary policies directed at price stability and exchange rate stability, which may have different effects on the analyzed determinants than in other countries.

2. Literature Review

Luca and Petrova (2008) and Rennhack and Nozaki (2006) included a much larger and much more heterogenous sample of countries from different regions, which may make their results less relevant to compare with the results of this research, but due to the similarities between the economic challenges the analyzed countries face, such as having a debt crisis or the persistence of euroization/dollarization (Rennhack & Nozaki 2006), the determinants chosen are still relevant.

Other papers, such as Ivanov, Tkalec and Vizek (2011) and Manjani (2015), focused on only one country, however, in this case, these are Croatia and Albania respectively, both of which are among the seven countries analyzed in this paper. Hence, their results may show similarities with the results obtained for the sample in this paper. Ivanov, Tkalec and Vizek (2011) analyzed the determinants of financial euroization in a post transition country, specifically, Croatia. Their analysis encompassed a period of 16 years, between 1994 and 2009. However, their theoretical approach was somewhat different, and qualitatively more comprehensive. Namely, they discussed the causes and effects of euroization using the so-called portfolio view (decision based on an optimum, minimal variance portfolio), market failure view (risk neutral agents' decisions) and institutional view (government policies), showing in the end that the portfolio view is important for explaining deposit and credit euroization. Along with some other variables such as bank foreign debt and exchange rate volatility, they also used the variables: REER and inflation to test for effects on both deposit and credit euroization respectively. They found that there is a short- and long-term effect of exchange rate volatility, REER and inflation on euroization of deposits and credit.

Kokenyne, Ley, and Veyrune (2010) also analyzed Croatia's euroization (dollarization) determinats using the sample of more than ten other countries across the world. Their research encompassed the same period between 1994 and 2009. Among other variables, the variable of inflation was found to have a positive effect on foreign currency deposits (FCD), while the variable of real effective exchange rate (REER) had a negative effect on both FCD and foreign curreny denominated liabilities to total liabilities

(FCTL) as well. In its early stages, capital account liberalization for transition countries resulted in the rise of foreign capital inflows that point up the access to FX lending with low interest rate. In fact, it affected the liability of balance sheets of local banks to be more FX indexed, leading to an increase in the level of euroization (Ganić 2013). Going further, Manjani (2015) conducted a study to explore determinants of financial euroization in Albania between 1999 and 2014. He examined the phenomenon from both a theoretical and empirical view. A proxy variable for explanation of euroization was foreign currency deposit (FCD). The research found that levels of euroization in Albania are persistent and influenced by interest rate differentials, REER (the change of the real exchange rate in terms of devaluation of the domestic currency), which proved to have a positive effect on FCD. Also, the variable of CPI also proved to be statistically significant and positive on the FCD.

Chailloux, Ohnsorge, and Vavra (2010) investigated the level of euroization in Serbia, its causes and implication for the country's policies. The authors concluded that Serbia is highly euroized, in terms of both deposits and loans, with the share of foreign currency loans around 70%. This was mostly caused by inflation volatility experienced by the country, especially during the 1990s, as well as the low interest rates on foreign currency loans. They argued that euroization is the consequence of macroeconomic instability, declining confidence in the domestic currency (credit risk), and an underdeveloped market for funding and hedging. Their analysis of the effects of monetary policy on euroization was based and small New-Keynesian model of monetary policy transmission in flows. Their results showed a connection between a more flexible exchange rate regime and a reduction of euroization.

Ganić, Dizdarević, and Mamuti (2017) analyzed the persistency of currency substitution (euroization) in seven Balkan countries: Albania, Bosnia and Herzegovina, Croatia, Serbia, North Macedonia, Romania, and Bulgaria (same as this paper), while considering the effects of the 2008 financial crisis. Their study used the annual data for deposit, credit, and liability euroization for each country. The aim was to compare the euroization level means of periods prior to, during, and after the crisis, and determine, using the t-test, whether there are significant differences between them. The study found no significant differences between the subperiods; however, they did find that the euroization levels were overall higher after the crisis.

Orszaghova (2015) explored the euroization in the Western Balkans. Similar to Chailloux, Ohnsorge and Vavra (2010), she identified it as a legacy of the political and economic conditions from the 1990s. She emphasized the influence of inflation volatility and exchange rate regimes on the high levels of euroization, but also the rational and risk-averse behavior of individuals. The analysis was majorly a qualitative one, explaining the reasons for both financial and real euroization in each of the ex-Yugoslav countries. A notable conclusionary remark was that euroization is deeply rooted in the Western Balkans and will only slightly decline in the long-term.

In another study, Pepić, Marinković and Radović (2015) explored currency substitution (euroization) in six South-eastern Europe (Albania, Serbia, Croatia, Bosnia and Herzegovina, North Macedonia, and Romania) between 2003 and 2014. They set credit euroization to be the dependent variable and nine independent variables, making 720 observations. They used the fixed effects (FE) model for their research. However, the results of the study showed a negative effect of the interest rate and a positive effect of inflation and CPI on FCTL while the remaining variables were shown as statistically insignificant.

Similarly, Basso, Calvo-Gonzales, and Jurgilas (2007) analyzed the role of banks and interest rates in relation to financial dollarization. Their research included 24 countries (transition and post-transition economies from the Balkans and Eastern Europe) between 2000 and 2006. They performed the Hausman specification test, and using the FE model, measured the effects of interest rate differentials, interest rate margins, economic openness, and foreign bank penetration on FCD and FCTL. They found that there is a negative effect of interest rate differentials on FCD, and a positive effect of

economic openness on FCD, and negative on FCTL.

Rosenberg and Tirpák (2009) analyzed the determinants of foreign currency borrowing in the new EU member countries. Their sample included the Central and East-European (CEE) countries that joined the EU, but not the Eurozone. Croatia was part of the sample as well, even though it was not an EU member at the time of the study. Their research covered a period of nine years, from 1999 to 2007. They found that the effects of joining the EU, such as access to foreign funds and greater openness had a great impact on foreign currency loans, and that the growth of euroization rates in this instance is in fact hard to curb. The analysis also used the FX deposits as a determinant of liability euroization. It was performed as a panel regression with the Ordinary least squares (OLS), the FE and the random effects (RE) models. The results showed a positive effect of interest rate differentials on credit euroization. While economic openness was initially included as a variable in the study, it was excluded from the results due to its variability across the sampled countries.

Luca and Petrova (2008) also had foreign currency loans as the object of examination. Their research encompassed 21 East-European transition economies, between 1990 and 2003. The results, using the FE model, showed a positive, but insignificant effect of interest rate and positive and significant impact of exports on credit dollarization.

Neanidis and Savva (2009) wrote about financial dollarization determinants in 11 transition economies, but more specifically in the short run. Their research covered the countries of Eastern Europe, the Baltic, and the Caucasus region. For both deposit and liability dollarization, the results of the FE model regression were supportive of the main drivers, like currency depreciation, inflation, minimal variance portfolio, interest rate differentials, policy restrictions on holdings of FCD, international financial integration, forward foreign exchange market liberalization, and corruption. Their results showed small differences between the FE and RE models. The results for the inflation variable were found to have a positive (0.014), but not significant effect on FCD.

Guscina (2008) attempted to explain emerging market economies, as to the political and macroeconomic impact on the structure of government debt. Hence, 19 countries of Eastern Europe, including Russia as well as some Latin American countries, were analyzed for a period of 25 years, between 1980 and 2005. In this analysis, Eastern Europe economies came into consideration only after the transition from socialism in the mid-1990s. The paper employed the FE model regression with, among many other variables not of direct interest for this paper, the foreign currency debt (a major component of FCTL) as the dependent. The results showed a significant and negative effect of exchange rate volatility (REER used as proxy) and a positive but insignificant effect of economic openness on foreign currency debt.

Rennhack and Nozaki (2006) conducted a differently conceived study of financial dollarization in Latin America, even though the analysis included transition economies from other regions as well. Their sample consisted of 47 countries, chosen depending on their monetary policies and high dollarization rates. The study was done for the period between 1990 and 2001, in the form of a panel data regression. Several variables were taken into consideration, mostly those related to government policies and conditions (democracy, institutions, legal frameworks). However, one of them was also exchange rate volatility, in this case one leaning towards depreciation (REER skewness), which had a positive effect on the dollarization of deposits.

Levy-Yeyati (2005) is often quoted in many euroization or dollarization-related works. He analyzed the consequences of financial dollarization. His work was mainly focused on Latin America, whilst making comparisons with Eastern Europe, stating that their behavior is not that different. In the part about dollarization drivers, FCD was analyzed as the dependent variable for the period 1990 to 1999. The regression results indicated a positive effect of CPI, significant at 1%.

It can be concluded that in the existing literature, there is a prevalence of credit euroization being analyzed, and FCTL are rarely considered. Furthermore, many of the outlined papers went deeply into policymaking and for those purposes derived a great number of complex parameters to measure against euroization levels. Hence, this paper will build on the existing literature, but at the same time simplify the sample analyzed (without including economies outside the given region) as well as the variables, without using dummy indicators or proxies.

3. Data and Methodology

3.1 Data

As stated in the introduction, the analysis covers seven of the Balkan countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, North Macedonia, Romania, and Serbia, as relevant transition economies. Two dependent variables: deposit euroization and liability euroizations were proxied with the share of foreign currency deposits to total deposits and the share of foreign liabilities to total liabilities, respectively. Five independent variables: Inflation rate, Real interest rate, REER, Trade openness and CPI were chosen to be tested against two dependent variables. Altogether, 140 observations were collected for each variable. The data was collected from the available databases of the respective national central banks, the IMF database and individual country reports, and the World Bank database (CBBH 2020; World Bank 2020; Monetary Statistics 2020; IMF Data 2020; Inflation, consumer prices (annual %) 2019; Interest rates 2020; International Monetary Fund 2005, 2019, 2020, 2021; National Bank of Albania 2021; English - Monetary Statistics 2020; Real interest rate (%) 2019; Statistics on Loans and Deposits by Amount Category and Economic Activity 2020; Trade (% of GDP) 2020).

3.2 Defining variables of euroization

In some previous empirical studies, certain derived, more complex variables such as interest rate differentials, inflation, and CPI volatility (Pepić, Marinković & Radović 2015, p.180) or measures of financial integration, market liberalization and corruption level (Neanidis & Savva 2009, p. 1865) were used. In this paper, a consideration in data collection was the availability of reliable data for the given countries and the given time period, as in some cases the data was even contradicting for the same years, depending on the source.

The ability to properly calculate certain parameters such as interest rate differentials and measures of volatility was questionable. Therefore, for the purposes of answering the research question, some simpler forms of certain parameters were used, to give a more direct answer to the research question: whether it is significant, or with a positive or negative effect on the euroization levels.

The empirical framework of this thesis is related to several economic indicators that determine a level of euroization in the selected countries. They are inflation rate and exchange rate expectation, Consumer Price Index, interest rate, trade openness.

3.2.1 Deposit euroization and liability euroization

As proxy variables for measuring deposit euroization and liability euroization, the study employs foreign currency deposit to total deposits and foreign currency liabilities to total liabilities, respectfully. Foreign currency deposit to total deposits was used in some empirical studies such as Kokenyne, Ley, and Veyrune (2010), Manjani (2015), Basso, Calvo-Gonzales, and Jurgilas (2007), Neanidis and Savva (2009), and Levy-Yeyati (2005). Foreign currency liabilities to total liabilities were used by Basso, Calvo-Gonzales and Jurgilas (2007) and Guscina (2008). It is one of the main reasons to include these two variables to measure financial euroization in this research.

3.2.2. Consumer Price Index (CPI)

CPI is an index that measures the change in the overall price of a relevant basket of consumer goods and services in an economy, in a given period. The variable of CPI was included in the models by Ivanov, Tkalec and Vizek (2011), Manjani (2015), Pepić, Marinković and Radović (2015), Neanidids and Savva (2009), and Yeyati (2005). The authors used CPI itself (or as a part of a formula for other variables) to

measure the effect on the level of euroization. The CPI is hence one of more common determinants of euroization, and the expectation, according to the literature, is that it should have a positive effect on euroization. This is because the volatility of CPI was linked with the uncertainty that induces euroization.

3.2.3. Inflation

Inflation is the phenomenon of an increase in the overall price levels (of all goods and services) in a given period, expressed in percentages. The variable of inflation is included in the models because it is present in the theoretical elaboration and statistical analysis of almost all of the available literature on euroization. It was found by Ivanov, Tkalec and Vizek (2011), Kokenyne, Ley, and Veyrune (2010), Pepić, Marinković and Radović (2015), and Neanidis and Savva (2009) that high and volatile inflation is related with high euroization. It is expected that the variable inflation rate will have a positive effect on euroization.

3.2.4. Real Interest Rate

The real interest rate is the lending interest rate in an economy, calculated by adjusting the nominal interest rate for inflation. The variable of (real) interest rate is included in the models because Chailloux, Ohnsorge and Vavra (2010), Pepić, Marinković, and Radović (2015), and Luca and Petrova (2008) tested it for effects on euroization. In some empirical studies done by Rosenberg and Tirpák (2009), Neanidis and Savva, (2009) or Basso, Calvo-Gonzales, and Jurgilas (2007) the interest rate differentials were used, which is not the same variable as real interest rate. However, according to Janus (2019) there are pattern similarities (high correlation) between the real interest rates of at least half of the non-Euro economies of Eastern Europe and the Balkans, and those of the Euro area. Based on the majority of the literature, a variable of interest rate is expected to have a positive effect on the level of euroization.

3.2.5. Trade Openness

Trade openness is the volume of trade (imports + exports) expressed as a percentage of GDP. The variable of trade openness is included in the models because some authors such as Basso, Calvo-Gonzales, and Jurgilas (2007) and Guscina (2008), used that variable in their research to explain the euroization phenomenon. According to the global trends explained previously, we can assume that high trade (economic) openness incentivizes depositing and borrowing in foreign currency. Trade openness is hence expected to have a positive effect on euroization level.

3.2.6. Real Effective Exchange Rate (REER)

REER is the weighted average course of a currency against a basket of other currencies with which it has the largest volume of exchange. The variable is included in the models because it measures the position of the domestic currency towards a bundle of other currencies it is most exchanged with. Most of the recent literature in transition countries identified exchange rate and its volatility as an important determinant of euroization. Ivanov, Tkalec and Vizek (2011), Manjani (2015), Guscina (2008) and Kokenyne, Ley, and Veyrune (2010) included REER into their analysis and proved it to have a negative effect on euroization.

3.3 The Model Specification

Kokenyne, Ley, and Veyrune (2010), Basso, Calvo-Gonzales, and Jurgilas (2007), Rosenberg and Tirpák (2009), Neanidis and Savva (2009), Guscina (2008), Rennhack and Nozaki (2006) and Levy-Yeyati (2005) used regression analysis to determine the influence of their variables on euroization parameters. In this study, the model for the data analysis is constructed as two respective multiple regressions performed with FCD as the dependent variable in Model 1 and FCTL in the Model 2. Each regression is performed to yield the results with the OLS model, the FE model, and the RE model. The OLS model is present in the analysis by Rosenberg and Tirpák (2009), and the FE model is used by Pepić, Marinković and Radović (2015), Basso, Calvo-Gonzales, and Jurgilas (2007), Luca and Petrova (2008), Neanidis and Savva (2009) and Guscina (2008).

Taking into consideration all the discussed determinants, the theoretical model for

determining what affects euroization is presented, where i stands for the country observed, and t for the year observed.

Model 1: ⟦Deposit euroization⟧_it = f(⟦Consumer Price Index -CPI⟧_it, ⟦Inflation rate⟧_it ⟦Interest rate ⟧_it , ⟦Trade Openness⟧_it , ⟦Real Effective Exchange Rate⟧_it ,

Model 2: ⟦Liabilities euroization ⟧_it = f(⟦Consumer Price Index -CPI⟧_it,, ⟦Inflation rate⟧_it ⟦Interest rate ⟧_it , ⟦Trade Openness⟧_it it, ⟦Real Effective Exchange Rate⟧_it.

The next model planned to be included in our estimation assumes that variation across the countries is random and uncorrelated with the independent variables (Stock & Watson 2012).

$$Y\_it = \alpha + \beta^{'} X\_it + u\_i + \varepsilon\_it \quad (3)$$

where Y is the dependent variable, α is the y-intercept constant, β is the slope coefficient of X, X is the explanatory (independent) variable, u is the regression residual, and ε is the error term of the model. Furthermore, the data that came out as the result of the regression analysis undergoes additional tests such as the Chow test, to ensure that the data can actually be pooled together, that is, that the estimated coefficients for the individual data sets are the same (Glen 2016). It also undergoes the Hausman specification test, which is used to show if there are endogenous variables in a regression, and thus ensure more reliable results than the OLS model (Glen 2017). The Hausman test was also used by Basso, Calvo-Gonzales, and Jurgilas (2007), whose article is also one of the few pieces from the collected literature that analyzed both FCD and FCTL specifically, as the dependent variables.

4. Results and Discussion

4.1 Descriptive Statistics and Correlation

Table 1 contains the overview of the descriptive statistics of each of the dependent and independent variables for all seven countries:

The mean euroization rates are between 50% and 60% for the FCD and FCTL, respectively. The euroization in this sample is in line with the findings of Luca and Petrova (2008), who had means between 45% and 55% and Neanidis and Savva (2009), who had higher averages (up to 70% for FCD). However, there are some differences because other countries were included in their samples. The FCD and FCTL have an almost identical standard deviation, as well as a positive value of skewness indicating increasing trends, which contributes to the argument of euroization persistence, as outlaid by Luca and Petrova (2008), Rennhack and Nozaki (2006), Ivanov, Tkalec and Vizek (2011), and Manjani (2015).

The standard deviation is the lowest for real interest rate and REER, while it is the highest for CPI and trade openness. Kokenyne, Ley, and Veyrune (2010), Guscina (2008) and Ivanov, Tkalec and Vizek (2011) used the standard deviation of REER and inflation as a measure of their volatility. The standard deviation on inflation found by Ivanov, Tkalec and Vizek (2011) was almost the same as in this research (11.75), the standard deviation of REER on the other hand, was smaller (5.67). Almost all of the reviewed literature connects high (euroization) dollarization rates with increasing trends of inflation. The standard deviation of the inflation supports the argument of increasing inflation trends and is in line with the findings of Neanidis and Savva (2009). The standard deviation of trade openness is 19.9, and not very different from the standard deviation measured for Export/GDP by Luca and Petrova (2008), which was 17.

Additionally, the implications of the skewness of the REER variable are found to be negative (-1.42). It can be interpreted as a tendency towards currency depreciation (Ivanov, Tkalec & Vizek, 2011).

Table 1: *Descriptive statistics*

	FCD	FCLTL	CPI	REER	INTEREST RATE	OPENNESS	INFLATION
Mean	51.18864	57.11893	95.42639	95.41372	6.970357	86.41737	5.389071
Median	47.35000	56.50000	99.85000	97.02368	6.805000	81.76274	2.596096
Maximum	82.71000	81.80000	143.9976	112.3942	45.18000	138.5762	95.01000
Minimum	27.80000	30.30000	19.75769	47.60855	-2.130000	22.49218	-1.580000
Std. Dev.	13.72494	13.41497	21.16468	9.662627	5.325985	19.93980	11.21955
Skewness	0.529037	0.046005	-0.798514	-1.423175	2.878877	0.457510	5.615256
Kurtosis	2.160654	2.019185	4.272939	6.996075	20.57925	3.441626	39.66061
Sum	7166.410	7996.650	13359.69	13357.92	975.8500	12098.43	754.4700
Sum Sq. Dev.	26183.99	25014.63	62264.15	12977.92	3942.890	55265.80	17497.09
Observations	140	140	140	140	140	140	140

Source: Authors' compilation, 2022

Furthermore, the correlation matrix between the explanatory variables is shown in Table 2, as a means of controlling whether they satisfy the criteria of acceptable multicollinearity.

Table 2*: Correlation matrix*

	CPI	INFLATION	INTEREST_RATE	OPENNESS	REER
CPI	1				
INFLATION	-0.6154067	1			
INTEREST_RATE	-0.4419941	0.491893049	1		
OPENNESS	0.58194731	-0.428746866	-0.503413720	1	
REER	0.636400014	-0.533826029	-0.33890460	0.61809802	1

Source: Authors' compilation, 2022

Namely, a correlation coefficient between two variables that is above 0.7 is considered a strong correlation, according to Wu (2020). Strongly correlated independent variables can cause problems with interpreting the results of the regression and make the model unstable and inaccurate. Hence, it is important that none of the independent variables used in this research have a strong correlation among each other.

The highest correlation is found between the variable CPI and the variable REER (0.63). On the contrary, the lowest correlation link is found between the real interest rate and REER. They are negatively correlated. Interestingly, some studies done by Luca and Petrova (2008) and Rennhack and Nozaki (2006) found the interest rate and REER variables respectively, to have positive impact of euroization levels.

Pepić, Marinković and Radović (2015) in their analysis used the change in CPI as a measure of inflation. Contrary to that, the inflation and CPI variables have a negative and moderate correlation, and cannot hance be treated as the same proxies to each other nor as the same variable (Table 2)

4.2 Regression analysis results

Table 3 provides an explanation of the statement made in the interpretation of Regression output Model 1 (Table 5) regarding the OLS model.

Table 3: *Model 1: Chow test*

Effects Test	Statistic	DF	Probability
Cross-section F	86.446810	(6,128)	0.0000
Cross-section Chi-square	226.775171	6	0.0000

Source: Authors' compilation, 2022

The data used for the regression analysis underwent the Chow test. Its results show that the value of the probability for the Cross-section Chi-square was less than 0.05. It means that the FE model is preferred over the OLS model. We also see this test done by Kokenyne, Ley, and Veyrune (2010), and their Chi-square probability value adhered to the same criteria.

Table 4: *Model 1: The Hausman test*

Test Summary	Chi-square Statistic	Chi-Square DF	Probability
Period random	2.228985	5	0.8166

Source: Authors' compilation, 2022

To establish preference for final interpretation between the FE and RE model, the Hausman test was conducted. The value of probability of the Cross-section Chi-square was 0.8166. The Hausman test value was higher than 0.05, and we concluded that the RE model is preferred over the FE model. Furthermore, Table 5 shows the regression output for the determinants of deposit euroization for the OLS model, the FE model and the RE model, respectively.

Table 5: *Regression output Model 1 (Dependent variable: FCD)*

	OLS model	FE model	RE model
C	19.58049	75.36979***	74.79110***
CPI	0.129256	0.193968***	0.191862***
INFLATION	0.148245	0.029752	0.029772
INTEREST RATE	0.607208**	-0.374934**	-0.365189**
OPENNESS	-0.104449	-0.319661***	-0.315551***
REER	0.243871	-0.132197	-0.128461

Source: Authors' compilation, 2022; * Significant at 10%; ** Significant at 5%; *** Significant at 1%

As for the FE and RE models, it is visible that the differences are very small, the largest difference being for the interest rate variable (0.01). There are similarities with the work of Neanidis and Savva (2009), who found insignificant differences between their results using the FE and RE models, as well the positive but insignificant effect of inflation.

The results of Model 1 show that the effect of CPI and trade openness on FCD is statistically significant at 1%, and the real interest rate has a statistically significant effect at 5%. The CPI has a positive effect, while the interest rate and openness have a negative effect on deposit euroization. These results indicate that the FCD would increase by 19% if CPI increases by 1%. The positive and significant effect of CPI supports the analysis of Manjani (2015) and Levy-Yeyati (2005). On the contrary, Basso, Calvo-Gonzales, and Jurgilas (2007) found a significant but negative effect, while Guscina (2008) found a positive but insignificant effect of openness on FCD.

The negative effects of the interest rate were proved by Basso, Calvo-Gonzales, and Jurgilas (2007) and Pepić, Marinković and Radović (2015), even though for Pepić, Marinković and Radović (2015), the effect of the interest rate was statistically insignificant. The negative effect of the interest rate is slightly greater than that of the trade openness. As shown in Table 6, the Chow test is performed for the Model 2 as well.

Table 6: *Model 2 Chow test*

Effects Test	Statistic	DF	Probability
Cross-section F	74.353802	(6,128)	0.0000
Cross-section Chi-square	210.113830	6	0.0000

Source: Authors' compilation, 2022

The results showed that the value of probability of the Cross-section Chi-square is less than 0.05, same as for Model 1. Hence, the FE model is preferred to the OLS model for Model 2.

Table 7 shows the Hausman test for Model 2.

Table 7: *Model 2 Hausman test*

Test Summary	Chi-Square Statistic	Chi-Square DF	Probability
Cross-section random	6.155246	5	0.2914

Source: Authors' compilation, 2022

Again, for final preference determination between the FE and RE models, we have the Hausman test. Same as for Model 1, the value of probability of the Cross-section Chi-square is again higher than 0.05, and hence, for Model 2 as well, the RE model is preferred over the FE model. Finally, Table 8 shows the regression analysis for Model 2 (liability euroization).

Table 8: *Regression output Model 2 (Dependent variable: FCTL)*

	Panel Least Squares	Fixed effect model	Random effect model
C	-1.247439	42.88506***	41.75433***
CPI	-0.021794	-0.001149	-0.004062
INFLATION	0.241492*	0.087712	0.089119
INTEREST RATE	0.559959**	0.007796	0.024097
OPENNESS	-0.113135	-0.205160***	-0.199215***
REER	0.681436***	0.330622***	0.338731***

Source: (Authors' compilation, 2022); * Significant at 10%; ** Significant at 5%; *** Significant at 1%
Source: Authors' compilation, 2022

The results displayed in Table 8 indicate that there are somewhat larger differences between the FE and RE models for the CPI and interest rate variable. However, neither of them proves to be significant. Unlike for deposit euroization, only two of the determinants proved significant for liability euroization: the trade openness and the REER. Both variables are statistically significant at 1%. Trade openness proved to have a negative effect on FCTL, and REER proved to have a positive effect. The negative effect of openness on FCTL was proven by Basso, Calvo-Gonzales, and Jurgilas (2007), while a positive and significant effect of REER on FCTL was not found in the reviewed literature.

5. Conclusion

As previously discussed, the determinants of euroization have been studied for the emerging markets and transition countries. The Balkans as a whole (and the Western Balkans especially) are particularly interesting for economic analysts, in terms of how the newly transitioned (and in some elements still transitioning) economies handle the challenges of maintaining stability and growth, and what influence do their macroeconomic and policy trends have on the euroization of their assets and liabilities.

This study explored the Balkan countries which do not use the euro as the official currency and examined their euroization trends over the whole 20-year period. It outlined plain macroeconomic indicators and tested their significance and effect on euroization providing a general answer why euroization levels remain as they do in the Balkans.

The results of the study have altogether showed that the rates of deposit and liability euroization stayed persistent over a period of 20 years. There werevery small variations, even during the period of the 2008 crises and its aftermath, as proved by Rennhack and Nozaki (2006), Ivanov, Tkalec and Vizek (2011), and Manjani (2015). As for the determinants of euroization, out of the set of five dependent variables, three proved to be significant for FCD, and two for FCTL. CPI proved to have a significant and positive effect on deposit euroization, as was proved by Ivanov, Tkalec and Vizek (2011), Manjani (2015), Pepić, Marinković and Radović (2015), Neanidids and Savva (2009), and Yeyati (2005). The real interest rate and trade openness proved to have a significant and negative effect on FCD, contrary to the findings of Chailloux, Ohnsorge and Vavra (2010), Pepić, Marinković and Radović (2015), Luca and Petrova (2008) Basso, Calvo-Gonzales, and Jurgilas (2007), and Guscina (2008). There was a very small difference between the values of the negative coefficients of the interest rate and openness. The variables of inflation and REER proved to be insignificant, and only one of the significant determinants (CPI) had a positive effect.

As for the euroization of liabilities, the variable of REER proved to have a positive effect on liability euroization. Finally, the trade openness proved to be significant (at 1%) and to have a negative effect on liability euroization, just like on deposit euroization, though a somewhat smaller one.

The findings for trade openness are contrary to those of Basso, Calvo-Gonzales, and Jurgilas (2007) and Guscina (2008), who found the effects on euroization to be positive. In Model 3, three of the determinants were proved to be insignificant, and the results were opposite from the expected positive and negative effects on liability euroization. As previously stated, euroization in the analyzed Balkan countries in general has not shown a rapid increase or decrease over the analyzed period, rather it has showed relatively small fluctuations.

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