

**ASSESSMENT OF BANKS'
LENDING DETERMINANT IN
CENTRAL EASTERN &
SOUTHEASTERN EUROPEAN
COUNTRIES**

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ABSTRACT

After the global financial crisis, credit in Central Eastern and South-eastern European countries has slowed down quickly, in some cases even contracting, leading to a decline in financial intermediation and a weak economic performance. This paper aims to evaluate empirically the factors that have influenced the lending activity of banks in these countries before and after the global crisis. The estimated results obtained by applying a panel regression method with fixed effects, show that economic growth, credit quality, the level of the financial intermediation together with foreign and domestic financing sources are important determinants of credit growth. The credit crunch after the crises is dictated mostly by the risk averse behaviour and the drop in banks' foreign finance, with the latter being to some context offset by the increased domestic funding. This analysis adds value to the existing research for this region, provides a better understanding of issues related to the recent credit sluggishness, and identifies main vulnerabilities to be addresses by policymakers.

1. INTRODUCTION

A comprehensive research analyzes the determinants of the credit activity, as bank lending is of special importance to the economic development and the financial stability of a country. The Central Eastern and Southeastern European Countries (CESEEC) are extensively discussed in the literature as interesting case studies of transition processes highly supported by the deepening of financial intermediation; the latter also aided by the participation of the West European banks in the region. Especially in the pre-crisis period, the higher financing from abroad has fueled the credit growth, thus supporting the deepening of the financial sector and the European integration process in this region.

The 2008 financial crisis severely impacted the credit activity of the foreign banks in the region. The financial problems with toxic assets that influenced most of the west parent banks were transmitted to their subsidiaries in the region, thus substantially affecting their banking activity. Especially after the Greek crisis and after the strengthening of the European supervision standards, the CESEE region has experienced a second wave of strains, associated with an economic downturn and further deleveraging. In this regard the topic about the determinants of credit growth is of special interest to understand the influence of the financial crisis and also the current challenges for the region.

In the recent years, following the financial crisis of 2008, most of the research on credit has been focused on credit growth determinants. These developments are even more important in the case of emerging economies because of the boom cycles some of them were experiencing before the crisis and the bust that followed thereafter. Based on a research paper by Guo and Stepanyan (2011), this paper aims to estimate empirically the influence of each of the fundamental factors on the credit developments in the region. To this end, results of OLS panel estimation with countries fixed effects are presented for pre-crisis and post-crisis periods, investigating possible changes in the importance of various factors determining credit growth.

The paper is structured in seven sections. The second section presents an overview of credit developments in CESEE countries and of the main factors determining it. The third section summarizes the relevant literature for the credit determinants, giving a special focus to the papers elaborating the CESEE region. The fourth section describes the model we employ in our analysis and the fifth section represents the estimated results with a special focus to the robustness of our model. The sixth section shows the interpretation of our findings. Finally, the seventh section concludes.

2. LITERATURE REVIEW

Most of the research on credit has been focused on determining the equilibrium level of credit in the economy and on establishing whether credit was overshooting or undershooting this equilibrium. Research in this field has been particularly dominant before the 2008 crisis, when several emerging countries were experiencing high credit growth rates. These studies usually employ a set of countries and regress the credit to GDP ratio against variables that determine credit, such as GDP per capita or real GDP, interest rate, inflation, and other financial indicators to account for the stance of the banking system¹.

The first of these studies was conducted by Cottarelli, Dell'Araccia, and Vladkova-Hollar (2005) on 15 CESEE countries, finding that credit developments up to 2002 were not inconsistent with economic fundamentals. Their results suggest that credit to the private sector had been driven by financial deepening, crowding-in effect, privatization, and overall transition towards market institutions. Boissay, Calvo-Gonzales, and Kozluk (2006) study credit developments in 11 CESEE countries. They estimate the deviation of credit/GDP ratios for these countries from their equilibrium level and their results suggest that only in Slovenia and in Romania the increase of Credit/GDP was in line with macroeconomic fundamentals. Furthermore, they find that credit growth was even

¹ See for example Kaminsky and Reinhart (1996), Gourinchas, Valdés, and Landerretche (2001), Cottarelli, Dell'Araccia, and Vladkova-Hollar (2005), Égert, Backé and Zumer (2006), Coricelli, Mucci, and Revoltella (2006) Schadler et al (2005).

more excessive in countries with fixed exchange rate regime. On the other hand, employing a similar framework, Kiss, Nagy, and Vonnák (2006), do not find evidence of overshooting in any of the CESEE countries with the exception of Latvia and Estonia.

The recent years, following the financial crisis of 2008, there has been a growing interest in credit developments, with a particular focus on credit growth determinants. These developments are even more important in the case of emerging economies because of the boom cycles some of them were experiencing before the crisis and the bust that followed thereafter.

An IMF paper by Aisen and Franken (2010) looks at credit developments for over 80 countries, focusing on the 2008 crisis. They use a large set of macro and financial variables to explain the real credit growth and find that the countries with higher credit growth before the 2008 crisis, with higher intermediation level, and with stronger economic activity slowdown experienced lower growth rates of credit after the crisis. They also find that counter-cyclical policies followed by some of the countries helped maintain higher credit growth in the respective economies.

Another study, by Barajas, Chami, Espinoza, and Hesse (2010) identifies banking sector characteristics, namely capitalization and loan quality, as factors that explain differences in credit growth among Middle Eastern and North African countries.

One of the most comprehensive studies after the crisis is the IMF paper by Guo and Sepanyan (2011), who look at credit growth determinants in 38 emerging countries for 2001-2010. They also decompose their analysis in pre-crisis and post-crisis periods, trying to find differences in drivers of credit growth in these two sub-periods. Their results are in line with theoretical predictions. On the supply side, higher growth of foreign liabilities and of deposits fuel higher credit growth and a healthier banking system extends more credit than an unhealthy one. On the demand side, higher economic growth is reflected in a higher demand for credit. Loose monetary policies -domestic and/or foreign- create premises for higher credit growth. Their findings on CESEE countries suggest that the high

foreign borrowing of banks was the main driver of credit growth before the crisis, followed by economic growth as the second most important factor. These two factors were also the most important after the crisis; first, the sharp withdrawal of foreign finance caused the rapid decline in credit growth rates and then the slowdown in economic growth explains the lack of credit in these countries.

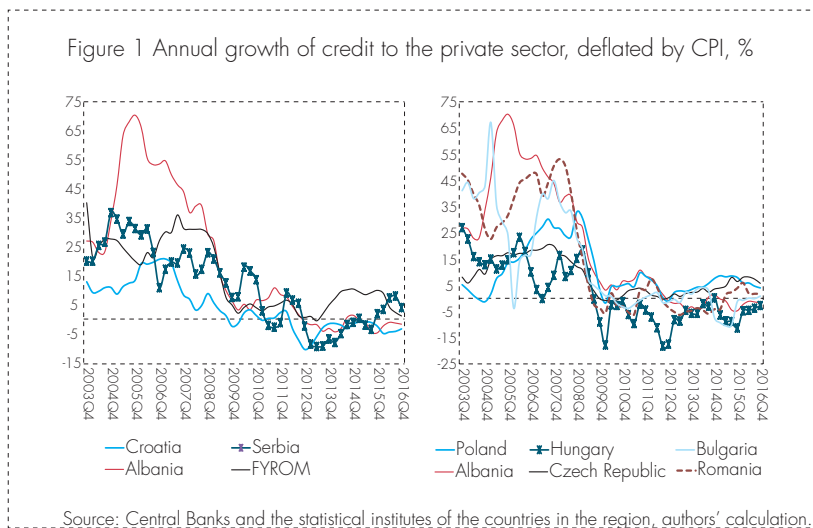
More recent research employs bank level data as well as macroeconomic ones. An IMF (2013) technical paper studying bank level data for CESEE countries finds that credit slowed down significantly after 2008 due to weakened macroeconomic conditions, deteriorations of banks' fundamentals and the increase of their sensitivity towards these fundamentals. Also, credit growth slowed more for foreign banks due to the tightening of the parent bank funding conditions.

In another IMF paper, Everaert et. al (2015) study bank level data for five CESEE countries and finds that supply factors gained importance relative to demand factors in explaining credit growth after the 2008 crisis. In other words, they concluded that the sensitivity of credit growth towards supply factors increased after the crisis, while the one towards demand factors decreased.

3. STYLIZED FACTS

The CESEE countries have experienced high credit growth before the financial crisis of 2008, leading to rapid growth of domestic demand. Bakker and Gulde (2010) argue that credit boom was the main factor behind the fueling of domestic demand, in turn, associated with increased imbalances and vulnerabilities in some of the sectors of economy. The distinguished pattern of the region is its close relation in trade and financial integration with the European economy. During this period, most of the countries in the region have experienced excessive current account deficits fueled by consumption, which represented the main driver of economic growth. According to their study, the overheating of the economy has been reflected also in high inflation and in the deterioration of competitiveness for some of the countries in the region.

During 2004-2008, the annual real GDP growth averaged almost 6% for the region. The accelerated economic growth has been associated with high real credit growth, averaging 26%, annually, for the entire region. The annual expansion rate of lending deflated by CPI, has ranged from the lowest figure of 11.4% in Hungary to a rate of 48.1% in Albania. The difference in the macroeconomic conditions reflected also differences in the initial condition of financial intermediation among the countries in the region. In some of the countries, such as Albania, the low initial level of credit portfolio created opportunities for banks to rapidly increase and deepen financial intermediation. Meanwhile, the overall expansionary cycle of the economy supported this development. Furthermore, as it has been mentioned in the IMF publication of regional economic issues (April 2013), the participation of West European banks in the region has helped substantially in the increase of the effectiveness and the deepening of financial intermediation.



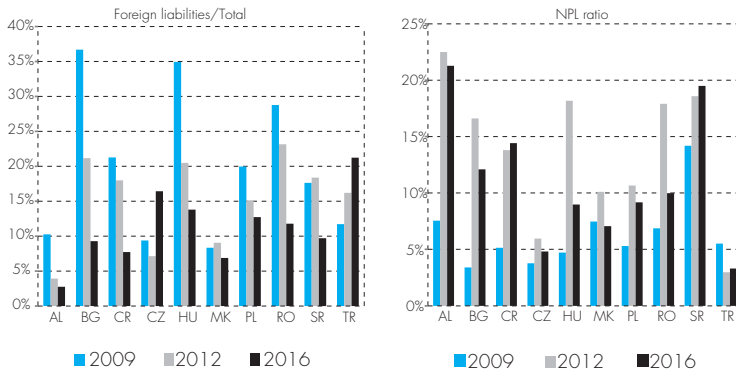
After the 2008 financial crisis, all the countries in the CESEE region have experienced poor growth of the loan portfolio. The average real growth of the credit portfolio fluctuated in the region, from the negative value of 4.7% for Hungary to an increase of 14.6% for Turkey. Since 2012, the already weak pace of credit growth slowed further and for most of the countries credit growth has

turned negative or has remained near zero. At the end of 2016, the credit activity in the region had stagnated and showed non evident sign of revival.

The factors that have conditioned the lending performance relate to both credit supply and credit demand. Right after the crisis, the tightening of credit supply has been the most important factor that has contributed to decelerated credit growth. After 2011, the main factor that has held back credit growth has been the lower demand for credit, caused by economic underperformance, gloomy confidence and lower needs for financing. In some of the countries (such as Hungary, Bulgaria, Croatia), the drop in demand has reflected also the high indebtedness of economic agents before the crisis.

At the beginning of the global financial crisis the tightening of the credit standards was dictated mostly by the liquidity problems of banks. After 2011, the lending standards have been tightened further, although not as strongly as in previous years. During these two periods, developments that have outlined the credit supply in the CESEE countries have reflected mostly the lack of foreign funding sources and the increased credit risk. In all these countries, banking systems are characterized by a strong presence of foreign banks, mainly European ones. During the period 2005-2008, the foreign liabilities of banks in these countries grew on average by 44%. Impavido et. al. (2013) show that during this period the foreign inflows financing the credit demand in the CESEE region were the highest ever in the emerging markets. The sustainability of this funding model was put to a strong test with the financial crisis of late-2008, where the CESEE banks faced massive and rapid withdrawals of foreign financing. The liquidity constrain for banks was the main factor that dictated initially the tightening of credit conditions and the slowing of credit growth in these countries. Then, with the gradual replacement of foreign funds with domestic funding and with the strengthening of the confidence in the banking system, the liquidity situation improved in most of the countries. Even though liquidity has improved and economic activity has picked up in the last years, 2015- 2016, the banks' credit recovery does not yet seem to be underway.

Figure 2 Foreign financing and the ratio of non-performing loans to the total loans



Source: Central Banks in the region, authors' calculation.

The second factor causing a tight supply of credit in the region was the increased credit risk. The ratio of non-performing loans to total loans has increased significantly in most of these countries and primarily has reflected the underperformance of the real economy. In the period 2009-2012, it increased by 9 percentage points on average for the entire region. The banking system faced a rapid deterioration of the credit quality, which was a key factor for the tightening of credit conditions, particularly in certain sectors. In a macroeconomic context, the high level of non-performing loans has led to unused capital (collateral) and has frozen the financing of new projects, hampering economic recovery. In the latest two years, due to a variety of measure undertaken to address the NPL problem, the ratio of NPLs has been declining, but it still remains a major concern for credit recovery.

Before the financial crisis, the increase in foreign currency lending² was a very widespread phenomenon amongst the CESEE countries that have been driven by both demand and supply factors. Beside the favorable interest rate differential of foreign currency loans, the

² These activities consist mostly to the euro lending. However there are countries in the region such as Poland and Hungary when Swiss franc lending was an important component in foreign currency lending. In our study we have not considered this special circumstance.

high integration of the real sector of the economy (trade) with the western countries, have encouraged the high demand for lending in foreign currency (Impavido et. al., 2013). Furthermore, the stable exchange rate during the pre-crisis period has played an important role in stimulating the demand for foreign currency lending. Meanwhile, the high share of foreign currency lending involves an important role of the exchange rate in the credit development. A depreciation of the domestic currency exchange rate against the euro increases the foreign currency loans expressed in domestic currency. In the meantime it increases the credit risk as the clients may stumble on difficulty to serve regularly the debt, especially the unhedged borrowers (Unicredit Report, 2011).

The data on lending interest rates show a general path for all the countries in the region. After the 2008 crisis, the lending interest rate increased compared to the pre-crisis period, but with different amplitude within the countries in the region. After showing a slight downward tendency in 2010 and 2011, it returned to higher levels in 2012, with the exception of Croatia and the Czech Republic. This development probably reflects also the second wave of shocks in the CESEE region after the European debt crisis. After that, the lending interest rates followed a declining trend. In the last two years, even though the lending interest rates have been set to the historical minimum, they have failed to encourage credit recovery, also due to the negative impact of the non-price lending standards.

4. METHODOLOGY

In our study, we employ panel data econometric analysis to explain the real credit growth in 10 CEE and SEE countries: Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Serbia, FYROM, and Turkey. The data is of quarterly frequency and covers the period 2004Q4 – 2016Q4. The data is taken from the websites of respective central banks and national institutes of statistics. We originally began with specification of Guo and Sepanyan (2011), including only GDP, foreign liabilities, deposits and interest rates. However, based on other research work on CESEE credit developments and on our observations drawn

from economic analysis of these countries, we extended the set of independent variables by including other variables accounting for the risk, financial depth, and the dominance of foreign lending in credit portfolio. We specify the regression equation in its broad form as follows:

$$CPS = f(GDP, NPL, DEP, FL, INT, IR, ER, DUM11)$$

where:

CPS = real credit to the private sector

GDP = real GDP

NPL = non-performing loans as a fraction of total loans

DEP = real deposits

FL = real foreign liabilities of the banking system

INT = deviation of CPS/GDP from its trend

IR = lending interest rate

ER = exchange rate

DUM11 = period dummy from 2011Q4 and afterwards

We believe that the behavior of credit and the effects of the explanatory variables vary importantly across this period, therefore we chose to divide the sample in two sub-periods: the first covers the years before the financial crisis, 2004Q4 – 2008Q3, and the second covers the period after the crisis, 2008Q4 – 2016Q4. Our expectations were confirmed by the results: variables affect credit with different lags and have different coefficients in these sub-periods. The Wald test shows that the coefficients of the variables in the second period are statistically different from the ones in the first period (results are found in Table 3 in Appendix 1³). The equations were estimated using fixed effects, thus accounting for unobserved heterogeneity across countries.

Real credit to the private sector is the dependent variable, calculated as the nominal CPS deflated by CPI.

Real GDP serves as a proxy for demand in the economy. The higher the real aggregate demand, the higher the demand for loans

³ The Wald test has been conducted for different break point period, but its parameters show the best performance for the fourth quarter of 2008.

in the economy; therefore, the coefficient is expected to have a positive sign. As in Guo and Sepanyan (2011), we use lagged GDP to avoid the problem of reverse causality, i.e. higher credit leads to higher GDP.

The inclusion of the NPL ratio serves two purposes. First, it represents a proxy for credit risk faced by banks. The higher the credit risk, the lower the willingness of banks to engage in lending. Second, NPLs may limit the banking system's capacity to lend. A banking system with high NPL in its balance sheet will use most of its resources in loan recovery processes and might suffer from capital erosion as well due to high loan provisions. Thus, the expected sign of the coefficient is negative; the higher the NPL ratio, the lower credit growth. Similar to the GDP variable, we use lagged values of the NPL ratio to account for possible causality between variable.

Deposits and foreign liabilities are the financing means of the lending activity; therefore, the higher their growth, the higher the credit growth, thus the expected sign of the coefficients is positive. In order to account for the importance of these items in financing the lending activity, which varies across time and across countries, these variables are weighted by their lagged share in total assets (as in Guo and Sepanyan (2011)), WDEP and WRFL respectively.

Current intermediation level is important for future credit growth. Countries with low credit/GDP ratios tend to experience faster credit growth than countries with high credit/GDP ratios. We employ the lagged deviation of CPS/GDP from its trend (estimated by HP filter); therefore, we expect a coefficient with negative sign for this variable (if CPS/GDP is above its trend, credit growth should fall and vice versa).

Interest rate represents the cost of credit and affects the demand for loans: the higher the interest rates, the lower the demand for loans. The expected sign of the interest rate coefficient is negative. In our model, three variables represent the interest rate. In the first sub-period we use the real interest rate for loans in domestic currency and the 12 month euribor - as a proxy for the real interest rate for loans in foreign currency, since data about the latter was not

available for most of the countries in this period. In the second sub-period, we use a single variable representing the real interest rate, calculated as the weighted average of interest rates in domestic currency and interest rates in foreign currency.

We include the exchange rate to account for the evaluation effect that exchange rate movements might have on credit developments. The motivation for doing so rises from the fact that part of the credit portfolio in most of countries in the sample is in foreign currency, mainly euro. The variable is expressed as domestic currency per one unit of euro, meaning that a rise in exchange rate means depreciation and vice versa. Therefore, the coefficient on this variable is expected to have a positive sign⁴.

We believe that the Greek crisis in 2011 has had permanent consequences in the banking systems in the region with regard to their lending approach and risk aversion. This was also dictated by the European parent banks' policies to deleverage from the CESEE region, a policy that is still present in some of the countries in the sample. Therefore, we include a time dummy, DUM11, to account for this change in banks' behavior after the Greek crisis.

According to Stock and Watson (2011), OLS estimation gives unbiased estimated coefficient when the variables included in the OLS panel model are stationary. Therefore, we tested for the existence of the unit root in the selected variables, before running the model. Unit root tests⁵ confirm that all the variables included in the model have unit root in the level, while they become stationary in the first difference. For this reason all the variables included in the model are first differenced.

Another characteristic of our model is the selection of the fixed effect. Having in mind the difference among the countries in the region, it was intuitively thought to run the model by including the fixed effect. However, we have evaluated the existence of the fixed

⁴ Table 1 in Annex presents the data used in the regression, with information about the transformation and the source of information.

⁵ The test used for the common unit root process is the Levin, Lin & Chu, and for the individual one is used the Im, Pesaran and Shin W-stat.

effect with the specialized statistic test. As the results show in Table 3 in Appendix 1, both tests, redundant test and the Hausman test, do confirm with high statistical confidence the existence of the fixed effects in the model.

5. ESTIMATION RESULTS

Table 1 below presents the estimation results of the regression equations for the period before the crisis and the one after the crisis. The estimated coefficients have the expected sign and are statistical significant. Furthermore, as expected, the lags with which the variables affect credit growth and the size of this impact are different for the two sub-periods.

Table 1 Estimation results.

	2004Q4-2008Q3			2008Q4-2016Q4		
	lag	coefficient	st. error	lag	coefficient	st. error
C	-	0.0200***	0.0068	-	0.0087***	0.0022
DLOG(RGDPC)	3	0.6167**	0.318	1	0.3792***	0.1057
D(NPL)	2	-0.7906*	0.4743	2	-0.1946***	0.0702
DLOG(RFL)*VWRF(-1)	-	0.6893***	0.0844	-	0.7210***	0.0759
DLOG(RDEP)*WDEP(-1)	-	0.5822***	0.0804	-	0.4805***	0.0561
DINT	2	-0.5549***	0.1268	1	-0.2003***	0.0492
D(RLR)	3	-0.1505**	0.0532	-		
D(REURIBOR)	2	-0.5480**	0.2824	-		
D(RR_L)				3	-0.0340	0.0736
DLOG(EURO)	-	0.1668***	0.039	-	0.1734***	0.0233
DUM11				-	-0.0112	0.0025
Observations	160	330				
R2 adjusted	0.82	0.69				
Countries FE						
Albania		0.0551			-0.0003	
Bulgaria		-0.0203			-0.0037	
Croatia		-0.0081			-0.0036	
Czech Rep.		-0.0031			0.0016	
Hungary		-0.0221			-0.0132	
FYROM		0.0012			0.0054	
Poland		-0.0142			0.0052	
Romania		0.0127			-0.0056	
Serbia		-0.0089			0.0017	
Turkey		0.0077			0.0125	

Note: *, **, and *** show significance at 10%, 5%, and 1% respectively.

GDP as a proxy for aggregate demand is found to be an important driver of credit growth, but its coefficient is lower in the post-crisis period, suggesting a weakening of the relationship between credit growth and economic activity. The same finding can be drawn from the results of Guo and Sepanyan (2011), where the coefficient on the real GDP growth is higher in the pre-crisis sample than in the full sample. This difference could reflect the asymmetric reaction in the two periods: during the optimism period credit follows closely the GDP growth, but in a “downturn cycle”, when the economic growth remains below potential almost all the time, other factors may gain more importance than the growth itself. The results of Everaert et. al (2015) also confirm a lower sensitivity of credit growth towards economic growth after the crisis.

At the same time, the lag with which GDP affects credit is shorter in the second period, meaning a faster channel from real activity to credit. A possible explanation might be that over time, the banking system has become more efficient in processing credit applications and therefore the faster impact of GDP in credit growth.

Both foreign liabilities and deposits are significant drivers of credit growth. The coefficient on foreign liabilities is higher than the one on deposits in both periods, thus suggesting that this form of financing has been more important in determining credit growth. Given the fact that after the 2008 crisis, the majority of the countries experienced a rapid withdrawal of foreign funds, the latter has been a major force behind credit slowdown during 2008-2012.

Non-performing loans, as a proxy for credit risk, as expected, has a negative impact in credit growth. The statistical importance of this indicator has been higher and the lags lower for the second period, reflecting as such the deterioration of loan quality within this period. The deviation of financial depth from its trend is also found to be an important factor that determines credit growth, especially in the pre-crisis period.

Price of credit, represented by lending interest rates, results significant only in the period before the 2008 crisis. The results for the pre-crisis period suggest that the foreign currency interest rate

has a much larger effect in credit growth than the domestic one. This is explained by the rapid expansion of foreign currency lending in most of these countries, fueled by the increase of foreign liabilities of the banking system. In the post-crisis period, the composite variable for interest rate is statistically insignificant. A caveat of our model is that it does not include non-price credit terms, such as collateral requirement, loan-to-value ratios, maturity, etc. Bank lending surveys in several countries show that lending standards, which include both price and non-price conditions, have been generally on the tightening side after 2008 (MNB, 2013), suggesting a tightening of non-price standards.

The effect of exchange rate changes is statistically significant, meaning that there is an evaluation effect in observed credit growth rates.

Finally, the dummy variable representing the years after the Greek crisis results significant and with a negative sign, as expected. This means that there is a shift in the behavior of the banks in the region that can be interpreted as an increase in risk aversion, which is partly a result of the deleveraging strategies followed by the European banks and the reduction of their operations in the region.

ROBUSTNESS CHECK

The stability of the model has been assessed by the coefficient stability test and the residuals test for each of the period. Both of these tests show high stability of the coefficients and support high confidence of the estimated coefficient for each of the model. The rejection with high confidence of the existence of the unit root in the residuals for the common residual assumption and the individual residual assumption, confirming that the residuals of the models are stationary, supporting the overall robustness of the model⁶. Meanwhile, the almost regular circle shape for each of the coefficient confirms the center estimation of the coefficient and their stability.

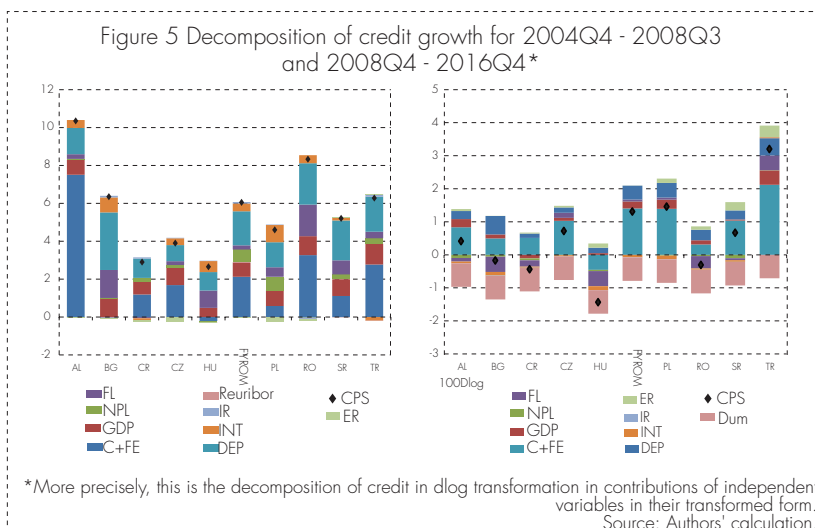
⁶ For more details refer to Table 1 in Appendix 2.

One of the main assumptions to accept (trust) the results of panel OLS estimation is that the residual (error) for each of the countries are uncorrelated with another. If this assumption does not hold the estimated coefficients tend to be biased. The correlation matrix of the residuals shows low correlation between country residuals for both periods, confirming that our assumption holds. Furthermore, the selection of estimating the model with cross section SUR means that we take into account to correct for both heteroskedasticity and contemporaneous correlation within cross section (countries). For more detailed information on the residual correlation and covariance matrix refer to Table 2 in Appendix 2.

Another approach to estimate the stability of the model is under an alternative specification, which can be done by adding a control variable. In this regard we have chosen to use the capital adequacy ratio (CAR), as an important factor that may have influenced credit developments in the region. In order to account for the effect of banks' capital on credit growth we estimated the equations including the CAR. The higher the CAR, the higher the lending ability of banks; therefore, the expected sign is positive. The results are presented in Table 3 in Appendix 2. The coefficients of other independent variables do not change much with the adding of CAR to the set of independent variables, adding proof to the stability of the obtained coefficients. The results of the new regressions suggest that capital is not an important factor in the pre-crisis period (the coefficient has the opposite sign and is statistically insignificant), but becomes such after the crisis. However, the impact of CAR changes in credit growth is relatively small compared to the impact of the other variables.

6. DISCUSSION OF THE RESULTS

In the following, we decompose real credit growth in contributions from the various factors identified in our regression. The benefit of this decomposition is twofold. First, it allows for the comparison of credit drivers among different countries taken in consideration. Second, it helps the analysis of what changed after the crisis of 2008. The decomposition for the two periods is presented in Figure 5 below.



Looking at the pre-crisis period, we see that domestic deposits and economic growth are important drivers of real credit growth in all the countries. Meanwhile, foreign liabilities have fueled credit growth only in some of the countries, especially in Bulgaria, Hungary, Romania, and to lesser extent, Serbia. In some of the countries, the high presence of foreign banks has facilitated the increase of foreign borrowing of the banking system.

In the majority of the countries, the rapid credit growth has been an outcome of already low levels of credit in the economy. Countries with initially low financial depth, as measured by credit/GDP ratios, are more prone to experience higher credit growth than countries with more mature credit markets. The effect of low initial credit/GDP is particularly high for Albania, Bulgaria, Hungary, FYROM, Poland and Romania.

Surprisingly, interest rates do not seem to be very important in determining credit growth in the pre-crisis period. This suggests that credit would have picked up in most of the countries regardless of the cost of credit, driven by high demand in an environment with low financial penetration.

The NPLs have been generally low in the years prior to the 2008 crisis in most of the countries. However, in some of the banking systems in the sample, especially in FYROM and Poland, NPLs were high in 2004. During the years that followed, up to 2008, the situation improved remarkably. The decrease of credit risk and the cleaning of the banking systems' balance sheet in these countries contributed positively to credit growth in this period.

The evaluation effect of exchange rate against euro is visibly present only in the Czech Republic and Poland, in both cases with a negative effect. While the majority of the countries experienced appreciation of domestic currencies in most of the years up to 2008, this phenomenon has been more pronounced in these two countries.

In the post-crisis period, the reversal of foreign finance to the banking systems has been a major force behind the worsening performance of credit in most of the countries. This is especially the case in Bulgaria, Hungary, and Romania, the same countries where foreign borrowing of the banking system was an important driver of credit growth. Turkey, on the other hand, has benefited from high foreign borrowing of the banking system in the last four years. This is due to the fact that the Turkish economy has not been in the same downturn cycle that the other countries have been experiencing after 2008.

The other source of funding, the domestic deposits, have continued to increase in all the countries, although to a lesser extent than in the years before the crisis. In some countries, its contribution to credit growth has more than offset the withdrawal of foreign finance, as in the case of Albania, Bulgaria and Romania.

The contribution of GDP growth to credit growth is much lower than in the pre-crisis period, due to a smaller elasticity and lower average GDP growth in this period. There are also differences in the economic performance among CESEE countries. The Turkish economy was not affected much by the crisis, while the economies of Albania, Poland, and FYROM managed to recover more rapidly after the slowdown following the crisis, thus contributing positively to credit demand. In the other countries, the contribution of GDP

growth to credit growth is either positive, but small, or negative (Croatia).

The deterioration of NPLs has been another contributor to weak credit growth in the region in the years immediately after the crisis. With the exception of Turkey, the banking systems in all the other countries faced considerable deterioration of their credit portfolio. Most of them have managed to curb NPL levels to below 15%, with the exception of Albania and Serbia, where their level is still high.

The deviation of credit/GDP from its trend has affected lending after 2008. However, unlike the period before the crisis, its effect is mostly negative (with the exception of Turkey), with a stronger effect in Bulgaria, Hungary, and Poland.

Perhaps the most striking result is the large negative effect of the time dummy for the years after the Greek crisis. The overall increase in risk aversion in lending and the strategies of European banks to decrease their exposure in the region have restricted the credit supply in these countries.

Finally, the evaluation effect of euro exchange rate, as expected, is positive after 2008. With the exception of Bulgaria, Croatia, and FYROM, which have had some kind of a fixed exchange rate arrangement, almost all the other countries in the sample experienced some depreciation towards euro during this period.

7. CONCLUSIONS

The region of Central Eastern and Southeastern European (CESEE) make an interesting case study where the transition process is highly supported by the deepening of financial intermediation, with the latter being enhanced also by the participation of the West European banks in the region. Especially in the pre-crisis period the higher financing from abroad has fueled credit growth, encouraging the development of the financial sector and the European integration process of this region. The 2008 financial crisis put substantial pressure to the credit activity of the foreign

banks in the region. Especially after the Greek crisis, and with the strengthening of the European supervision standards, the CESEE region has experienced a second wave of strains associated with an economic downturn and further deleveraging. In this regard the topic about the determinants of credit growth is of special interest to understand the influence of the financial crisis as well as the current challenges for the region.

This paper aimed to elaborate in more details the factors that have influenced the credit developments in the region, contributing to the existing literature in this field. Based on Guo and Stepanyan (2011) approach, we have empirically estimated the influence of each of the fundamental factors in credit crunch in the region. The results, obtained through OLS panel data with fixed effects and estimated for the pre-crisis and post-crisis periods, have confirmed the changes in the importance of various factors that affect credit after the crisis. Our findings are broadly in line with other studies in the literature, which conclude that GDP growth, credit quality, the level of the financial intermediation together with foreign and domestic financing sources are important determinants of credit growth.

The estimated results show that credit growth after the financial crisis has been strongly held back by the withdrawal of the foreign funds from the region and the change in banks' behavior after 2011. The negative effect of the withdrawal of foreign liabilities has been balanced off to some extent by the increased role of domestic deposits in financing the lending activity. Meanwhile, the general deleveraging process and the increase of risk aversion of European banks following the Greek crisis has had its toll on credit supply, thus hampering the credit revival.

We find a low impact of lending interest rates in the period before the crisis, while its significance decreases in the post-crisis period. Even though policy makers in the region have eased the monetary conditions, other non-price lending conditions, which are important factors in stimulating credit demand, remain tighter than in the period before the crisis, thus counterbalancing the effect of low interest rates. Therefore, lending activity remains constrained upon

high uncertainties perceived, risk aversion, and low confidence from both the demand and supply sides. This suggests that policymakers in the region should also seek to reduce risk premia in the economy, by undertaking the necessary structural reforms and providing a sustainable path of economic growth.

Finally, it is worth mentioning that the degree of financial intermediation is low for most of the countries in the region. Therefore, from the demand perspective there is still room for increased lending in the future. This will require a more proactive role of banks in providing financial intermediation and in supporting the economic growth. The high CESEE banking systems' dependence on the European banks increases their vulnerability on external shocks and the parent bank deleveraging policies, having implication for the credit growth. Monetary and financial stability policies should take into consideration this structure feature of the CESEE banking sector. However, the deepening of the financial intermediation remains a crucial instrument in supporting the long run growth and the further convergence of the region to the western European countries.

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APPENDIX 1- MODEL SPECIFICATION

Table 1 Description and specification of the variables.

Variable	Description	Transformation	Source
Credit to the private sector	Credit to the private sector, deflated by CPI	Dlog	Country's Central Banks
Real GDP	4 quarters cumulative sum of real GDP	Dlog	National Institutes of Statistics
NPL	NPLs as ratio to total loans	First difference	Country's Central Banks
Domestic deposits	Domestic deposits of the banking system, deflated by CPI	Dlog, multiplied by their lagged ratio to credit	Country's Central Banks
Foreign liabilities	Foreign liabilities of the banking system, deflated by CPI	Dlog, multiplied by their lagged ratio to credit	Country's Central Banks
CPS/GDP	Nominal CPS/4Q sum of nominal GDP	Deviation from trend (calculated with HP)	Authors calculation's
National currency loan interest rate (2004Q4 – 2008Q3)	Interest rate of new loans in national currency, CPI deflated	First difference	Country's Central Banks
Foreign currency loan interest rate (2004Q4 – 2008Q3)	12m Euribor, CPI deflated	First difference	ECB; Eurostat
Composite loan interest rate (2008Q4 – 2012Q4)	Weighted interest rate for new loans in various currencies, CPI deflated	First difference	Calculated, Country's Central Banks
Exchange rate	National currency per 1 Euro	Dlog	Country's Central Banks
DUM11	0 for 2004Q4 – 2011Q3 and 1 afterwards		

Table 2. Fix effect versus random (Redundant test) for the selected periods

Period	Redundant test	Statistics	D.F	p-statistic
2002-2008	Cross-section Chi-square	78.258567	9	0.0000
2008-2016	Cross-section Chi-square	5.645214	9	0.0000
Period	Hausman test	Chi-SQ Statistics	D.F	p-statistic
2002-2008	Cross-section random	0.000000	8	1.0000
2008-2016	Cross-section random	0.000000	8	1.0000

Table 3 Estimation of coefficient changes.

Wald Test:			
Pool: 2008Q4-2016Q4			
Test Statistic	Value	df	Probability
F-statistic	25.91270	(6, 312)	0.000000
Chi-square	155.4762	6	0.000000
Null Hypothesis:			
C(2)-0.62=0, C(3)+0.79=0, C(4)-0.69=0, C(5)-0.58=0, C(6)+0.55=0, C(8)-0.17=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)	Value	Std. Err.	
-0.62 + C(2) (GDP)	-0.240829	0.102750	
0.79 + C(3) (NPL)	0.595422	0.068255	
-0.69 + C(4) (FL)	0.031001	0.073827	
-0.58 + C(5) (DEP)	-0.099484	0.054582	
0.55 + C(6) (DInt)	0.349700	0.047800	
-0.17 + C(8) (ER)	0.003368	0.022614	
Restrictions are linear in coefficients.			

APPENDIX 2 - ROBUSTNESS TEST

Table 1 Residual test for the selected periods

Variable	Common unit root Levin, Lin & Chu t^*	p-statistic	ADF -Fisher Chi-square	p-statistic	PP-Fisher Chi-square	p-statistic
First period Adjusted 2004-2008 (observation 142/150)						
RESID_ country	-11.5523	0.0000	152.23	0.0000	181.545	0.0000
Second period Adjusted 2008-2016 (observation 318/330)						
RESID_ country	-14.5149	0.0000	186.944	0.0000	203.253	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. The null hypotheses are that the residuals have a unit root. With high confidence we can reject the null hypotheses and accept that the residual of each of the model are stationary.

Table 2 Residuals feature for the selected periods⁷

First period: 2004-2008 estimation										
Residual covariance matrix										
	_AL	_BG	_CR	_CZ	_HU	_MK	_PL	_RO	_SR	_TR
_AL	0.001	(0.000)	(0.000)	0.000	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	0.000
_BG	(0.000)	0.002	(0.000)	(0.000)	0.000	0.000	0.000	(0.000)	0.000	0.000
_CR	(0.000)	(0.000)	0.000	(0.000)	(0.000)	0.000	0.000	0.000	0.000	(0.000)
_CZ	0.000	(0.000)	(0.000)	0.000	0.000	(0.000)	0.000	(0.000)	(0.000)	0.000
_HU	(0.000)	0.000	(0.000)	0.000	0.000	0.000	(0.000)	0.000	0.000	0.000
_MK	(0.000)	0.000	0.000	(0.000)	0.000	0.000	(0.000)	0.000	0.000	0.000
_PL	(0.000)	0.000	0.000	0.000	(0.000)	(0.000)	0.000	0.000	(0.000)	0.000
_RO	(0.000)	(0.000)	0.000	(0.000)	0.000	0.000	0.000	0.001	0.000	(0.000)
_SR	(0.000)	0.000	0.000	(0.000)	0.000	0.000	(0.000)	0.000	0.001	(0.000)
_TR	0.000	0.000	(0.000)	0.000	0.000	0.000	0.000	(0.000)	(0.000)	0.000
Residual correlation matrix										
	_AL	_BG	_CR	_CZ	_HU	_MK	_PL	_RO	_SR	_TR
_AL	1.00	-0.05	-0.09	0.11	-0.41	-0.38	-0.36	-0.30	-0.20	0.30
_BG	-0.05	1.00	-0.31	-0.11	0.18	0.24	0.04	-0.03	0.35	0.29
_CR	-0.09	-0.31	1.00	-0.29	-0.01	0.13	0.35	0.68	0.28	-0.10
_CZ	0.11	-0.11	-0.29	1.00	0.21	-0.02	0.04	-0.32	-0.26	0.17
_HU	-0.41	0.18	-0.01	0.21	1.00	0.67	-0.08	0.19	0.29	0.06
_MK	-0.38	0.24	0.13	-0.02	0.67	1.00	-0.01	0.44	0.13	0.02
_PL	-0.36	0.04	0.35	0.04	-0.08	-0.01	1.00	0.51	-0.04	0.15
_RO	-0.30	-0.03	0.68	-0.32	0.19	0.44	0.51	1.00	0.07	-0.09
_SR	-0.20	0.35	0.28	-0.26	0.29	0.13	-0.04	0.07	1.00	-0.22
_TR	0.30	0.29	-0.10	0.17	0.06	0.02	0.15	-0.09	-0.22	1.00
Second period: 2008-2016 estimation										
Residual covariance matrix										
	_AL	_BG	_CR	_CZ	_HU	_MK	_PL	_RO	_SR	_TR
_AL	0.000	0.000	(0.000)	(0.000)	0.000	0.000	0.000	(0.000)	0.000	(0.000)
_BG	0.000	0.000	(0.000)	(0.000)	0.000	0.000	0.000	0.000	0.000	(0.000)
_CR	(0.000)	(0.000)	0.000	(0.000)	(0.000)	0.000	0.000	0.000	0.000	(0.000)
_CZ	(0.000)	(0.000)	(0.000)	0.000	(0.000)	0.000	0.000	(0.000)	0.000	0.000
_HU	0.000	0.000	(0.000)	(0.000)	0.000	(0.000)	0.000	0.000	0.000	(0.000)
_MK	0.000	0.000	0.000	0.000	(0.000)	0.000	0.000	(0.000)	0.000	(0.000)
_PL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	(0.000)
_RO	(0.000)	0.000	0.000	(0.000)	0.000	(0.000)	0.000	0.000	(0.000)	0.000
_SR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	(0.000)	0.000	(0.000)
_TR	(0.000)	(0.000)	(0.000)	0.000	(0.000)	(0.000)	(0.000)	0.000	(0.000)	0.001
Residual correlation matrix										
	_AL	_BG	_CR	_CZ	_HU	_MK	_PL	_RO	_SR	_TR
_AL	1.00	0.40	-0.30	-0.11	0.25	0.16	0.30	-0.10	0.36	-0.10
_BG	0.40	1.00	-0.09	-0.13	0.27	0.00	0.25	0.35	0.12	-0.08
_CR	-0.30	-0.09	1.00	-0.05	-0.07	0.24	0.15	0.07	0.18	-0.03
_CZ	-0.11	-0.13	-0.05	1.00	-0.00	0.04	0.30	-0.02	0.07	0.14
_HU	0.25	0.27	-0.07	-0.00	1.00	-0.05	0.18	0.04	0.17	-0.14
_MK	0.16	0.00	0.24	0.04	-0.05	1.00	0.34	-0.13	0.06	-0.41
_PL	0.30	0.25	0.15	0.30	0.18	0.34	1.00	0.15	0.11	-0.05
_RO	-0.10	0.35	0.07	-0.02	0.04	-0.13	0.15	1.00	-0.02	0.38
_SR	0.36	0.12	0.18	0.07	0.17	0.06	0.11	-0.02	1.00	-0.03
_TR	-0.10	-0.08	-0.03	0.14	-0.14	-0.41	-0.05	0.38	-0.03	1.00

⁷ In the residuals table, each of the countries is represented by the following abbreviation: AL-Albania; BG- Bulgaria, CR-Croatia, CZ- Czech Republic, HU- Hungary, PL- Poland, RO-Romania, SR-Serbia, MK-FYROM, and TR -Turkey.

Table 3 Estimation results with CAR.

Variable	2004Q4-2008Q3			2008Q4-2016Q4		
	lag	coeff	st. error	lag	coeff	st. error
C	-	0.0192***	0.0069	-	0.0082***	0.0022
DLOG(RGDPC)	3	0.6405**	0.3222	1	0.4165***	0.1089
D(NPL)	2	-0.8808*	0.4817	2	-0.1968***	0.0665
DLOG(RFL)*WRFL(-1)	-	0.6986***	0.0878	-	0.7147***	0.0766
DLOG(RDEP)*WDEP(-1)	-	0.5819***	0.0845	-	0.4903***	0.0573
DINT	2	-0.5364***	0.1336	1	-0.1949***	0.0495
D(RLR)	3	-0.1613***	0.0530			
D(REURIBOR)	2	-0.5204*	0.2947			
D(RR_L)				3	-0.0467	0.0768
DLOG(EURO)	-	0.1662***	0.0379	-	0.1802***	0.0230
DCAR	1	-0.0984	0.1364	1	0.2196**	0.1106
Observations	160	330				
R2 adjusted	0.83	0.69				
Countries FE						
Albania		0.0551			-0.0001	
Bulgaria		-0.0201			-0.0039	
Croatia		-0.0079			-0.0035	
Czech Rep.		-0.0029			0.0016	
Hungary		-0.0213			-0.0134	
FYROM		0.0005			0.0055	
Poland		-0.0145			0.0048	
Romania		0.0127			-0.0058	
Serbia		-0.0088			0.0024	
Turkey		0.0072			0.0124	

Note: *, **, and *** show significance at 10%, 5%, and 1% respectively.

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