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Stability of CEE Banks in the Crisis Years

Capital Adequacy and Too-Big-to-Fail Parent Banks in CEE[1]

Summary

The paper analyses the factors of capital adequacy in the banking FDI of Central and East European countries by relying on the Bankscope database. The main hypothesis is that parent ownership mitigated the impacts of the financial crisis on commercial banks, as parent banks capitalized those affiliates which turned red in household and corporate lending. This type of cross-market rebalancing is tested by a regression analysis. Several different factors were identified such as the too-big-to-fail phenomenon of parent banks, the FX rate volatility, the changing monetary environment represented by a 3-month market rate, the fiscal shock caused by sector-specific taxes and the risk of debtor failures represented by proxy of non-performing ratios.

Introduction

Due to the US financial crisis and the recession in the EU, the European banking system suffered serious losses in the first decade of the new millennium. Moreover, the banking market of Central and Eastern Europe (CEE) showed a variety of individual

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impacts as a result of the multiple risks of national policy, foreign exchange and solvency. Banks in the CEE region suffered capital losses due to global and local impacts. This process put a pressure on foreign investors to rethink their strategies and either re-capitalize the losses or withdraw their direct investment from the region.

The paper analyses these capital adjustment decisions, with focus on the following factors: 1) status of the parent bank; 2) foreign exchange rate volatility in CEE countries; 3) the changing monetary environment expressed in inter-bank market rates; 4) public finance induced shocks on the banking sector by sector-specific taxes; and 5) non-performing loans (NPL) in the domestic market of operation.

The hypothesis is that too-big-to-fail (TBTF) parent ownership mitigated the impact on CEE commercial banks, as parent banks capitalized the affiliates that turned red in household and corporate lending. Accordingly, a strong cross-market rebalancing emerged in the Central and Eastern European region.

The analysis uses a multiple regression model including cyclical effects, monetary indicators, NPL ratios and a sector-specific tax dummy. The analysis demonstrates that the predominance of TBTF parent banks was a protective factor, as they ensured the necessary capital adjustments of their CEE bank affiliates.

The methodology is derived from capital buffering models and makes the regression model of the analysis. The methodological section commences with the theoretical origins of the composed estimation model, the optimal capital structure equation. Three indicators with an available database will be used to represent capital adequacy, thus testing the hypothesis in three different approaches. Finally, the empirical analysis is followed by an explanation of correlation, significance and adequacy of the database.

The empirical conclusions show that the macroeconomic and regulatory factors have an insignificant impact on the capability of CEE affiliates and branches of multinational banks, and it is almost only the financial power and investment strategy of the parent bank which matters in their capitalisation.

CEE banking and cross-border linkages

Although, in the second decade of the 21st century, the CEE commercial banking sector operates in market economies as usual, the region has a legacy of the command economy that lasted up to 1989. Benczes (2008) summed up the impacts of the past on the banking sector, which was privatised relatively recently, transformed into a kind of two-tier system and opened up to foreign investors, who then became majority owners in the undercapitalized transition region. Besides, CEE markets are characterized by small scales, low financial penetration and low product diversification. These resulted in peculiar features regarding the vulnerability and stability of the CEE banking sector (Benczes, 2008, pp. 128-138).

The small and fragmented market in CEE is not only due to the region's geographical and political fragmentation, but also to the differences between the national financial and fiscal-monetary policy mixes and strategies. Sovereign risks and interest

rate policies affect the structure of loans and deposits differently. Before the global and the euro crisis, all CEE countries had national monetary autonomies. Some of them chose the strategy to pass it to the European Central Bank as soon as possible (Slovenia, Slovakia, Estonia and Latvia), or are planning to do so (Bulgaria, Romania and Lithuania), while others have been making efforts to preserve the national currency (Czech Republic, Poland and Hungary). Certain monetary authorities apply strict and high interest rates, some do not. In the eve of the crisis certain countries had higher foreign reserves, others had lower, etc. These policy differences modified and differentiated the credit and deposit structure of the countries. According to Lentner's (2015a) details and analysis of this process, foreign currency loans were spread by policy incentives. Due to the differences between the various national risk premium and interest rate policies, in the countries (Hungary, Baltic states, Romania, and the Ukraine) which retained high rates while also giving opportunity to foreign currency loans, the depreciation caused by the global panic in the emerging market currencies hit households and firms indebted in euro, Swiss franc or other foreign currencies. The solution for meeting the challenge of foreign currency indebtedness is described, among others, by Lentner's case study (2015b). On the other hand, the countries which kept their risk premium close or below the euro area market rates were only slightly exposed to foreign exchange risks related to loans.

Árvai et al. (2009) focused on cross-border interbank spill-overs between Western and Eastern Europe. They recognized an asymmetric dependency of CEE countries on Western European banks, as banking contagion is determined (mitigated) to a major extent by multinational banks. The measured exposure of Western (except for Austrian and Swedish) banks is low. The historical market share figures of foreign banks clearly show that foreign ownership is predominant in the CEE region, considerably beyond 50%, everywhere except Slovenia. Foreign ownership share is important for two reasons: on one hand, strong ties with multinational banking provides indirect channels to one another in the CEE region through the common lender parent bank; and on the other, the relatively big multinational banks mitigated and prevented the mass failure of CEE banking sectors as these TNCs had the liquidity to refund banks for their equity lost and guarantee the deposits left uncovered by the increasing amount of non-performing loans.

Theoretical background and the reasonableness of regressors

Moshirian (2008, p. 2291) concludes that FDI was an "important vehicle for multinational banks to enter developing countries". He diagnoses that the European financial integration and the emergence of large multinational banks started a new era in the competition and consolidation of banks. His assumes that the home country bias becomes much smaller in an integrated sectoral environment.

First of all, it should be clarified why banks invest in a foreign country.[2] Berger et al. (2001) assume a global advantage of multinational banks in comparison to domestic

banks, as multinationals have access to better technology to evaluate and monitor the risks and better practices to treat moral hazard. According to Goldberg and Saunders (1981), Brealey and Kaplanis (1996), Konopielko (1999), Buch (2000), Moshirian (2001) and Williams (2002), banks follow their customers. Others (Claessens et al., 2001; Hymer, 1979) are of the view that banks seek efficiency and higher profitability, which can be achieved by extending the market or the number of foreign customers. Lesnik and Haan (2002) measured a strong positive correlation between the liberalisation of the banking market and the banking FDI moving into developing, transiting countries. Claessens et al. (2001) modelled tax advantages sought by foreign banks.

In their studies on CEE and other post-Soviet European countries, Papi and Revoltella (2000), and Mathieson and Roldòs (2001) came to the conclusion that return on equity (ROE), the NPL ratio, the attitude of the host country's authorities and the liberalisation of entry regulations were the most significant factors of attractiveness. Naaborg (2007), however, found that several studies in the literature contradicted each other regarding the link between efficiency and foreign ownership. Horen (2007) analysed whether it matters if the host and home countries of banking FDI are developed or emerging ones when it comes to location decisions. Based on location-related knowledge, he found that banks from developing countries are more important in other developing national banking markets.

Although this paper seeks evidence for the capability of multinational affiliates to resist crises, one must keep in mind the statement made by Eller et al. (2006, p. 302), namely that "foreignness" does not automatically guarantee higher efficiency and competitiveness, and thus a higher economic growth multiplier. The current hypothesis, however, does not concern cost efficiency but liquidity guaranteed by the TBTF nature of parents to avoid bank failure.

The market-seeking activities of multinational banks in CEE countries resulted in predominant oligopolies in the regional banking market, backed by large banks considered to be too big to fail. In Stern and Feldman's (2009) explanation, the TBTF phenomenon implies that political decision-makers bail out big banks in the case of a failure, because they fear an extended banking crisis and a sudden stop in lending, which may trigger general economic depression. TBTF parent banks are important factors in the re-capitalisation of the CEE banking sector, as the losses were ultimately backed by the parent banks' home governments. Being a TBTF bank means it can suffer any degree of loss, their home government will save them, and that is why they can reserve their capability to re-capitalize their affiliated CEE banks with net losses.

Which banks can be considered as TBTF? Stern and Feldman (2009, p. 12) define the term as banks that "play an important role in a country's financial system and its economic performance". Apart from the bank's size, its share in payments and securities transactions also matters. This makes a bank ingrained in the economy, as market actors can assume with certainty that the government will save it in the case of a failure.

Borio (2009) and Rixtel and Gasperini (2013) explain the importance of the economic crisis on the funding of banks. In their view, the crisis increased the ratio of

non-performing loans rapidly reduced the prices of financial assets. This trend deteriorated the corporate value of banks, and is important for two reasons. First, parent banks can also be affected by toxic assets and non-performing loans in their domestic markets, as shown by Rixtel and Gasperini (2013, pp. 4, 7), who also demonstrated the impact of the crisis on the 3-month LIBOR, bank credit default swaps (CDS), and the permanent relative devaluation of global bank stock indices since 2008. This can reduce the parent banks' financial capacity to refund CEE affiliates losing equity. However, it is offset by the TBTF nature of the parent banks and their bail-out. Second, the opposite shock through the intra-bank channel includes the case when the value of the affiliates is reduced by the consequences of the crisis, and the parent banks must raise funds to make their contribution to equity so that the affiliates can meet the capital requirements.

Fluctuations in foreign exchange (FX) rates may also have significant impacts. As, referring to the results of Froot and Stein's (1991) model, Ushijima (2008, p. 293) states: "the limited access to external capital due to informational frictions renders FDI sensitive to foreign exchange rate... This is because appreciations of the home currency increase firms' net worth or internal funds in terms of foreign currencies, enabling them to outbid foreign rivals in acquiring information-intensive overseas assets." The composition of FX loans and the volatility of the FX rate can have an impact on assets and the equity of banks. Needless to say, clearly there is a degree of correlation between the NPL ratio and the FX rate. An increasing default risk was manifested in CEE due to the depreciation of national currencies, and the increasing risk premium of insurance against credit default swaps (CDS). The combined effects of recession in CEE economies, the liquidation of companies and the termination of jobs, declining wages in manufacturing and the depreciation of the value of the real estate stock as a guarantor of loans resulted in the depreciation of the credit stock. Part of the collateral value behind bank loans disappeared due to the recession of the real economy.

In addition, monetary policies changed significantly due to the global crisis, not only in the Federal Reserve, but also in CEE and the Euroregion. Central bank rate cuts, increased money supply, innovative central bank interventions (e.g. two-week central bank bonds), etc. appeared.

In the event of an economic crisis, new sources are required to increase the budget revenue, especially if the government is compelled to exercise fiscal discipline due to an unsustainable public debt and the consequent increased credit risk premium, or if there is shortage of credit on the capital markets. The banking sector can become tempting for the government, since banks work with money. In the CEE region, banking taxes and taxes on financial transfers have been in effect since 2010. For example, the Hungarian government levied taxes on banks' turnover and transfer services in a very innovative manner, thus setting an example for Poland and other countries. In addition, the Hungarian government limited the banks' opportunity to shift this burden on the customers. The new taxes were imposed on a temporary basis, with reference to the crisis, but they eventually became a permanent component of the public

budget. Such tax shocks confirm the assumption that equity restoration is particularly related to losses from tax liabilities. In the literature, DeAngelo and Masulis (1980) assume that an optimum capital structure is achieved if the marginal tax advantages and marginal disadvantages of bankruptcy are equal. Stolz (2007, p. 22) translates this to banking capital structure as a trade-off between "tax advantages of deposit financing and leverage related cost… due to the reserve requirements". Hungary imposed a high bank tax on turnovers in 2011, but a lower rate had already existed since 2009. Slovenia levied a bank tax after August 2011. Slovakia imposed a one-time tax in 2012, but, not surprisingly, this turned out to be permanent in 2013 in a modified form. Poland imposed the bank tax in 2014. In the rest of the CEE countries bank tax had only existed in theory (e.g. Croatia, Romania and Bulgaria) or had not been part of the government's taxation plans at all (e.g. Estonia, Latvia, Lithuania and the Czech Republic) before 2014.

Non-performing loans are a significant factor in banks' assets and equity. The NPL ratio reduces a bank's lending capacity via provisions. The assumption of the analysis is that an increasing NPL ratio forces the bank to decide whether it wants to keep its lending capacity with a capital increase or change the lending strategy and accept the reduced capacity.

Regression analysis is based on the following methodological background: the analysis of capital adjustment of banks in specific circumstances, defined in the introduction, ought to be based on the literature of the optimal capital structure. Stolz (2007) surveys the change of capital buffers accumulated by banks in the case of the required charter value, reserve rate and minimum capital which try to prevent bank failures. This approach helps us develop the methodology along regulatory aspects. Stolz (2007, p. 13) defines the purpose of regulation as follows: "The traditional banking literature… has identified a moral hazard problem at banks, as depositors, the largest source of funds, are likely to be unable and/or unwilling to monitor banks' investment strategies. This irresponsiveness of funding costs to banks' risks gives rise to moral hazard behaviour on the part of banks: banks have an incentive to decrease capital-to-asset ratios and to increase asset risk, thereby increasing their probability of default and extracting wealth from deposit insurance system. Hence, regulation has to set minimum capital requirements, thereby forcing banks to hold more capital and, thus, placing more of their own funds at risk."

She refers to the conclusion drawn by Merton (1978), which states that banks maintain their reserves above the required minimum and the charter value to have a buffer for any unexpected case. However, regulation can cause moral hazard if the total of the regulatory minimum capital requirement and the buffer exceed the book value. In this case, banks start to pay dividends from earnings instead of accumulating a buffer. Their "risk-loving and gambling for resurrection" strategy increases the moral hazard in the banking sector and makes the failure and contagion more likely. Based on this phenomenon, the Basel III regulation, which increased the capital requirements, can result in the increasing need for re-capitalisation and/or for bail-out in the banking sector. This conclusion is confirmed by Gennotte and Pyle (1991), who

established that the capital minimum increases the risk of bank failure. In the earlier version of the Basel Standards, Berger and Udell (1994) as well as Peek and Rosenberg (1995) analysed the moral hazard of stricter regulations. Maurin and Toivanen (2012) also analysed the capital buffer. They also concluded that banks operate above the minimum capital requirements.

Hanson et al. (2011) and Kok and Schepens (2013, pp. 6-7) studied the risk that, if banks reduce their assets, their lending activity must be suppressed, which has an adverse impact on non-financial investment and consumption, and generates depression. In addition, decline in assets means less securities in the banks' portfolio. In addition, crises may reduce banks' balance sheets and cut their equity instead of a capital increase. Special taxes on banking turnover or asset values have impacts similar to crises or to tightening regulatory measures. The authors refer to Lemmon et al. (2008), Flannery and Rangan (2006), Berger et al. (2008), and to Gropp and Heider (2009), who examined the determinants of the optimum amount of bank capital and the speed of related capital adjustment. They emphasised that sometimes market implications overwrite or exceeds the regulation, and so the regulation will have no effect. On this basis, Gropp and Heider (2009) distinguish binding and non-binding capital requirements.

The dynamic analysis of banks'capital adjustment to specific circumstances (detailed above) may be based on the literature of the optimal capital structure. Specifically, the current regression analysis is based on the methodological ideas of Stolz (2007) and Kok and Schepens (2013). These models introduce the following dynamic function:

$$K^*_{i,t} = \beta\, X_{i,\,t\text{-}1}\,, \qquad\qquad\qquad\qquad\qquad (1)$$

where $K^*_{i,t}$ is the bank-specific, time-varying optimal capital ratio in the dynamic model, and $X_{i,\,t\text{-}1}$ is the vector of bank-specific variables. The index i is the indicator of the bank and t is for the year.

Adjustment is measured as a difference between the optimal ratios of two periods:

$$K_{i,t} - K_{i,t\text{-}1} = \lambda\,(K^*_{i,t} - K_{i,t\text{-}1}) + Regular_{i,t}\,, \qquad\qquad (2)$$

where $K_{i,t}$ and $K_{i,t\text{-}1}$ are the effective capital ratios, and λ is the speed of adjustment to the optimal ratio. A low value of λ implies a passive capital management by banks. $\varepsilon_{i,t}$ is the residual. The projection of capital adjustment can be given as follows:

$$K_{i,t} = \lambda\,(\beta\, X_{i,\,t\text{-}1}) + (1-\lambda)\,K_{i,t\text{-}1} + e_{i,t}\,, \qquad\qquad 0 < \lambda < 1. \qquad (3)$$

The t and 1 indicators highlight the dependency of the capital ratio on the ratio of the previous period, thus making the model dynamic.

Methodology

The current focus is on the level of protection enjoyed by banks in the region or the degree of their vulnerability in terms of capital adequacy. The data is taken from the Bankscope database a comprehensive, global database of banks' financial statements. It contains the balances, financial reports and specific rating data of banks in CEE countries.[3]

The baseline model is represented by the following equation:

$$K_{i,t} = \beta_0 + \beta_1 K_{i,t-1} + \beta_2 FX_t + \beta_3 RATE_t + \beta_4 NPL_t + \beta_5 D_{parent-TBTF,t} + \beta_6 D_{Tax,t}, \quad (4)$$

In equation (4), K is the capital adequacy indicator. FX is the standardized relative index of the annual nominal exchange rate in comparison to 2007, in euro, to the national currency, calculated as follows:

$$FX = 1 + (FX_i - FX_{2007})/FX_{2007} \qquad (5)$$

The calculation in equation (5) is necessary because first of all, the FX rates of national currencies to the euro are very different in terms of digits, requiring a common denominator. Second, banks work with a nominal volume of money and therefore the change in the nominal FX rates can significantly modify the net earnings and the value of assets, equity and liabilities. The FX rates are values at the end of the period (year). The benchmark is 2007, as the depreciation of CEE national currencies started at the end of the third quarter of 2008.

RATE is the national, annual data of a 3-month money market interest rate calculated by Eurostat. As economic cyclicality is included in the model with both the money market rate and the capital indicator of the previous period. To avoid excessive complexity and multicollinearity in monetary indicators, the three-month market interest rate is the only monetary variable included in the regression analysis as a proxy for all money market and monetary policy processes.

NPL is the ratio of non-performing loans. In this analysis, its proxy is the Loan Loss Reserves / Gross Loan (LLRGL) ratio, which provides provisions against NPLs.[4] The regression model contains a dummy $D_{parent-TBTF}$ for the parent bank's position as a TBTF. Its value is 1 if the parent is TBTF and 0 otherwise. In this study the TBTF dummy is 1 if either of the following conditions apply:

1) the parent bank is among the 250 largest European banks;

2) the parent bank is among the 10 largest banks of its country of residence;

3) the parent bank is among the 30 largest banks of its residence country if this country is Germany, Austria, France, Italy, USA, Japan, China, Netherlands, UK and Russia, as these countries have a large concentration of banks and are significant investors in the region;

4) the parent bank is in state ownership;

5) the parent bank is backed by a car manufacturing holding (e.g. VW/Porsche, Renault Fiat, etc.).

In any other case, the value of the dummy is 0.

The above-mentioned trade-off between tax advantages of deposit financing and leverage cost is represented by D_{Tax}, which is the dummy of national sector-specific taxes on banks, which is 1 if a bank tax is in effect. This way the model can distinguish years with and without a sector-specific tax in place.

As the two dummies reflect different aspects, it is important not to fall into the *dummy variable trap* (Gujarati and Porter, 2009, p. 281). Attention must also be paid to multicollinearity between the NPL ratio and the *FX* ratio. The depreciation of the national currency affects the NPL ratio in countries significantly indebted in FX credits, as discussed above. The model does not contain direct GDP growth indicators to

eliminate any further multicollinearity, as the money market rate, the NPL ratio and $K_{i,t-1}$ already represent cyclical effects.

As in light of the regressors, regression focuses on the correlation between the development of capital adequacy the model uses three Bankscope indicators for the adequacy of banking capital:

1) the TIER1 ratio, which expresses a banking firm's core equity capital as a percentage of its total risk-weighted assets;

2) the Total Capital Ratio (TCR), which is a synonym for the Capital Adequacy Ratio and is calculated as follows: (Tier 1 capital + Tier 2 capital) / total risk-weighted assets;

3) the Equity to Total Assets ratio (ETA).

The regression uses data for the period between 2009 and 2014. The geographical range is the eleven CEE EU member states, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Although there are 379 CEE banks registered in Bankscope, only 290 of these had data for LLRGL and only 167 banks had TCR and ETA data for all of the years of the analysed period. The data are annual ones, since the quarterly breakdown has been very deficient.

With three ways of operationalizing the dependent variable, the specific regression functions are the following:

$$TIER1_{i,t} = \beta_0 + \beta_1\, TIER1_{i,t-1} + \beta_2\, FX_t + \beta_3\, RATE_t + \beta_4\, LLRGL_{i,t} + \beta_5\, D_{parent\text{-}TBTF,\, i,t} + \beta_6\, D_{Tax,t}, \quad (6)$$

$$TCR_{i,t} = \beta_0 + \beta_1\, TCR_{i,t-1} + \beta_2\, FX_t + \beta_3\, RATE_t + \beta_4\, LLRGL_{i,t} + \beta_5\, D_{parent\text{-}TBTF,\, i,t} + \beta_6\, D_{Tax,t}, \quad (7)$$

$$ETA_{i,t} = \beta_0 + \beta_1\, ETA_{i,t-1} + \beta_2\, FX_t + \beta_3\, RATE_t + \beta_4\, LLRGL_{i,t} + \beta_5\, D_{parent\text{-}TBTF,\, i,t} + \beta_6\, D_{Tax,t}, \quad (8)$$

Data for FX and interest rates were downloaded from Eurostat. The banks' ratios (TIER1, TCR, ETA, LLRGL) and the parent banks' TBTF phenomenon were collected on-line from Bankscope. Information on bank-specific taxes was collected from the business press.

Analysis and results

The regression was run using OLS with the stepwise method which mode can fine tune the relevant regressors and excluded the insignificant ones. The overall results of the analysis are summed up in Table 1, which shows a high degree of fit with R^2 values around 0.78-0.8 The F-test results are highly significant and verify that the composition of regressors influence the three capital adequacy ratios. The Durbin-Watson test, which measures the autocorrelation of residuals, indicates that the results are over the upper bound.

Based on an analysis of multicollinearity, regressors are independent from each other. Table 2 shows that the values for the variance inflation factor and tolerance are very low, which means that most of the regressors do not actually influence one another. Numbers in bold indicate moderate cases of covariance. An examination of the detailed correlation and covariance results reveals that collinearity is only strong between the interest rate and the foreign exchange rate (correlation was measured around -0.5 and -0.55), as logically follows and expected from the interest rate parity theory. Besides, the

collinearities between the exchange rate and LLRGL, on the one hand, and between the interest rate and LLRGL, on the other, are worth mentioning (with a correlation around -0.2 to -0.24). As mentioned above, this was expected. However, multicollinearity does not invalidate the regression analysis, as the number of observations is sufficiently large for the estimator to be able to make a difference between the variables.

Table 1: Model summary

	adjusted R²	F-test	Durbin-Watson	Significance	Number of observations (residual degree of freedom)
TIER	0.788	609	2.018	***	492 (489)
TCR	0.741	726.991	1.972	***	766 (763)
ETA	0.798	1156.295	1.987	***	879 (876)

*Note: *** denote significance at 1%.*
Source: The author's calculations

Table 2: Collinearity indicators

	TIER		TCR		ETA	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
LLRGL	0.891	1.122	0.92	1.087	0.915	1.093
Lagged dependent variable	0.963	1.038	**0.685**	**1.46**	**0.703**	**1.422**
FX index	**0.671**	**1.49**	0.962	1.039	0.944	1.059
$D_{parent-TBTF}$	0.979	1.021	0.95	1.052	0.950	1.053
D_{Tax}	0.947	1.056	0.698	1.432	0.719	1.39
RATE	**0.67**	**1.492**	0.997	1.003	0.984	1.016

Source: The author's calculations using SPSS, entry mode

The results for the individual regressors are summed up in Table 3. The most important variable explaining capital adequacy is its value in the preceding period (t-1). This is an obvious conclusion, as financial or capital stocks are highly determined by their past. It is more interesting that if the dummy is in a TBTF parent's ownership, it is positive and significant in all cases of capital adequacy ratios and both methods. In the cases of TCR and ETA, TBTF is significant at the 1% threshold, or in the case of TIER1, at 5%. Thus, this regressor remains included in the stepwise method in the functions of all capital adequacy variables. This leads to the conclusion that the characteristics of bank owners in the CEE region have a positive influence on the capital adequacy ratio.

As for the rest of the variables, LLRGL is insignificant in the cases of TIER1 and TCR. It only has a significant influence on ETA, which is expected as the LLRGL provisions directly modify the value of the equity. The FX index is completely irrelevant in the determination of the three measures of the dependent variable. The effect of the

banking tax is negative, as expected in most specifications, and its impact is comparable to the TBTF owner phenomenon. However, it is not so highly significant. The market interest rate is only significant in the case of a TCR, calculated with the stepwise method.

Only the t-1 value of the dependent variable and the TBTF parent dummy were included in all three capital adequacy regressions at a 5% significance level. The strange phenomenon is that the third regressor included is always different in the three functions. This is explained by the considerable differences in the number of observations, due to data availability. Concerning the value of the constant, ETA has a very low value, which indicates that the composed regressors cover the explanation of the dependent variable very well.[5]

Table 3: Results of the regression analysis

	TIER	TCR	ETA
constant	3.908 (0.609) ***	4.61 (0.479) ***	1.024 (0.367) ***
lagged dependent variable	0.883 (0.017) ***	0.857 (0.015) ***	0.893 (0.015) ***
LLRGL	excluded	excluded	−0.069 (0.023)***
FX index	excluded	excluded	excluded
$D_{parent-TBTF}$	0.052 (0.604) **	0.064 (0.451) ***	0.058 (0.328) ***
D_{Tax}	−0.05 (0.57) **	excluded	excluded
RATE	excluded	−0.037 (0.076) **	excluded
N	492	766	879

Note: Standardized coefficients and standard errors are in parenthesis. *, **, *** denote significance at 10%, 5%, and 1% respectively. "Excluded" means that the variable does not meet the 5% significance expectation of the stepwise method.
Source: The author's calculations using SPSS

Conclusions

This study analyses the determinants of capital adequacy in CEE banks. Several potential determinants are identified, such as the TBTF phenomenon of parent banks, the FX rate volatility, a changing monetary environment represented by a 3-month market rate, fiscal shocks due to sector-specific taxes, and the risk of debtor failure, represented by loan loss reserves to the gross loan ratio. Using the insights of the capital adjustment theory, a regression model is built up to explain capital adjustment.

It is assumed that ownership by a TBTF parent moderated the impact of the crisis in CEE commercial banks, as the parent banks recapitalized their affiliates which had

turned red with regard to household and corporate lending. This type of cross-market rebalancing was confirmed by the regression analysis, which concluded that the parent bank being TBTF or multinational matters in capital adequacy in the CEE region.

By regressing three different capital adequacy indicators of the CEE banks, it is possible to draw insights on several determinants. First, multinational banks have been instrumental in maintaining capital adequacy and the lending capacity in the CEE region. In the case of all three capital adequacy indicators, the TBTF parent indicator was significant. The TBTF parent banks' topping up the capital of CEE subsidiaries was crucial in the maintenance of financing capacity during the financial crisis, characterized by increasing defaults on loans. Second, clear conclusions also emerge on other potential determinants. The indicator of NPLs (LLRGL) and the proxy for monetary policy (the market rate) had no significant impact on the risk-weighted capital adequacy ratios (TIER1 and TCR). This is in contrast with the sector-specific tax, which had a significant adverse impact on these ratios and thus deteriorated the lending capacity.

The empirical results are explained through macroeconomic and regulatory factors, which have a limited impact on the capacity of CEE affiliates and branches of multinational banks, and the single factors that matter in their capitalisation are the financial muscle and investment strategy of the parent bank. These factors seem to overwrite the default risk of NPLs and previous insights on regional monetary transmission. This is especially obvious in the CEE business environment, where the banking market is predominated by affiliates in multinational ownership.

Notes

[1]   The work was created in commission of the National University of Public Services under the priority project KÖFOP-2.1.2-VEKOP-15-2016-00001.

[2]   For a full summary of the literature, see Bol et al., 2002.

[3]   Some aspects must be mentioned about the database. Although the global crisis and defaulting domestic debtors have made the CEE banking sector unattractive for investors, some changes have nevertheless been initiated in the ownership structure of banks to alter their foreign/domestic characteristics. In the database, such changes are taken into consideration and are registered dynamically. The CEE banks that have shares publicly traded on the stock exchange and thus numerous foreign institutional or private investors with low ownership percentages, but no foreign investors with a significant leverage (minimum 25% ownership), are classified as domestic banks in their countries of residence (such as OTP in Hungary, or PKO Bank or Getin Noble Bank in Poland). The rationale behind this decision is that foreign portfolio investments are made through the trade of existing shares on the stock exchange and not via initial public offering. The incompleteness of Bankscope made it necessary to chase the owner of some CEE banks, as many of these are owned through intermediaries and the geographical source of FDI is not always clear, such as in the case of CEE banks with Italian owners. In many cases, the Bankscope database was complemented with national banking data (where available). All things considered, the ultimate owners' residence was taken into account. For example, many CEE banks are directly owned by Unicredit Bank Austria, which has Austrian residency, but the ultimate owner, Unicredit, is resident in Italy.

[4]   Although there is a specific indicator for the NPL ratio in the Bankscope, i.e. the NCO/average gross loans, the database is very deficient when it comes to CEE banks.

[5]   As the averages of the three dependent variables are close to one another (TIER = 15.59, TCR = 17.46, ETA = 11.77), their constants are comparable.

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