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Role of Foreign Capital in Stability of Banking Sectors in CESEE Countries*

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Abstract

We investigate whether foreign ownership in the banking sector is a key determinant of its stability in Central, Eastern and South-Eastern European (CESEE) countries, as there is no consensus in the current literature on emerging markets. To this end, we introduce a financial strength index (FSI) as a proxy for financial stability. We used binary regressions for both pooled and panel data to model bank- and country-level data for 20 CESEE countries from 1995 to 2014. Our findings indicate that there is no significant direct link between the share of foreign-owned banks and stability in CESEE banking sectors; instead, financial stability is dependent on banks' credit policies and their balance sheet structures, irrespective of the type of ownership. We argue that positive macroeconomic development drives financial stability in CESEE countries, increases penetration by foreign banks and encourages them to expand through the pursuit of aggressive credit policies. Such policies, rather than the share of foreign capital per se, may have negative impacts on financial stability, exacerbating boom–bust cycles.

1. Introduction

The banking sectors in Central, Eastern and South-Eastern European (CESEE) countries are bank based and dominated by foreign, mostly EU-headquartered, banks. The share of foreign-owned banks in CESEE countries, on average, equals three-fourths of total banking sector assets (as of the end of 2014). The rapid increase in foreign bank entry before the global financial crisis 2007+ (GFC) was associated with dynamic lending growth and a gradual increase in competition; however, it did not spark strong growth in the size of the banking systems in CESEE countries. During the GFC, most CESEE countries were not directly affected by the instability of the more advanced economies; instead, there were only isolated cases of banking problems. Prior to the GFC, a high share of foreign capital was largely considered a 'blessing' for CESEE countries, since such investments typically brought expertise

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and more advanced risk management systems from home countries (i.e. the countries of foreign investors) and accelerated the development of host (i.e. CESEE countries) banking systems. However, the widespread financial difficulties and deleveraging of banks in advanced economies during the GFC cast doubt over the stabilising role of foreign capital.

According to Impavido et al. (2013), before the GFC, the CESEE region was characterised by strong aggregate credit growth (as a result of, for example, the convergence process), which was mainly fuelled by capital inflows and led to rapid growth while also causing the accumulation of internal and external imbalances. These imbalances constituted systemic risks and included excessive credit growth (with a mounting stock of FX loans, especially in Latvia, Lithuania, Hungary, Romania and Bulgaria), overheated economies and widening of current account deficits. The standard economic policy measures at the national level were largely ineffective. Yet banks in CESEE did not go through the financial crisis homogeneously (Bonin et al. 2014). Banks in the Czech Republic, Poland and Slovakia remained largely stable during the crisis, but Hungary, for example, was vulnerable due to a sizable fiscal deficit and reliance on external financing. The impact of deleveraging of foreign banks in the region was eased by the Vienna Initiative, which coordinated the process between respective stakeholders. Just before the GFC, banking sectors in CESEE countries were characterised by relatively higher profitability, high quality but declining capital adequacy and an eroding liquidity position. These conditions and imbalances improved somewhat after the GFC, as credit growth has stabilised and deleveraging by systemically important parent banks has become less intense.

In this paper, we explore how foreign-owned banks have driven the stability of banking sectors in CESEE countries. For this purpose, we introduce a financial strength index (FSI) as a proxy for banking sector stability, using both bank- and country-level data for 20 CESEE countries between 1995 and 2014. Next, we test the extent to which the financial stability of CESEE banking sectors is dependent on macroeconomic situation, banking sector development, credit policies and safety net characteristics to determine what role foreign capital plays in the host country's financial stability.

Our contribution to the literature is twofold. First, unlike many single-country studies, we run a cross-country analysis of financial stability for 20 of the CESEE countries. To the best of our knowledge, no such analysis has been conducted before. Second, in addition to applying the FSI, we control for the effects of financial safety nets by introducing appropriate variables and providing evidence of their impact on the strength of the banking sector. We find that foreign capital in the banking sector is not directly a key determinant of banking sector stability. Our results show that financial stability is more dependent on credit lending policies, irrespective of who owns the bank.

The structure of the paper is as follows. In Section 2, we review the relevant literature on the importance of foreign capital to financial stability and empirical attempts to construct financial stability (or financial strength) indices. In Section 3, we describe the data and the methodology used. In Section 4, we present our empirical results and a discussion. Section 5 discusses policy implications and draws conclusions.

2. Literature Review

Our paper is related to two streams of research: the first assesses the impact of foreign capital on banking sector stability, and the second focuses on development of an aggregated measure of financial strength. We attempt to bridge these two approaches by measuring the impact of foreign-owned banks on financial stability, as approximated by the FSI.

Only a few studies explicitly focus on modelling the impact of foreign-owned banks on bank risk and financial stability in host countries (e.g. Barth et al., 2004; Yeyati and Micco, 2007; Hsieh et al., 2013). Most of these studies either cover the impact of foreign banks on particular countries (or regions) or examine countries at different levels of economic development. Our research fits into the second group, as we try to gauge the impact of foreign banks (mostly from the Eurozone) on the CESEE region.

A great majority of studies analyse the period before the GFC (e.g. Lee et al., 2012; Hassan et al., 2012; Ghosh, 2012; Buch et al., 2013), while only a few take post-2007 data into account (e.g. Hsieh et al., 2013; Bremus and Buch, 2015; Stremmel and Zsámboki, 2015). The scarcity of studies on the post-crisis period creates a need to verify whether the pre-crisis view of the role of foreign banks has changed. This is of particular importance in the context of the significant retrenchment and deleveraging of banks from home countries during the GFC, and our study attempts to fill this gap.

Increased activity from foreign banks is a result of financial globalisation, and it has both positive and negative effects. Bremus and Buch (2015) argue that low financial openness shielded economies from contagion from abroad but at the same time, closed economies may experience higher macroeconomic volatility due to less transnational risk sharing. According to Demirgüç-Kunt et al. (1998), foreign banks may—especially during periods of stress—stimulate capital outflows, support flight to quality, bust asset bubbles and retrench to home countries, ultimately deleveraging in host countries. On the contrary, according to the IMF (2015), foreign-owned subsidiaries tend to behave in a less pro-cyclical manner than host countries' domestic banks during times of domestic crises. Therefore, the impact of foreign capital on the banking sector remains ambiguous.

There is pre-GFC evidence that foreign banks have a positive impact on the stability of banking sectors in host countries, leading to lower bank risk proxies (e.g. Choi and Hasan, 2005) and a reduction in the incidence of crisis (Demirgüç-Kunt et al., 1998). Stremmel and Zsámboki (2015) challenge this view, arguing that significant presence of foreign-owned banks actually magnifies the amplitude of the financial cycle. The important caveat is that while foreign banks tend to reduce fragility as they enter the market, they often do not have this effect when expanding their existing market share.

The positive effects of foreign-owned banks are due to several reasons, the main ones being their impact on non-performing loans (NPLs) and higher efficiency. Ghosh (2012) argues that foreign bank penetration enhances asset quality (lowers NPLs) because it compels domestic banks to improve their credit scoring models. According to Hasan and Marton (2003) in the case of Hungary, and Weill (2003) in the case of Czech Republic and Poland, involvement of foreign capital leads to

improvements in efficiency compared to domestic banks. The higher efficiency of foreign banks (as a result of privatization) is also confirmed in transition CESEE countries by Bonin et al. (2005a, 2005b) and in China by Berger et al. (2009). Foreign banks also implement more rigorous provisioning standards, which results in higher risk-based capital ratios than those typical of domestic banks (Crystal et al., 2001). Using panel data from 89 countries, Detragiache et al. (2008) provide evidence that a positive impact on bank risk may result from foreign banks having less risky loan portfolios than domestic banks (the 'cream-skimming effect' of foreign banks). Foreign owners also enable the diversification of liquidity risk and the absorption of domestic liquidity shocks through internal capital markets in the presence of idiosyncratic shocks (Barba Navaretti et al., 2011).

On the other hand, several studies also point out the negative effects of foreign banks, which have higher risk profiles. Correa (2008) shows that, when acquired by a foreign bank, a target bank's performance does not improve in the short run. According to Hassan et al. (2012), greater foreign bank presence can be associated with higher loan loss provisions, which might be a sign of either prudent risk management or lower credit portfolio quality. Unite and Sullivan (2003) find that loan loss provisions increased after numerous entries of foreign banks, as domestic banks were being squeezed out of the credit market by their foreign competitors. Further, Yeyati and Micco (2007) argue that an increase in foreign ownership leads to lower competition in the banking sector and an increase in bank risk, as foreign banks have a more risky profiles than domestic banks, which is also confirmed by De Nicolò and Loukoianova (2007). An increase in bank risk by foreign-owned banks is also observed by Angkinand and Wihlborg (2010), who show that foreign ownership reduces the Z-score, thus inducing higher risk-taking in the banking sector in countries without high explicit deposit insurance coverage.

The literature uses several common proxies of bank risk. They are, among others, the Z-Score[1] (e.g. De Nicolò and Loukoianova, 2007; Yeyati and Micco, 2007; Angkinand and Wihlborg, 2010; Buch et al., 2013; Hsieh et al., 2013), changes in bank ratings (e.g. Crystal et al., 2001; Pasiouras et al., 2006) and NPLs and loan loss provisions (in terms of their nominal or relative levels). However, several studies have also attempted to create an aggregate financial strength (or stability) index.

An FSI can be helpful in describing the current condition of the banking system (and other financial sectors) and in justifying policy actions. A detailed comparison of composite FSIs by Gadanecz and Jayaram (2009) concludes that research in this domain is still in the early stages of development. However, as there is no uniform definition of financial stability, its operationalisation is often based on a wide set of ratios rather than on an aggregated index (Schinasi, 2006). Although aggregated indices began to appear in the literature at the beginning of the twenty-first century, there is still no universal or widely accepted methodology.

There are two main approaches to building an aggregated FSI. The first is based primarily on financial market data and is used when depicting the condition of the financial system in the US and other advanced economies, where financial

[1] Z-Score is a simple measure of risk associated with an individual bank's condition; it reflects the bank's probability of insolvency. It is usually computed as a sum of return on assets (ROA) and equity capital to total assets over the standard deviation of ROA (see Lepetit and Strobel, 2013; 2015).

markets are well developed (e.g. van den End, 2006; Cardarelli et al., 2011; Holló et al., 2012; Islami and Kurz-Kim, 2014). Unfortunately, we cannot follow this approach, as reliable financial market data is not available for such a large sample, among others due to underdevelopment of capital markets in CESEE countries. The second approach, which we follow, uses sectoral data on the condition of the banking (or financial) system by summing normalised and weighted financial ratios; it is constructed primarily by national central banks in Europe (e.g. Geršl and Heřmánek, 2006; Swiss National Bank, 2006; Bank of Finland, 2007; Bank of Latvia, 2010; Bank of Albania, 2010). Cevik et al. (2013) presents, however, a mixed approach, constructing an FSI for five CESEE countries with the use of six economic and financial components (reflecting, among other things, banking sector stress based on balance sheet data, market risk, external debt and sovereign risk).

Yet despite differences in their construction, the FSIs in the literature are often correlated, mainly due to the use of overlapping or very similar data (Kliesen et al., 2012). The majority of the abovementioned studies are single-country studies; there are very few cross-country studies that use an FSI (see Cardarelli et al., 2011; Slingenberg and de Haan, 2011; Cevik et al., 2013; Vermeulen et al., 2015), and those do not explicitly cover CESEE countries. According to the review of FSIs by Cevik et al. (2013), most studies examine financial stress in advanced countries. To the best of our knowledge, no study has used the FSI to analyse the impact of foreign ownership on the stability of the banking sector for 20 post-communist countries.

3. Methodology and Data

In this study, we use bank-level and country-level data. We collected the bank-level data from the Bankscope database. For the panel modelling, we use country-level data collected from the World Bank database, central bank websites, the IMF database and hand-collected data.

3.1 Financial Strength Index Methodology

Over the years, CESEE countries have experienced more dynamic economic growth than advanced economies, which is the main reason why these host countries have attracted foreign capital. Credit risk has been the most important driver of bank performance in these countries. Since CESEE countries represent bank-based financial systems, we limit the aggregated index to the banking sector, which is the key determinant of financial stability in CESEE countries.

We follow the methodology presented by Das et al. (2004), Geršl and Heřmánek (2006), among others, which combines IMF FSI-like indices or financial (accounting) ratios representing the CAMELS-based[2] approach by applying different weighting systems. Our index reflects the most important elements of the CAMELS-based approach and includes key drivers of a bank's financial standing (capital adequacy and profitability) as well as the main types of risks (credit and liquidity).

We use five bank-specific variables (see Table 1) to build an FSI. First, we cover banks' capital adequacy, which represents their resilience and ability to absorb

[2] CAMELS is one of the most popular methods for assessing the financial condition of individual banks as well as of the banking sector. It focuses on analysing bank capital adequacy (C), asset quality (A), management (M), earnings (E), liquidity (L) and sensitivity to market risks (S).

losses, by using the capital ratio *ETA* (equity to total assets ratio). Second, we use the typical profitability ratio *ROA*, which illustrates banks' ability to generate income and provide sources for the future build-up of equity capital. Third, we include a measure of liquidity (*LAF, liquid assets to total funding ratio*) to account for banks' ability to withstand short-term shocks (e.g. in the form of deposit outflow). Fourth, we include the structural liquidity ratio *LD (loans to customers to deposits from customers ratio)* to represent banks' funding stability and capacity to expand lending. Fifth, we cover banks' asset quality using *LITA (impairment charges to total assets ratio)*, which shows banks' levels of credit risk. High *LITA* may be the result of insufficient loan portfolio diversification and has the potential to reduce profitability and hamper credit growth. A higher index value reflects improved conditions in the banking system.

Table 1 Variables Used to Calculate the FSI

Category	*Variable*	*Calculation method*	*Weight*	*Impact*	*Data source*
Capital adequacy	ETA	Equity to total assets	0.2	positive	Bankscope
Profitability	ROA	Return on assets	0.2	positive	Bankscope
Liquidity	LAF	Liquid assets to total funding	0.2	positive	Bankscope
Liquidity	LD	Loans to customers to deposits from customers	-0.2	negative	Bankscope
Asset quality	LITA	Impairment charges to total assets	-0.2	negative	Bankscope

We calculate the minimum and maximum values for the abovementioned variables over the full period from 1995 to 2014 separately for each country. In the next step, we apply empirical normalisation to each variable for each bank in each year using the following formula:

$$I_{it}^{n} = \frac{I_{it} - Min(I_i)}{Max(I_i) - Min(I_i)} \tag{1}$$

where I_{it} is the value of variable *i* in year *t*, and $Max(I_i)$ and $Min(I_i)$ are the maximum and minimum values of the given ratio during the 1995 to 2014 period for each respective country. As a result, we obtain normalised values between the interval of 0 and 1 for the 5 variables.

The FSI is further used as a dependent variable. The FSI represents the weighted sum of the five normalised variables for banks and was calculated for banks of all types of ownership (the variable names are the same as in Table 1):

$$\text{FSI} = 0.2 \cdot \text{ETA} + 0.2 \cdot \text{ROA} + 0.2 \cdot \text{LAF} - 0.2 \cdot \text{LD} - 0.2 \cdot \text{LITA} \tag{2}$$

As a result, the index values on the bank level range from -0.32 to 0.47 in our sample (the theoretical values range from -0.4 to 0.6).

We calculate the index for each bank in a CESEE country for each year from 1995 to 2014. We aggregate the micro data to calculate the FSI on the country level

by weighting the bank-level index with the total assets of each given bank[3]. The result is the asset-weighted average value of the FSI for each CESEE country from 1995 to 2014. The values of the asset-weighted index on the country level range from -0.06 to 0.28.

The weights assigned to each variable reflect their importance in the aggregated index. As there is no comprehensive theoretical model to provide weights for each variable, nor are there any clear empirical guidelines, we base our assessment on expert judgment and assign an 0.2 weight equally to each of the five variables[4]. Such a solution is similar to European Banking Authority (EBA 2015) guidelines on assessing core risk indicators for the purposes of risk-based contributions to deposit guarantee schemes.

Although we significantly expand the index proposed by Das et al. (2004), we also face similar dilemmas. Our choice of financial ratios is constrained by the need to choose the same financial ratios available for the full sample of CESEE countries over the period from 1995 to 2014. Due to significant data gaps, it was not possible to use, for example, the Basel capital adequacy ratio (CAR) or the NPL ratio. Thus, we faced the trade-off that Das et al. (2004) did: a wider set of variables for a smaller number of countries or a smaller set of variables for a larger number of countries. For this study, we choose the latter approach.

For the purpose of a robustness check, we introduce two Z-Score measures, given by formulas (3) and (4), as well as an FSI with weights assigned on the basis of the principal components analysis (PCA)[5] (hereafter: FSI–PCA):

$$Z - Score_1 = \frac{\mathrm{ETA}_t + \mu_{ROA}}{\sigma_{ROA}} \tag{3}$$

$$Z - Score_2 = \frac{\mathrm{ETA}_t + \mathrm{ROA}_t}{\sigma_{ROA}} \tag{4}$$

where ETA_t is the value of ETA in period *t*, σ_{ROA} is the standard deviation of ROA for each bank for the whole sample, μ_{ROA} is the average value of ROA over the sample period and ROA_t is the value of ROA in period *t*.

The Z-Scores have been widely used in the literature since 1986 (Boyd and Graham, 1986) as a proxy for banks' stability (e.g. Lepetit and Stroebel, 2013 for Z-Score 1; Beck and Laeven, 2006 for Z-Score 2). We use the PCA approach to determine a low number of unobserved factors that explain the highest possible share of variance in the data (Suhr, 2005). We use country-level groups of variables that we assume are linearly correlated, while we assume that the proportion of variance described by each extracted factor is time-constant. We differentiate each group by type of bank ownership. Following Kaiser–Guttman's rule, we retain only those

[3] We do not calculate the indices for banks or banking groups operating in several CESEE countries because we are not able to grasp intragroup transactions, especially with the parent company; therefore, each bank is included separately.

[4] An attempt to assign different weights (ranging from 0.1 to 0.25) to the five financial ratios yields comparable results.

[5] The authors would like to thank Karol Rogowicz for his helpful assistance.

characteristics with eigenvalues greater than 1. Few researchers, such as Klomp and de Haan (2012), use PCA for comparative analysis. This is in line with the approach of assigning weights for similar ratios by Hakkio and Keeton (2009) and Cevik et al. (2013).

3.2 Panel Data Modelling

We raise two research questions:

1) Which factors determine the direction of change in the FSI?

2) Is the entire population of banks more stable than foreign-owned banks in a given country in a specific year?

Clearly, both questions follow a semi-parametric form: We do not model the value of the difference; instead, we concentrate on the direction of change in the former case and the existence of the advantage of a certain group of banks in the latter case. This approach reduces problems with outliers (a few huge and influential changes that determine the results of the estimation), while also partially relaxing the parametric assumptions related to the functional form of the model.

The independent variables are listed in Table 2[6]. The selection of variables is based on an in-depth review of the literature. Due to our focus on the role of foreign-owned banks, some variables are presented separately for the total banking sector and for foreign-owned banks. Since banking systems in CESEE countries are bank-based, credit activity is a driving force of their business, and excessive credit growth may overheat the economy and undermine the stability of the banking sector; therefore, we focus on selecting variables on loans. This is reflected in a loan growth ratio (a proxy for a bank's credit policy), a credit-to-GDP ratio (a proxy for financial development, e.g. Bremus and Buch, 2015) and the share of loans granted by foreign-owned banks out of the total number of loans (a proxy for the role of foreign-owned banks). A typical measure used to reflect the role of foreign-owned banks is their share in total bank assets (e.g. Yeyati and Micco, 2007; Angkinand and Wihlborg, 2010). The use of the ratio of share of loans granted by foreign-owned banks in relation to total loans creates a more accurate picture of their credit activity and its potential role in (in)stability. We also control for the structure of banks' balance sheets (loans vs. other assets) by including a ratio of other assets (e.g. debt securities issued by governments) to GDP. The macroeconomic country-level control variables include GDP growth in real terms (e.g. Angkinand and Wihlborg, 2010; De Nicolò and Loukoianova, 2007), change in real interest rates (e.g. Angkinand and Wihlborg, 2010) and, for a robustness check in nominal interest rates, change in real effective exchange rates (similar to De Nicolò and Loukoianova, 2007). Additionally, we control for a financial safety net (measured by an FSN index)[7]. This is motivated by the role of regulation and supervision, as shown by Anginer et al. (2017). We introduce an FSN index using an approach similar to La Porta et al. (1998) to measure anti-director rights. The FSN index is based on our own data and reflects changes in FSN composition in CESEE countries over the whole period,

[6] In additional estimations we also included a crisis dummy. Its impact on both dependent variables was not statistically significant. Those results are available from the authors on request.

[7] The FSN index methodology is presented in the Annex.

including supervision, deposit insurance, the role of the central bank and the resolution mechanism. Although Demirgüç-Kunt et al. (2015) presented an FSN index, it was only based on 2013 data and focused on deposit insurance. Our approach takes a broader view of the financial safety net. Overall, we employ different sets of explanatory variables for the Z-Score than Fang et al. (2014), who used *inter alia* total assets, loan and deposit ratio, loan loss provision and other macroeconomic variables.

Table 2 Independent Variables Included in the Model of the Direction of Change of the FSI (year over year) and for the Model of the Ratio of the FSI of Foreign-owned Banks to the Total FSI

Notation	*Definition*	*Expected impact*	*Data source*
LOAN_growth	Loans growth in real terms (n/n-1)	-	Bankscope
LOAN_growth_for	Loans growth in real terms (n/n-1) in foreign-owned banks	-	Bankscope
Credit_to_GDP	Credit-to-GDP (sum of loans to GDP) change (year over year)	-	Bankscope and WB database
Credit_to_GDP_for	Credit-to-GDP (sum of loans to GDP) - level in foreign-owned banks	-	Bankscope and WB database
OA_to_GDP	Other assets (total assets less loans) to GDP - change (year over year)	-	Bankscope and WB database
OA_to_GDP_for	Other assets (total assets less loans) to GDP - level in foreign-owned banks	-	Bankscope and WB database
GDP_growth	Change in GDP in real terms (year over year), $(GDP_t – GDP_{t-1}) / GDP_{t-1}$	+	WB database
NIR_change	Nominal interest rate change (year over year), $(NIR_t – NIR_{t-1}) / NIR_{t-1}$	-	WB database and central banks websites
RIR_change	Real interest rate change (year over year), $(RIR_t – RIR_{t-1}) / RIR_{t-1}$	-	WB database and central banks websites
RER_change	Change in the real effective exchange rate of a country. As in Bruno and Shin (2015), it is logarithm of the nominal exchange rate times the ratio of US inflation and domestic inflation.	+/-	WB database and central banks websites
FSN_index	Compound index for financial safety net	+	own
FOREIGN_SHARE_growth	Share of loans granted by foreign banks in total loans - change in share (year over year)	+/-	Bankscope and own
FOREIGN_SHARE_lev	Share of loans granted by foreign banks in total loans	+/-	Bankscope and own

Notes: for = foreign-owned banks, lev = level.

In both research questions, we consider a twofold outcome (the increase or decrease of the index in the first case, and the lower or higher financial strength for banks owned by foreign capital than for all banks in the country in the second case). As a consequence, we have to use binary regression approaches such as logit or

probit models.

In both cases, we start with a random effects specification:

$$y_{it}^{*} = x'_{it}\beta + \alpha_i + \varepsilon_{it}$$

$$y_{it} = \begin{cases} 0 \; if \; y_{it}^{*} < 0 \\ 1 \; if \; y_{it}^{*} \geq 0 \end{cases} \tag{5}$$

where y_{it}^{*} is the latent (unobservable variable), x'_{it} is the vector of the regressors given in Table 2, α_i is the random effect of the individual country *i*, ε_{it} is the spherical error term and y_{it} is the observable dependent variable. In the first case, y_{it} = 1 in the case of an increase and 0 in the case of a decrease or no change in the FSI for the group of banks from the *i*-th country in year *t*. In the second case, y_{it} = 1 if the index of strength is higher for the complete set of banks from the *i*-th country in year *t* and 0 if the index of strength is higher for banks owned by foreign capital. Two natural approaches include probit and logit regressions, which are used in the first and the second case, respectively. This selection is made on the basis of the regressions' fit to the data (in the second case, there is a minor preference for the logit vs. the probit model, whereas the opposite is true for the other case). The log-likelihood ratio test of the hypothesis of zero variance in the random effects rejects the null hypothesis in the first case ($p < 0.001$); it does not do so in the other case ($p = 0.54$). This suggests that the random effects probit should be used as a final model in the first case, but that the individual effects in the random effects logit should be dropped in the second case. These steps yield the pooled logit model with no individual effects. As a result, the final structures used are as follows:

Model of the dynamics of the FSI:

$$y_{it}^{*} = x'_{it}\beta + \alpha_i + \varepsilon_{it}$$

$$y_{it} = \begin{cases} 0 \; if \; y_{it}^{*} < 0 \\ 1 \; if \; y_{it}^{*} \geq 0 \end{cases} \tag{6}$$

where y_{it}^{*} is the latent (unobservable variable), x'_{it} is the vector of regressors given in Table 2, α_i is the individual normally distributed random effect of country *i*, ε_{it} is the spherical logistically distributed error term and y_{it} = 1 in the case of an increase and 0 in the case of a decrease or no change in the FSI for the group of banks from the *i*-th country in year *t*.

Model of the ratio of overall FSI to foreign-owned banks' FSI:

$$y_{it}^{*} = x'_{it}\beta + \varepsilon_{it} \tag{7}$$

$$y_{it} = \begin{cases} 0 \; if \; y_{it}^{*} < 0 \\ 1 \; if \; y_{it}^{*} \geq 0 \end{cases}$$

where y_{it}^{*} is the latent (unobservable variable), x'_{it} is the vector of regressors given in Table 2, ε_{it} is the normally distributed spherical error term and y_{it} = 1 if the index of stability is higher for the complete set of banks from the *i*-th country in year *t* and 0 if the index of stability is higher for banks owned by foreign capital.

We present descriptive statistics for the direction of change in the FSI and for the overall FSI-to-foreign-owned-bank FSI ratio in Table 3.

Table 3 Descriptive Statistics

Variables	*Mean*	*Std. Dev.*	*Min*	*Max*
FSI	0.406	0.492	0	1
FSI_for/FSI	0.578	0.495	0	1
LOAN_growth	0.063	0.257	-1.703	1.216
LOAN_growth_for	0.140	0.419	-1.093	3.840
Credit_to_GDP	0.025	0.113	-0.785	0.668
Credit_to_GDP_for	0.245	0.256	0	1.637
OA_to_GDP	-0.489	0.272	-1.294	-0.020
OA_to_GDP_for	0.140	0.124	0	0.479
GDP_growth	-0.016	0.235	-2.211	0.354
NIR_change	-0.024	0.187	-1.989	2.117
RIR_change	0.012	0.797	-10.162	8.436
RER_change	0.787	24.439	-179.230	302.508
FSN_index	1.533	0.790	0	3.750
FOREIGN_SHARE_growth	0.029	0.136	-1	0.989
FOREIGN_SHARE_lev	0.545	0.339	0	1

Notes: for = foreign-owned banks, lev = level.
Source: Based on the WB database, Bankscope, central bank websites, bank annual statements, the IMF and hand-collected data.

In most cases, the credit growth is more volatile in the case of foreign banks than it is in the sector as a whole, which translates into a material variability of average credit-to-GDP growth for foreign banks. Concurrently, the non-credit part of foreign bank balance sheets is relatively more stable over time. The FSI also varies significantly, as does the FSN proxy.

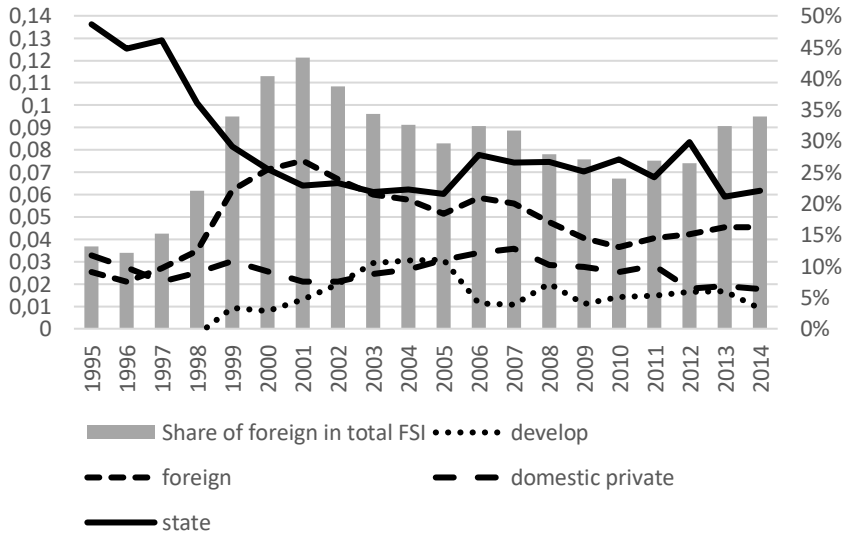
Due to the limited number of observations for the pre-crisis and post-crisis periods, we refrain from estimating separate models for these cases. Altogether, we estimate six models: Baseline Model 1 (with an FSI), and five other models with an emphasis on robustness checks (Models 2–6). In Models 2–4, we substitute the dependent variable (FSI) with Z-Score 1, Z-Score 2 and FSI–PCA, respectively, as other proxies of banks' financial strength. In Models 5–6, we model the FSI. While

the interest rates might be relevant factors of the financial situation, it is difficult to establish a single economically obvious type of rate; thus, we use the change in the real interest rate (RIR) in the baseline model. However, in Model 5, we substitute the change in RIRs with the change in nominal interest rates (NIR) as one of the regressors. Finally, in Model 6, we exclude the FSN index from the set of regressors in order to check the stability of the results.

4. Empirical Results

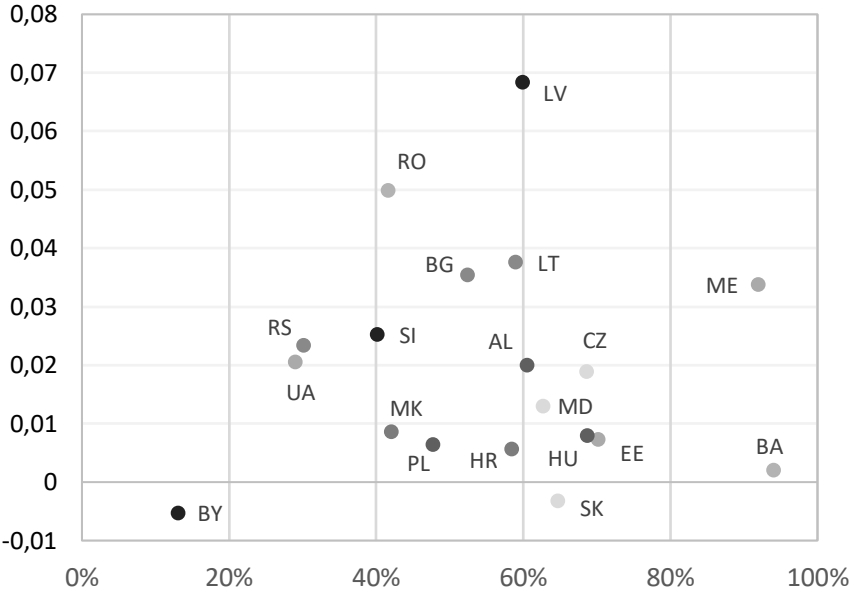
As measured by the level of the FSI (see Figure 1), subsidiaries of foreign banks are, on average, more stable than domestic banks throughout the vast majority of the analysed period. This finding is in line with Buch et al. (2013), who examine a sample of German banks and find that, in general, international banks are not riskier than domestically active banks. However, this contradicts De Nicolò and Loukoianova's (2007) findings; they claim that foreign banks have significantly higher risk profiles than domestic and state-owned banks. The stability of foreign subsidiaries (as well as their shares in the FSI) in CESEE countries began to gradually decline from the beginning of the twenty-first century until the GFC; however, in recent years, this measure has begun to recover. At the same time, the country-level analysis (see Figures 2 and 3) reveals that there might be, on average, a negative relationship between the share of foreign capital in the banking sector and its stability (as measured by some indices). This is especially visible in the period following the GFC.

Figure 1 Development of Asset-weighted Average FSI for Banks of Different Ownership Types



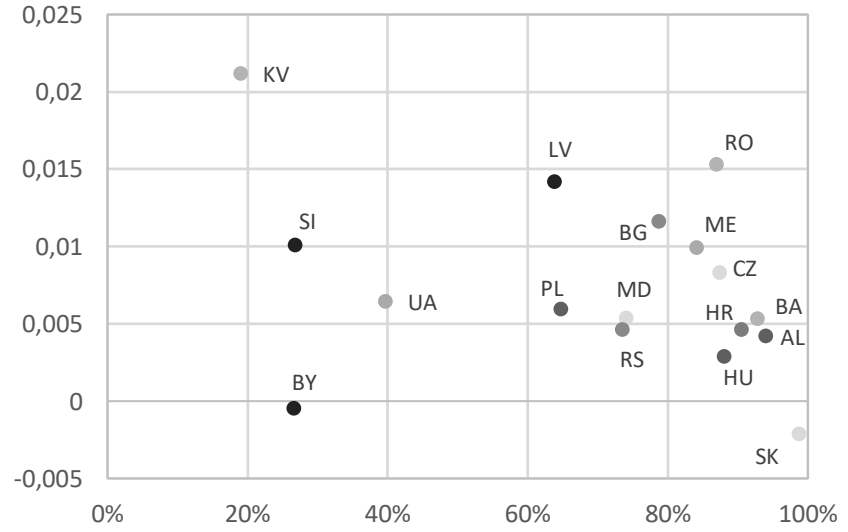
Notes: Lines = left-hand scale (level of FSI), bars = right-hand scale (share of average FSI for foreign banks in the sum of average FSIs for banks of all types of ownerships).

Figure 2 Average level of FSI and Share of Foreign Ownership in the Banking Sector pre-GFC (1995 to 2006)



Notes: Due to data gaps, the data for KV are not shown, horizontal line = average share of foreign ownership in banking sector assets, vertical line = average level of FSI.

Figure 3 Average Level of FSI and Share of Foreign Ownership in the Banking Sector post-GFC (2007 to 2014)



Notes: Horizontal line = average share of foreign ownership in banking sector assets, vertical line = average level of FSI.

The results of the estimation of the model given by Formula (6) are presented in Table 4.

Table 4 Estimates of the Direction of Change in FSI Logit Model Determinants on Country-level Data

Notation	*Model 1.1*	*Model 1.2*	*Model 1.3*	*Model 1.4*	*Model 1.5*	*Model 1.6*
LOAN_growth	-2.522***	-2.711***	-2.847***	-1.537*	-2.374***	-2.648***
	(-3.33)	(-3.41)	(-3.57)	(-2.42)	(-3.46)	(-3.61)
Credit_to_GDP_growth	-0.674	-0.0459	0.196	-1.661	-0.742	-0.641
	(-0.73)	(-0.05)	(0.22)	(-1.85)	(-0.81)	(-0.70)
OA_to_GDP_growth	0.239	-0.0713	-0.155	0.525	0.184	0.183
	(0.60)	(-0.18)	(-0.36)	(1.31)	(0.46)	(0.47)
GDP_growth	2.202**	1.237	2.757***	1.621*	2.141**	2.265**
	(2.64)	(1.60)	(3.30)	(2.08)	(2.61)	(2.74)
NIR_growth					-1.456	
					(-0.52)	
RIR_growth	-1.189	-1.609	-1.972	-1.018		-1.323
	(-1.31)	(-1.86)	(-1.91)	(-1.44)		(-1.47)
RER_growth	0.00193	-0.00263	0.000185	0.00241	0.00200	0.00223
	(0.58)	(-0.88)	(0.07)	(0.70)	(0.59)	(0.68)
FSN_index	0.0828	-0.0187	-0.173	0.0908	0.120	
	(0.58)	(-0.13)	(-1.18)	(0.65)	(0.88)	
FOREIGN_SHARE_growth	-1.562	-1.329	-1.169	-1.180	-1.354	-1.736
	(-1.10)	(-0.98)	(-0.84)	(-0.90)	(-0.97)	(-1.24)
constant	-0.175	0.496	0.562	-0.0765	-0.295	-0.0483
	(-0.54)	(1.47)	(1.59)	(-0.25)	(-0.96)	(-0.20)

Notes: N = 219, t-statistics are in parentheses, *p < 0.05, **p < 0.01, ***p < 0.001.
Source: Based on the WB database, Bankscope, central bank websites, bank annual statements, the IMF and hand-collected data.

The number of factors that impact change in the FSI is quite limited throughout all of the models, including the loan growth (supply side) with a negative impact and the growth of GDP (demand side) with a positive impact. While we treat Model 1.1 as the baseline model, we provide Models 1.2–1.6 for the purpose of a robustness check.

Excessive credit activity in catching-up economies may lead to a credit boom and the accumulation of imbalances, thus undermining financial stability. The importance of credit growth for banks' financial strength is a result of their business profile, which is traditionally focused on deposits and loans. If the loan growth is related to more liberal credit standards, this may lead to higher credit risk and therefore higher impairment charges and lower profitability.

The model suggests the GDP has a positive impact on FSI change, as improvement in economic conditions leads to lower credit risk, which is the key risk factor that determines stability in CESEE banking sectors. Additionally, a higher GDP increases loan demand, enhancing profitability prospects for banks and ultimately leading to a stronger financial position.

Our results are highly robust throughout all of the models, except for the loss of statistical significance of GDP growth in Model 1.2 (with Z-Score 1). This may be explained by the fact that Z-Score 1 includes an average ROA over the whole sample period, not the current value. This reduces the impact of any changes in bank profitability related to procyclicality. However, the credit growth still remains significant, underlining its role in stabilising the banking sector.

The results of the estimation of the model given by Formula (7) are presented

in Table 5. In this case, our purpose is to identify whether the stability of the whole sector in the same country is higher than the stability of foreign-owned banks in a given country.

Table 5 Estimates of the Ratio of the Total FSI to the FSI of Banks with Foreign Ownership; Random Effects Probit Model Determinants on Country-level Data

Notation	*Model 2.1*	*Model 2.2*	*Model 2.3*	*Model 2.4*	*Model 2.5*	*Model 2.6*
LOAN_growth_for	-0.239 (-0.63)	0.502 (1.22)	0.725 (1.62)	0.308 (0.70)	-0.196 (-0.53)	-0.347 (-0.94)
Credit_to_GDP_growth_for	1.756* (2.03)	0.229 (0.31)	0.630 (0.83)	3.600** (3.23)	1.767* (2.03)	1.883* (2.15)
OA_to_GDP_growth_for	-9.079*** (-4.29)	-1.921 (-1.06)	-3.484 (-1.87)	-4.880* (-2.51)	-9.180*** (-4.34)	-8.908*** (-4.22)
GDP_growth	0.891 (0.78)	0.511 (0.48)	-0.186 (-0.17)	1.203 (1.07)	1.297 (1.26)	0.845 (0.74)
NIR_growth					-0.635 (-0.13)	
RIR_growth	-1.378 (-0.85)	-0.289 (-0.17)	0.0775 (0.05)	-1.270 (-0.78)		-1.650 (-1.04)
RER_growth	0.00336 (0.56)	0.00334 (0.67)	0.00212 (0.44)	0.00526 (0.85)	0.00328 (0.54)	0.00434 (0.75)
FSN_index	0.272 (1.10)	0.272 (1.17)	0.262 (1.12)	0.0331 (0.14)	0.315 (1.29)	
FOREIGN_SHARE_lev	0.964 (1.16)	1.144 (1.47)	1.513 (1.93)	-0.993 (-1.19)	1.051 (1.27)	1.084 (1.30)
constant	0.450 (0.84)	-1.288* (-2.37)	-1.386* (-2.51)	0.837 (1.53)	0.306 (0.59)	0.800 (1.82)

Notes: N = 215, t-statistics are in parentheses, *p < 0.05, **p < 0.01, ***p < 0.001.
Source: Based on the WB database, Bankscope, central bank websites, bank annual statements, the IMF and hand-collected data.

In baseline Model 2.1, only two variables have statistically significant impact on the ratio of the total FSI to the FSI of foreign-owned banks: i) the growth of the credit-to-GDP ratio of foreign-owned banks with a positive impact, and ii) the ratio of other assets to the GDP growth ratio of foreign-owned banks with a negative impact.

These two variables show the structure of the balance sheet (credits vs. other assets) and the size of the banking sector. An increase in the credit-to-GDP ratio of foreign-owned banks shows that their credit expansion plays a positive role in strengthening the whole banking sector. If foreign-owned banks place more importance on other assets instead of credits, such as T-bills, T-bonds or deposits in parent banks, this negatively impacts the financial strength of the whole banking sector. Foreign-owned banks seem to act as a litmus test: they expand their credit activity instead of focusing on other assets if the overall situation on the market is attractive. If they do not, they allocate their assets in 'safe havens'. The results are robust throughout all models; however, in Models 2.2 and 2.3, none of the variables are statistically significant.

In summary, we would like to highlight that the factors that are important for changes in financial stability, as proxied by the FSI, are linked to credit growth and overall macroeconomic situations. The share of foreign capital seems to have a neutral impact on financial stability unless the credit policy is aggressive. Therefore, unlike Unite and Sullivan (2003) and Angkinand and Wihlborg (2010), we cannot confirm a direct negative link between an increase in foreign bank penetration and

higher risk-taking in the banking sector. Our findings show that it is the host country's conditions that affect the stability of foreign-owned banks, meaning that foreign-owned banks must react to local conditions and that foreign banks' success is the same as the host country's success. The differences in the balance sheet structure between the whole banking sector and foreign-owned banks determine the differences in the level of the FSI. If the credit expansion of foreign-owned banks takes place, then the overall situation in the banking sector is fair.

5. Conclusions

The debate over the impact of foreign banks on the stability of CESEE countries has accelerated since the GFC, yet there are only a few studies that provide empirical evidence for the stability implications of foreign bank ownership in CESEE countries. We contribute to this debate by analysing a panel of 20 CESEE countries between 1995 and 2014 using a composite FSI.

The CESEE countries, in which the average credit-to-GDP ratio was between 20 per cent and 60 per cent from 1995 to 2014, are not as 'overbanked' as their more advanced EU peers, since the change in size of the banking sector does not play a significant role in their stability.

We find contrasting evidence on the impact of foreign-owned banks on financial stability. On the one hand, subsidiaries of foreign banks are, on average, more stable than domestic banks. Yet the results of our panel models suggest that foreign capital in the banking sector is not a decisive factor in determining the sector's stability. This is in line with the results of Haselmann and Wachtel (2007), who find that excessive risk taking is not characteristic for a specific ownership type of banks in transition economies. It shows that it is not the type of owner that determines the bank's impact on financial stability, but rather other determinants should be explored. Overall, our results cannot unequivocally support either the studies showing the positive impact (Demirgüç-Kunt et al., 1998; Choi and Hasan, 2005) or those arguing for the negative impact of foreign capital (Yeyati and Micco, 2007; Hassan et al., 2012). Therefore, the impact might depend on the environment in which the foreign banks operate. Yet, in contrast to most studies, we did not analyse foreign bank impact through NPL or loan loss provisions, but rather employed financial ratios to proxy the financial strength of banks.

We find that financial stability is more dependent on country-specific factors and banks' credit policies. It is more likely that foreign ownership indirectly affects financial stability via the credit policy channel reflected in the structure of foreign-owned banks' assets. Robust economic growth in CESEE countries incentivises the expansion and aggressive credit policies of both domestic and foreign-owned banks, which contributes to boom and boom–bust cycles.

Surprisingly, the composition of the FSN is not statistically significant. This may be explained by the fact that financial safety net in most CESEE countries is well developed, with the strong position of the central bank and the deposit guarantee scheme. It has been developing gradually since the beginning of the economic transformation, catching up to international trends and good practices as well as EU requirements. This is in contrast to Fang et al. (2014) who found that having an

explicit deposit insurance policy reduces financial stability, while institutional and banking law reforms improve stability in transition economies.

Future research should investigate the determinants of financial stability on a sample of both emerging (including CESEE) and advanced economies. Since we did not find an unequivocal answer to the role of foreign-owned banks in this cross-country study, it is worth exploring detailed country case studies in future research.

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