Comparing market power at home and abroad: evidence from Austrian banks and their subsidiaries in CESEE

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In this study, we examine markups of Austrian banks and their subsidiaries in Central, Eastern and Southeastern Europe (CESEE) on an unconsolidated level. Markups are evaluated by means of the Lerner index by simultaneously estimating a price and a cost function derived from oligopoly theory. For that purpose, we use a novel fixed effects seemingly unrelated regression approach and a unique supervisory dataset covering around 800 banks over the period from the first quarter of 2008 to the second quarter of 2016. We find evidence for positive markups for Austrian subsidiaries in CESEE. These markups are even higher than the markups of Austrian parent banks, which emphasizes the importance of the CESEE markets for the overall profitability of the Austrian banking sector. Looking at the determinants of markups for Austrian subsidiaries in CESEE, we find that higher Lerner indices are associated with better capitalization, higher loan loss provisions and, more generally, greater size – the latter effect is especially true for banks in more developed host countries. Also, there is a negative correlation between the Lerner indices of subsidiaries and parent banks. This implies that opportunity costs in the home country play a role in determining market power in the host country.

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Banking in CESEE economies has been very dynamic over the last three decades. In the early and mid-1990s, banks transformed from operating under a socialist system to operating under a market economy (Barisitz and Gardó, 2009). It took several steps to accomplish the transformation from a monobank system, where one single bank had more or less been responsible for central banking as well as commercial banking operations. A first wave of reforms included extensive liberalization measures and initial limited restructuring and tightening efforts, but was not accompanied by sufficient institutional changes to safeguard the transitional process (Barisitz and Gardó, 2009). A second wave of reforms focused on in-depth privatization to bring in missing know-how, technology and capital. As a consequence and with the turn of the millennium, mostly Western European investors acquired the lion's share of CESEE banking sectors. Austrian banks were at the forefront of the expansion into CESEE markets. The motives to expand were manifold, including market size, favorable political developments and historical connections.[2] During this expansion phase, catching up-driven credit growth could fully unfold under the new foreign-owned bank presence to further underpin economic growth in the region. Austrian banks also profited strongly from these developments, with their subsidiaries in

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[2] *More generally and based on German bank data, Buch (2000) shows that foreign (banking) activities are positively related to demand conditions on the local market, foreign activities of home-based firms, and the presence of financial centers.*

CESEE contributing to overall profitability in the Austrian banking sector. With the outbreak of the global financial crisis and in line with global trends, credit growth came to an abrupt halt and operating income of Austrian subsidiaries under pressure. At the height of the crisis, the Vienna Initiative was founded to foster cooperation among international financial institutions, European agencies and governments and the largest Western European banks in the region. The aim was to sustain parent bank funding and hence maintain overall stability of the financial sector in the region.[3]

In this study, we provide an up-to-date assessment of markups of Austrian banks, drawing on a unique supervisory dataset. The data allow us to compare the market power of subsidiaries in CESEE and their parent banks in Austria, which may shed light on banks' motives for investing abroad. Since markups during the expansionary phase were generally high in the region, we concentrate on the more interesting period, namely the aftermath of the crisis, which is characterized by diverging profitability.[4] Our focus is on juxtaposing the markups of Austrian subsidiaries in CESEE and those of their Austrian parent banks, a topic that has so far not been systematically investigated. Nevertheless, there is a related strand of the literature that assesses the impact of foreign-owned banks on the host country's banking sector and macroeconomy. In a nutshell, the literature summarized in Cull et al. (2017) reveals evidence that the presence of foreign-owned banks in developing economies enhances efficiency by exerting pressure on locally-owned banks' cost structure. The literature focusing on banks in CESEE seems inconclusive, though: while Poghosyan and Poghosyan (2010) find that foreign ownership enhances competition and efficiency in CESEE, Green et al. (2004) do not find a significant effect of foreign ownership on banks' total costs for the period from 1995 to 1999. A more detailed picture is provided in Jeon et al. (2011). Their analysis reveals that the efficiency-enhancing effect of foreign-owned banks depends crucially on the mode of entry into local markets: the positive effect of foreign bank presence on competition in the banking sector is significantly stronger with greenfield investments (which increases the number of banks in the financial system) than with mergers and acquisitions. Havrylchyk and Jurzyk (2011) examine the role the mode of entry plays for foreign-owned banks in CESEE. They find that greenfield banks show higher profitability due to greater cost efficiency compared with local banks. This is not true for takeover banks where the foreign bank inherits the cost structure and staff from the original bank. Results in Bonin et al. (2005) could be summarized in a similar fashion, revealing that foreign-owned banks in CESEE are more cost efficient compared with state-owned banks, especially if the foreign owner pursues a strategic investment purpose. There is also a link between the presence of foreign-owned banks and banking sector stability. A broad consensus seems to have formed that in the presence of a local (i.e., host country) shock, foreign-owned banks can act as a stabilizer for the host economy (Cull et al., 2017; Havrylchyk and Jurzyk, 2011). This stabilizing function works through subsidiaries' access to liquidity and credit from parent banks. By contrast, global shocks – such as the outbreak of the global financial crisis – may be imported through foreign banks

[3] *For more details, see www.vienna-initiative.com.*

[4] *In what follows we use the terms "markups" and "profitability" interchangeably. This can be justified either by considering the construction of the Lerner index or by correlating the index with a well-known profitability measure. For our dataset, we find a positive correlation of the index, with a return on assets and a return on assets before taxes of about 0.6.*

and may materialize through reduced credit lending. Regarding this latter aspect, there is a branch of the literature examining domestic firms' access to credit in the presence of foreign-owned banks. It could be argued that foreign-owned banks are at an informational disadvantage relative to their local peers in the host country since the latter can draw on soft information that includes knowledge of borrowers' intangible traits (Cull et al., 2017). This implies that foreign-owned banks are associated with reduced access to credit for informationally opaque firms, as evidenced in Detragiache et al. (2008) and Gormley (2014). For CESEE economies, though, the relationship seems more complex, and empirical evidence indicates that foreign banks pursue different strategies within the same host countries (Cull et al., 2017). finan

In this paper, we examine the degree of competition of Austrian subsidiaries in CESEE by using the Lerner index (Lerner, 1934), which is a widely accepted competition measure and follows standard microeconomic theory. More precisely, it identifies the extent to which the price charged by a firm or bank in an industry diverges from the price that would emerge under perfect competition. The Lerner index is defined by the difference of actual prices and marginal cost over prices. It measures competition for each bank in its local market without explicitly considering all its competitors. As the Lerner index measures relative profitability, it is possible to compare the Lerner indices of different subsidiaries to the home-based parent. The home-based banking activity of the parent therefore can be seen as the alternative investment opportunity. In this sense, it is an ideal concept to monitor the investment decision of a firm or bank to enter new markets.

The empirical literature on Lerner indices is abundant. For example, Gunter et al. (2013) analyze determinants of the net interest rate margin (NIM) for Austrian banks over the period 1998 to 2013. They find that among other factors, the Lerner index is significantly (and positively) related to the NIM. Turk-Ariss (2010) examines the relationship between market power, bank efficiency and stability, estimating Lerner indices for a broad sample of 821 banks in 60 developing countries. Her results support the competition fragility view, which postulates that increased competition might negatively impact stability in the financial system. Efthyvoulou and Yildirim (2014) examine Lerner indices for a range of CESEE economies and show that foreign-owned banks achieve on average higher markups than their locally-owned peers. They also find that the global financial crisis put an end to a broad convergence trend of Lerner indices across countries and that the influence of asset quality and capitalization varies between the pre-crisis and post-crisis sample periods. Other studies on banking sector competition for CESEE economies focus solely on pre-crisis data (e.g., Agoraki et al., 2011).

The paper is structured as follows: the next section summarizes the theoretical framework, which lays the basis for estimating the Lerner index. Section 2 describes the data, and section 3 presents the empirical results. Finally, section 4 concludes.

1 Theoretical framework

The Lerner index corresponds to the markup of prices over marginal costs divided by prices (Lerner, 1934). Since the marginal costs of firms or banks are not directly observable, calculating the Lerner index requires estimating a cost function to derive marginal costs in a first step. Marginal costs and prices are then used to calculate the index in a second step.

1.1 The Lerner index

We follow the seminal work of Angelini and Cetorelli (2003) and assume that the banking sector normally follows an oligopoly. The special cases of perfect competition (Lerner index equals 0) and monopoly power (Lerner index equals 1) are also covered.[5] To maximize profits, Π_j, each bank j sets equilibrium prices:

$$\max_{q_j} \Pi_j = p(Q,z)q_j - C(q_j, w_j) \tag{1}$$

Such a decision is based on cost considerations ($C(q_j,w_j)$) and on the degree of competition in the market measured by the inverse demand function p(Q,z), where $Q=\sum_{j=1}^{N} q_j$ is the industry output of all N banks and z are exogenous variables that affect demand for bank services. For lack of data on the different products/services of a bank, we summarize all output of a bank in an aggregate banking product q_j which is approximated by the total assets of bank j. The three variables that enter the cost function are denoted by $w_{j,i}$: $w_{j,1}$ are interest expenses, $w_{j,2}$ staff expenses and $w_{j,3}$ other operating expenses ($w_j=\sum_{i=1}^{3} w_{j,i}$). The price of the aggregate banking product (p_j) is defined as the ratio of the sum of interest income, fee income and income from investment to total assets.

The corresponding first order condition to equation (1) is

$$\Pi'_{j_j} = p_j - C'(q_j, w_j) + \frac{\Theta_j}{\tilde{\varepsilon}} = 0 \tag{2}$$

where the second term on the right-hand side measures the deviation from a perfectly competitive benchmark.[6] In line with Angelini and Cetorelli (2003), the separate identification of Θ_j and $\tilde{\varepsilon}$ is not required if one aims to analyze the bank's overall degree of market power. It is sufficient to estimate $\lambda = -\frac{\Theta_j}{\tilde{\varepsilon}}$. Dividing λ by the average price p yields the Lerner index.

$$L_j = \frac{p_j - C'(q_j,w_j)}{p_j} \tag{3}$$

The Lerner index is usually defined to be between 0 and 1, measuring the relative markup of price over marginal cost.

We assume the standard production technology for banks that is based on three inputs (deposits, labor and other costs)[7] and a translog specification for the cost function.[8]

$$\ln(C_j) = \alpha_{1,j} + s_0 \ln(q_j) + \frac{s_1}{2}(\ln(q_j))^2 + \sum_{i=1}^{3} c_i \ln(w_{j,i}) + \ln(q_j)\sum_{i=1}^{3} s_{i+1} \ln(w_{j,i}) + c_4 \ln(w_{j,1})\ln(w_{j,3}) + c_5 \ln(w_{j,1})\ln(w_{j,2}) + c_6 \ln(w_{j,2})\ln(w_{j,3}) + \sum_{i=1}^{3} c_{i+6} \ln(w_{j,i})^2 \tag{4}$$

[5] *In case of negative profits, the Lerner index might become negative, but such a situation is not likely to be sustainable over a longer period, since such a bank would be expected to exit the market at some point.*

[6] *The term Θ is usually defined as the conjectural elasticity of total industry output with respect to the output of the j^{th} firm and $\tilde{\varepsilon}$ is the market demand semi-elasticity to the price.*

[7] *Other costs include physical capital as described in the literature.*

[8] *See Beck et al. (2013), Carbó Valverde and Rodríguez Fernández (2007), Coccorese (2014) and Turk-Ariss (2010) for a similar cost function specification.*

The primary advantage of the translog cost function is its flexibility. Many popular functional forms (e.g., the Cobb-Douglas specification) are restricted special cases of the translog cost function. The right hand-side variables are the output measures, the input prices, quadratic terms of them and all possible interaction terms.

For the estimation we rewrite equation (2) in the following way:

$$p_j = \frac{c_j}{q_j}\left(s_0 + s_1 \ln(q_j) + \sum_{i=1}^{3} s_{i+1} \ln(w_{j,i})\right) + \alpha_{2,j} \qquad (5)$$

We estimate equation (4) and equation (5) with a bank fixed effects seemingly unrelated regression model, separately for subsidiary and parent banks. The underlying assumption is that bank cost equations are very similar, but some banks are better managed than others, which is precisely captured by the fixed effects $\alpha_{1,j}$ and $\alpha_{2,j}$ for all banks j. So, except for the fixed effects, the other coefficients are the same for the subsidiaries (parents). In this way, we sacrifice some heterogeneity for more stability in the estimated coefficients.[9]

Bank-specific Lerner indices are then calculated based on the coefficients of the panel. The panel approach pursued in this study is in contrast to the framework used by Angelini and Cetorelli (2003), who estimate their simultaneous equation system for each year (cross section by cross section). Our approach takes advantage of the panel structure of our dataset (repeated observations of the same individuals and cross-equation error correlation). In addition, we impose cross-equation restriction that follows from economic theory and should improve the precision of the estimates (Bresnahan, 1989). In particular, we impose that the following parameters are equal across equations (4) and (5): s_0, s_1, s_2, s_3 and s_4.

2 Data

Our empirical analysis is primarily based on quarterly supervisory data reported by Austrian subsidiaries in CESEE under International Financial Reporting Standards (IFRS). These banking-related data consist of balance sheet, income statement and credit risk positions and are collected for 16 countries: Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, FYR Macedonia, Hungary, Latvia, Poland, Romania, Russia, Serbia, Slovakia, Slovenia and Ukraine. In total we have quarterly data on 57 subsidiaries for the period from the first quarter of 2008 to the second quarter of 2016. Due to a structural break in regulatory reporting, earlier data of the same quality are not available. The number of subsidiaries per country varies between 1 (Albania, FYR Macedonia, Latvia) and 4 (Croatia, Romania, Serbia, Slovakia, Slovenia). Austrian banks' claims are largest on the Czech Republic, Croatia, Romania, Russia, Slovakia and Hungary (Wittenberger et al., 2014), with the Czech, Russian, Slovak and Croatian markets being the most profitable ones.[10] For Austria, we use quarterly supervisory

[9] *We also do not estimate clustered standard errors, as most of the heteroscedasticity in the data is removed by either using ratios or taking the logarithm. Clustering on the bank level would yield unreliable estimates for some banks due to the small number of observations. To a lesser degree the same holds true on the country level. We also do not want to remove banks or countries with only a few observations from the estimation in order to estimate more reliable clustered standard errors. Removing these banks would cause a type of "survival bias" in the data. Finally, to calculate the Lerner index, as seen in equation (6), standard errors are irrelevant.*

[10] *In absolute terms, viewed over the 2003-to-2015 period. See Kavan et al. (2016) for more details.*

data reported by 745 domestically operating banks at the unconsolidated level according to national Generally Accepted Accounting Principles (GAAP). Most importantly, this implies that interest income earned by Austrian banks' subsidiaries abroad is neither included in the NIM nor in the net fee and commission income ratio (NFCIR). These two datasets ensure that there is no overlap in measuring the profitability in CESEE (subsidiary, investment) and in Austria (parent, alternative investment).[11]

To prevent outliers from distorting the empirical analysis, we apply a two-stage cleaning algorithm suggested by Sigmund et al. (2017) to the variables used (except for log(total assets), see table 1 for further details). First, we eliminate outliers across banks for each time period. An observation is considered an outlier if it is too far from the median (more than four times the distance between the median and the 2.5% or 97.5% quantile). In a second stage, we eliminate outliers across time for each bank. Here, the threshold distance is defined as 12 times the distance between the median and the 10% or 90% quantile. Such parameters ensure that the number of removed observations remains limited and the resulting distributions exhibit a reasonable shape when judged from a qualitative perspective.[12]

Summary statistics of subsidiaries and parent banks are listed in table 1 below.

Table 1

Bank data summary

	Subsidiaries					Parent banks				
	Minimum	Median	Mean	Maximum	Variance	Minimum	Median	Mean	Maximum	Variance
log(total assets)	3.09	7.58	7.59	10.55	2.03	8.46	11.90	12.12	18.87	1.99
log(interest expenses/total assets)	–8.69	–5.19	–5.24	–3.43	0.40	–12.92	–6.11	–6.14	–3.12	0.62
log(staff expenses/total assets)	–11.27	–5.89	–5.88	–3.80	0.29	–13.53	–5.83	–5.89	–2.68	0.25
log(fee, commission and other expenses/total assets)	–8.29	–5.61	–5.58	–2.10	0.30	–11.00	–6.28	–6.28	–1.78	0.22
Total costs/total assets	0.00	0.01	0.01	0.13	0.00	–0.01	0.01	0.01	0.22	0.00

Source: Thomson Financial.

The data show that (based on the median) subsidiaries are generally smaller compared with their parents (in terms of total assets), they have similar staff expenses over total assets and larger revenues from fees relative to their parents.

We complement the bank-related data with a set of macroeconomic variables that has been proposed in the literature (see e.g., Delis, 2012; and Efthyvoulou and Yildirim, 2014). More specifically, we collect year-on-year CPI inflation and GDP growth, GDP per capita and institutional factors (the overall economic freedom indicator, property rights, freedom from corruption, economic freedom, business freedom, investment freedom and financial freedom, as provided by the Heritage Foundation; as well as the World Bank's control of corruption, government

[11] *Branches only play a minor role (less than 0.1%) in terms of total lending abroad and are fully included in the cross-border lending of the respective Austrian bank. In this framework, any direct (without a subsidiary) cross-border activity of an Austrian bank is reflected in its home Lerner index. So, by looking at the parent and the subsidiary Lerner index, we give a full view on all activities related to CESEE markets.*

[12] *Our outlier detection mechanism is responsible for some gaps in chart 2. Other data gaps are due to confidentiality reasons. If there is only one subsidiary in a country, the Lerner index is not reported. These data are still used for the estimations, however.*

effectiveness, political stability, regulatory quality and rule of law indicators). GDP per capita and institutional factors are available only in annual frequency, while all other data are made available in quarterly frequency. Annual data have been converted to quarterly data by simply reusing annual observations over the quarterly frequency domain. This can be rationalized by considering that the variables of annual frequency typically show only negligible time variation within a given year. From a macroeconomic perspective, the set of countries we cover is quite heterogeneous as it includes more advanced economies, euro area countries and less developed but dynamic economies as well as more fragile ones.

3 Results

In this section, we first analyze the coefficients of the cost function, i.e., equation (4), for CESEE and Austria, which are a necessary input for the derivation of the Lerner index. We then discuss the estimated Lerner indices and finally investigate the determinants of the Lerner indices of Austrian subsidiaries.

3.1 Results of the cost functions

We report the results of the translog cost function, i.e., equation (4), in tables 2 and 3.

Table 2

Estimates of translog cost function – CESEE subsidiaries

Variable name	Estimate	Standard error	t-value	Pr(>|t|)
log(total assets)	0.968	0.006	155.996	0.000
log(total assets)^2	0.002	0.000	3.929	0.000
log(interest expenses/total assets)	0.244	0.010	25.349	0.000
log(staff expenses/total assets)	0.203	0.015	13.916	0.000
log(fee, commission and other expenses/total assets)	0.390	0.012	32.089	0.000
log(total assets)*log(interest expenses/total assets)	0.002	0.001	3.199	0.001
log(total assets)*log(staff expenses/total assets)	–0.003	0.001	–3.578	0.000
log(total assets)* log(fee, commission and other expenses/total assets)	–0.001	0.001	–1.670	0.095
log(interest expenses/total assets)* log(staff expenses/total assets)	–0.084	0.002	–40.986	0.000
log(interest expenses/total assets)* log(fee, commission and other expenses/total assets)	–0.135	0.002	–84.780	0.000
log(staff expenses/total assets)* log(fee, commission and other expenses/total assets)	–0.066	0.002	–32.617	0.000
log(interest expenses/total assets)^2	0.101	0.001	185.589	0.000
log(staff expenses/total assets)^2	0.064	0.001	57.286	0.000
log(fee, commission and other expenses/total assets)^2	0.103	0.001	154.601	0.000
R2				0.9999
Adjusted R2				0.9999
Number of banks				57.0000
Average number of time periods				24.1356
Number of total observations				1,424.0000

Source: Authors' calculations.

Clearly, the greatest driver of log(total costs) are log(total assets). Other important drivers are log(interest expenses divided by total assets), log(staff expenses divided by total assets) and log(other costs over total assets). The coefficients of the interaction terms with log(total assets) show that there are economies of scale with respect to

log(staff expenses divided by total assets) but a positive interaction effect with log(interest expenses divided by total assets).

The results for Austrian parent banks are displayed in table 3 and show a similar picture.

Table 3

Estimates of translog cost function – Austrian parent banks

Variable name	Estimate	Standard error	t-value	Pr(>|t|)
log(total assets)	0.912	0.015	59.142	0.000
log(total assets)^2	0.001	0.001	0.956	0.339
log(interest expenses/total assets)	0.335	0.009	39.382	0.000
log(staff expenses/total assets)	0.425	0.016	27.106	0.000
log(fee, commission and other expenses/total assets)	0.747	0.015	49.158	0.000
log(total assets)*log(interest expenses/total assets)	0.012	0.000	33.095	0.000
log(total assets)*log(staff expenses/total assets)	–0.017	0.001	–14.656	0.000
log(total assets)* log(fee, commission and other expenses/total assets)	–0.006	0.001	–7.445	0.000
log(interest expenses/total assets)* log(staff expenses/total assets)	–0.055	0.001	–50.616	0.000
log(interest expenses/total assets)* log(fee, commission and other expenses/total assets)	–0.050	0.001	–49.783	0.000
log(staff expenses/total assets)* log(fee, commission and other expenses/total assets)	–0.038	0.002	–20.928	0.000
log(interest expenses/total assets)^2	0.036	0.001	43.636	0.000
log(staff expenses/total assets)^2	0.074	0.001	69.487	0.000
log(fee, commission and other expenses/total assets)^2	0.063	0.000	195.794	0.000
R2				0.9993
Adjusted R2				0.9993
Number of banks				745.0000
Average number of time periods				29.8800
Number of total observations				22,263.0000

Source: Authors' calculations.

It is worth noting that, compared with Angelini and Cetorelli (2003), our estimation results are in a much more credible range and have economically meaningful signs.[13] These superior properties might be attributed to the panel estimation approach we pursue, which seems well suited for the dataset at hand. The plausibility check of the estimated parameters of the cost function ensures confidence in the analysis that is to follow.

3.2 Estimated Lerner indices for Austrian subsidiaries in CESEE

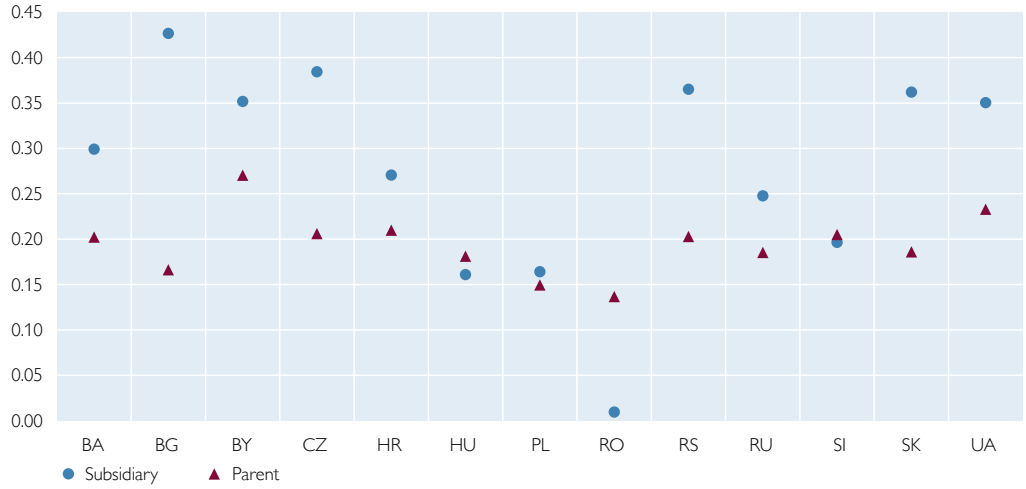
The Lerner index for each bank *j* in each period *t* is calculated based on the coefficients in tables 2 and 3 (see Fischer and Hempel, 2006):

$$L_{j,t} = \frac{p_{j,t} - {C_{j,t}}/{q_{j,t}}\left(\hat{c}_0 + \hat{c}_1 \ln(q_{j,t}) + \sum_{i=1}^{3} \hat{s}_{i+1} \ln(w_{j,i})\right)}{p_{j,t}} \quad (6)$$

[13] *Turk-Ariss (2010) also estimates Lerner indices for a broad range of countries, but without estimating an explicit cost function. Instead, she regresses the Lerner index on a cost-efficiency measure and an alternative profit-efficiency measure, which might render results prone to endogeneity issues.*

Chart 1

Lerner index, average over sample period (Q1 2008 – Q2 2016)



Source: Authors' calculations.

Note: The plot shows cross-country means of estimated Lerner indices of CESEE subsidiaries and Austrian parent banks, averaged over banks within a given country and over time. For confidentiality reasons, we do not show data for countries where only one subsidiary is present (i.e., Albania, Latvia and FYR Macedonia).

To get a first impression and to see whether there are significant differences between the estimated markups for subsidiaries and those for parents, we calculate Lerner indices, averaged over banks within a country and over the sample period. The results are shown in chart 1, with blue (circles) referring to Lerner index values of subsidiaries and red (triangles) to parent banks, respectively.

First, we see that our estimates of the Lerner index are generally well behaved and positive. For single banks negative values appear occasionally; these are not shown in the chart, however. Pricing below marginal costs might serve as a strategy to deter the entry or induce the exit of other competitors into/from the market (Coccorese, 2014) but is unlikely to be sustainable in the long run. Looking at cross-country heterogeneity, we find the highest Lerner index for subsidiaries (on average) in Bulgaria (0.43) and the smallest in Latvia (0.05). In Romania, the mean Lerner index over the sample period is even smaller (0.01). However, this result is driven by one starkly negative observation in one time period. The same applies for subsidiaries in Russia. The median, which is a statistic more robust to outliers, indicates a Lerner index for subsidiaries of 0.29 for both Romania and Russia, which is rather high compared with the other countries. For the remaining countries, mean and median statistics are very close. Overall, our estimates lie in the range of those of other empirical studies, such as Agoraki et al. (2011), Coccorese (2014) and Weill (2013), although these studies typically use other time periods, estimation techniques and datasets and typically focus on both domestic and foreign-owned banks. Next, the chart shows that on average

Table 4

Welch two sample t-test

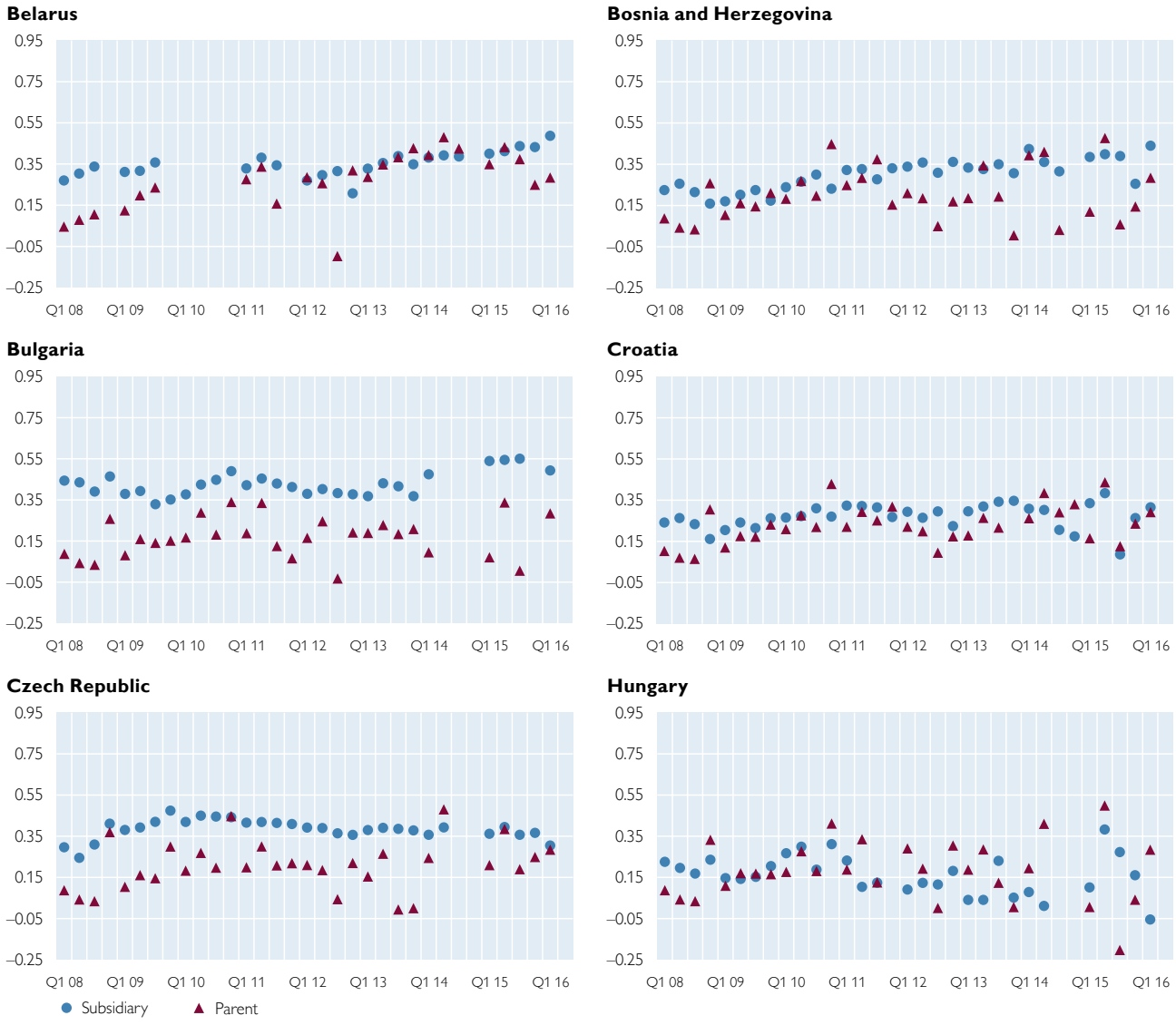
	Subsidiaries	Parent banks
Mean	0.250	0.175
t-statistic		2.690
Degrees of freedom		66.379
p-value		0.009

Source: Authors' calculations.

Note: Tests of equal means of subsidiary and parent banks' Lerner indices. Underlying observations are averaged over the sample period. Alternative hypothesis: true difference in means is not equal to 0.

Chart 2

Lerner index per country and over time (part 1)



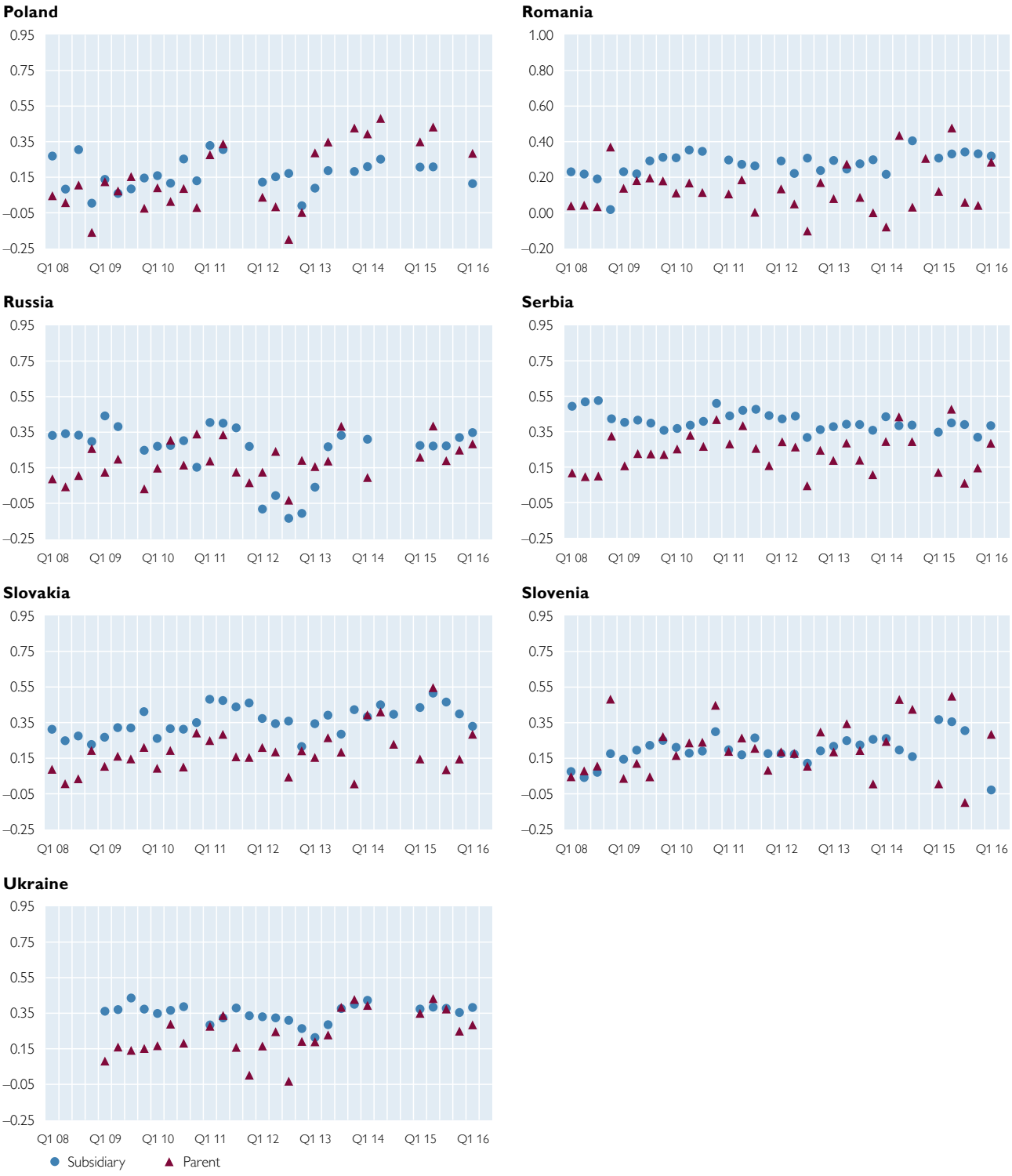
Source: Authors' calculations.

Note: The plots show the evolution of estimated Lerner index pairs of CESEE subsidiaries and corresponding Austrian parent banks (averaged over banks within a given country). To ease the readability of the plots, we limited the Lerner index to a range between –0.25 and 1. For confidentiality reasons, we do not show data for countries where only one subsidiary is present (i.e., Albania, Latvia and FYR Macedonia).

markups are higher in subsidiary countries than in the home market of the parent banks, Austria. This result is in line with literature findings that markups are generally higher in less developed countries than in more advanced economies (Coccorese, 2014; Claessens and van Horen, 2012; Delis, 2012; World Bank, 2012). At first glance, our results corroborate these general trends from the literature. Notable exceptions are the Czech Republic and Slovakia. Both countries are more advanced relative to their peers, but the markups in the banking sector are rather high (see also Kavan and Widhalm, 2014, with respect to a descriptive profitability assessment). A more systematic analysis regarding the drivers of Lerner indices is

Chart 3

Lerner index per country and over time (part 2)



Source: Authors' calculations.

Note: The plots show the evolution of estimated Lerner index pairs of CESEE subsidiaries and corresponding Austrian parent banks (averaged over banks within a given country). To ease the readability of the plots, we limited the Lerner index to a range between –0.25 and 1. For confidentiality reasons, we do not show data for countries where only one subsidiary is present (i.e., Albania, Latvia and FYR Macedonia).

carried out in the next subsection. To investigate differences between parent banks and subsidiaries further, we carry out a simple t-test for differences in the mean of the two groups, where we again average the underlying observations over time. The test – depicted in table 4 – clearly rejects the null hypothesis of equal means, which corroborates the impression gleaned from chart 1 that the Lerner index is in general higher for subsidiaries than for parent banks.

Next, we investigate time patterns of the Lerner index per country, which are depicted in charts 2 and 3. To ease the readability of the charts as well as cross-country comparison, we have limited the Lerner indices displayed to the range between –0.25 and 1.[14] Some observations emerge from the data. First, in some countries, variation over time – measured by the coefficient of variation – is much higher for subsidiaries than for the associated parent banks. Countries that fall into this category comprise Romania, Latvia and Russia. To examine the dynamics of Austrian subsidiaries and parent banks' profitability in greater detail, we regress the average Lerner index (per country) on a simple time trend plus a constant term. This exercise shows evidence for an increase in markups for subsidiaries in some economies, namely Belarus, Bulgaria, Latvia, FYR Macedonia, Slovakia and Slovenia. Given the fact that the literature indicates generally higher levels of profitability prior to the crisis (see e.g., Kavan et al., 2016), this finding might indicate a (small) recovery to pre-crisis levels. For the remaining countries, the estimates are not significant (or even negative). For some countries, regulatory changes over the sample period might partially account for this. For example, Kavan et al. (2016) point out the increase in subsidiaries' other operating expenses due to measures to curb foreign currency loans, local bank levies as well as changes in business structures.[15] As a last observation, we note that for countries in which no evidence of an increase in markups for Austrian subsidiaries was found, in many cases the associated parent banks' market power increased positively and significantly over time. We examine this potentially negative relationship between the markups of subsidiary and parent banks in more detail in the next subsection.

3.3 What drives markups of Austrian subsidiaries in CESEE?

In this section, we investigate the determinants of Austrian subsidiaries' Lerner indices, with a particular focus on the Lerner index of the parent bank. In other words, does the markup of a parent bank influence the markup of its subsidiary? Through synergies, similar business models and funding costs the parent bank could influence its subsidiaries' profit margin. Studies not looking at the subsidiary-parent bank nexus primarily relate measures of markups to bank-related variables on the one hand and macroeconomic factors on the other hand. Delis (2012) uses a panel of 84 advanced and emerging economies and finds that financial liberalization policies, the degree of economic development and the quality of institutions determine market power in the banking sector.

[14] *Observations that fall outside this range comprise those for FYR Macedonia (in the fourth quarter of 2013) and Romania (in the second and fourth quarters of 2014).*

[15] *See Beckmann (2017) for an overview of these measures for CESEE economies.*

In what follows, we regress the Lerner index for subsidiary j at time t, $L_{j,t}$, on a set of control variables:

$$L_{j,t} = \alpha_j + \beta' X_{j,t} + \varepsilon_{j,t}. \quad (7)$$

Here, $X_{j,t}$ denotes a set of K explanatory variables, $\varepsilon_{i,t}$ the idiosyncratic error term ($j \sim N(0;\sigma_e^2)$) and α_j the bank fixed effect. We opt to include a broad set of variables a priori and then use a model-selection algorithm to obtain a specification that best describes the Lerner index. The results of the selected model are then compared with established findings from the literature.

The set of possible explanatory variables draws on the empirical literature on the Lerner index and includes four bank-specific variables: (1) the Lerner index of the associated parent bank, which is our focal determinant, (2) the leverage ratio (of the subsidiary, defined as capital over assets), (3) log(total assets) as a proxy for the size of the subsidiary and the loan loss provision ratio (LLPR) to account for the riskiness of a bank's loan portfolio. We add the following macroeconomic variables: (1) year-on-year GDP growth, (2) inflation and (3) GDP per capita. Finally, we follow Delis (2012) and control for institutional quality, corruption, or financial freedom by adding (1) the overall economic freedom indicator, (2) property rights, (3) freedom from corruption, (4) economic freedom, (5) business freedom, (6) investment freedom and financial freedom, (7) control of corruption, (8) government effectiveness, (9) political stability, (10) regulatory quality and (11) rule of law indicators. Since empirical research suggests a nonlinear relationship of bank size and markups (see, e.g., Coccorese, 2014; or Fernández de Guevara and Maudos, 2007), we also include interaction terms of total assets with the remaining variables.

To examine the model space and make a choice from among the set of potential regressors, we apply the best subset algorithm of Furnival and Wilson (1974) that has been recently extended for fixed effects panel models by Siebenbrunner et al. (2017).[16] We consider the five best models for each model size if possible (there exists only one model with all possible regressors). To find the best model among the different model sizes, we apply the Bayesian information criterion. The results for the model that achieve the best fit are displayed in table 5.

Table 5

Determinants of the Lerner index

Variable name	Estimate	Standard error	t-value	Pr(>|t|)
Lerner index parent banks	–0.1661	0.0573	–2.8996	0.0038
Leverage ratio	2.1000	0.4519	4.6474	0.0000
Total assets	0.1134	0.0743	1.5272	0.1271
GDP per capita	–0.0002	0.0000	–3.2476	0.0012
Total assets x GDP per capita	0.0000	0.0000	2.0369	0.0420
Loan loss provisions	0.5026	0.2191	2.2939	0.0220
Within R2				0.06
Adjusted within R2				0.00
Overall R2				0.59
Between R2				0.48
BIC				–403.52

Source: Authors' calculations.

Several salient features emerge from the regression analysis. First,

[16] *For each of the selected fixed effects models, we test for the importance of individual effects (α_j) ex post. This is done with the Breusch-Pagan Lagrangian multiplier test (Breusch and Pagan, 1980). We also perform the test proposed by Honda (1985) as well as a standard F-test. All three tests lead to the conclusion that individual effects matter. Finally, we perform the Hausman (1978) test that tipped the scales in favor of the fixed effects model. All test statistics are available from the authors upon request.*

mostly bank-related variables turn out to be significantly related to banks' markups, namely the leverage ratio, an interaction term of total assets with real GDP per capita and loan loss provisions. The positive coefficient for the leverage ratio indicates that better-capitalized banks achieve higher markups. Since capital is the most expensive form of liability, a strong capitalization is indicative of a bank's high creditworthiness, which goes hand in hand with lower funding costs. This "reputation" effect was also demonstrated in Havrylchyk and Jurzyk (2011), while Efthyvoulou and Yildirim (2014), using broadly the same time period as in this study, do not find evidence of this effect for foreign banks. Our finding is also important from a macroprudential point of view: considering the fact that the Lerner index is a very good proxy for the profitability of banks, many arguments put forward against the requirement of better-capitalized banks when Basel III was introduced might be unsustainable.[17] Next, we find a positive and significant relationship between loan loss provisions and markups. This implies that banks with higher provisions are associated with higher markups and hints at a revenue-risk tradeoff. It basically confirms the fundamental economic theory that risk and return are correlated. The higher the risk of loan impairments is, the higher is the Lerner index. On average, banks are able to take this tradeoff into account when setting their markups.

Finally, our model-selection algorithm revealed the interaction term of real GDP per capita with the size of the bank (as measured by total assets) as an important determinant of the Lerner index of Austrian subsidiaries in CESEE.[18] The interpretation of coefficients in a linear regression model with multiplicative terms is slightly different from that of a simple linear regression. First, since both variables that form the multiplicative term are continuous, the effect of bank size on the Lerner index can only be evaluated for different values of real GDP per capita (see Brambor et al., 2006). We vary real GDP per capita from the minimum to the maximum value that we observe in our sample and calculate the respective marginal effect on the Lerner index. This exercise reveals a positive relationship between the total assets and markups of Austrian subsidiaries. This finding is in line with Coccorese (2009), who uses a large international dataset and shows that larger banks may profit from cost advantages.[19] Our results further indicate that the positive effect of total size on the Lerner index increases with real GDP per capita. This implies that the more developed the host country is in economic terms, the greater the benefits are which the subsidiary can reap from cost advantages. Due to the interaction terms included, also the interpretation of the main terms (real GDP per capita and total assets) changes compared with a standard linear regression. More precisely and focusing on the effects of total assets, the attached coefficient in table 5 indicates the effect of bank size on the Lerner index for the

[17] *See Schmitz et al. (2017) for a new view on how solvency affects banks' profitability indirectly through its interaction with funding costs.*

[18] *More precisely, the algorithm selected a model including only one parent of the interaction term, total assets times real GDP per capita, namely real GDP per capita. As outlined in Brambor et al. (2006), however, it is imperative to include all parents of the interaction term to conduct meaningful inference. We hence augmented the model to feature also total assets.*

[19] *There are also studies reporting the opposite. For example, Gunter et al. (2013) do not find a significant correlation of bank size with the Lerner index for Austrian banks. More specifically, their results show that primary banks have a higher Lerner index than non-primary banks. Primary banks in Austria operate on small regional bank markets and therefore have more information on their potential customers.*

case of zero real GDP per capita income. Similarly, the coefficient of real GDP per capita provided in table 5 refers to a bank having zero total assets. Since both situations are highly unrepresentative of our data sample, we estimate the model in table 5 without the interaction term (in which the coefficients of bank size and real GDP per capita refer to the average effects). These estimations corroborate the positive (unconditional) relationship between bank size and markups of Austrian subsidiaries, whereas the coefficient attached to real GDP per capita is statistically negative but close to zero. Finally, when turning to the focal variable – the Lerner index of the parent bank, we find a significant and negative relationship in the data. This implies that the profitability of subsidiaries is negatively related to opportunity costs – as measured by the parent banks' Lerner index – in the home markets of the parent banks. In this sense, our results generalize findings of Havrylchyk and Jurzyk (2011), who report this negative relationship only for subsidiaries in CESEE that have been acquired by taking over existing domestic banks. The negative relationship of investment conditions in parent banks' home countries and the profitability of their subsidiaries in foreign host countries is also demonstrated in Moshirian (2001) and De Haas and Van Lelyveld (2006).[20] Taken at face value, this implies that especially those banks that gain comparably smaller markups in the home market compensate for the lack of profitability with subsidiaries that are associated with higher markups. Finally, the results provided in table 5 generally hint at a very small set of factors that determine the Lerner index. In particular, the macroeconomic environment in the host country does not seem to be a determining factor for a bank's market power. Moreover, variables related to institutional quality, corruption, or financial freedom all turn out to be statistically insignificant. This contrasts results of Delis (2012), who concludes that a certain level of institutional quality is a precondition for the success of reforms that aim at enhancing competition and efficiency in the banking sector. Such differences might arise because we use post-crisis data, focus on parent banks and their subsidiaries and also on a specific region, namely Austria and CESEE, and pursue a state-of-the-art statistical framework, which has hitherto not been used in the existing literature (see Siebenbrunner et al., 2017, for more details on the statistical properties of the econometric framework).

To ensure that our results are not driven by observations related to particular countries in the sample, and since we include bank rather than country fixed effects, we carry out a robustness exercise. More precisely, we re-estimate the model provided in table 5 N=16 times, each time dropping one country from the sample. The results are provided in table 6.

The middle panel shows the median over the estimated coefficients together with +/–1 standard deviation (SD) bounds. The table indicates that the coefficients are not shaped by the inclusion of a particular country.

Table 6

Cross-country robustness exercise

	Median – 1 SD	Median	Median + 1 SD
Lerner index parent banks	–0.2255	–0.1749	–0.1243
Leverage ratio	1.7525	2.1394	2.5262
Total assets	0.0667	0.1173	0.1679
GDP per capita	–0.0002	–0.0002	–0.0001
Total assets x GDP per capita	0.0000	0.0000	0.0000
Loan loss provisions	0.3337	0.5095	0.6852

Source: Authors' calculations.

[20] *Again, this view is challenged by Efthyvoulou and Yildirim (2014), who find the counterintuitive opposite result, namely that market power of foreign banks increases with GDP growth (as a measure of opportunity costs/alternative investment) in the home country.*

4 Summary and conclusions

Over the years, subsidiaries of Austrian banks in CESEE have substantially contributed to the profitability of the Austrian banking sector. With the onset of the global financial crisis, the operating income of Austrian subsidiaries came under pressure, and profitability across the region started to diverge. This study is the first to provide a systematic assessment of profitability developments for Austrian parent and subsidiary banks for the post-crisis period and, more generally, to compare two banking markets that are interrelated via ownership. For that purpose, we have collected a unique dataset that draws on regulatory reports of over 800 banks. Market power – and thus profitability – is assessed by estimating Lerner indices, which measure the extent to which the price charged by a bank for a loan diverges from the price that would emerge under perfect competition in the market. Our results are as follows: First, we find that Lerner indices for Austrian subsidiaries in CESEE are positive and range from 0.05 (Latvia) to 0.4 (Bulgaria). The fact that markups are positive indicates a sound level of profitability. This result is well in line with a series of papers providing a descriptive assessment of profitability (Kavan and Widhalm, 2014; Kavan and Martin, 2015; Kavan et al., 2016; Wittenberger et al., 2014). Comparing estimates of the Lerner index of Austrian subsidiaries with those of their parent institutions shows that subsidiaries record – on average – higher profitability than their parent bank. This finding might empirically corroborate Austrian banks' investment decision to enter new markets in CESEE.

Second, we examine the drivers of subsidiaries' Lerner indices by evaluating a battery of competing models that include bank characteristics as well as macroeconomic data and indicators of institutional quality, economic freedom, government efficiency and corruption. Our estimates show that only a small number of factors can account for differences in estimated Lerner indices, which are mostly related to bank rather than macroeconomic factors. More specifically, Lerner indices for subsidiaries tend to be higher for well-capitalized banks, banks with higher loan loss provision ratios and larger banks in more developed economies. We thus find evidence for the importance of having well-capitalized banks, since they are not only more resilient to adverse shock but also more profitable (in normal times). That higher loan loss provisions are associated with higher markups empirically validates the well-known tradeoff between risk and return. We also find that markups are higher for larger banks due to cost efficiency gains. This effect, however, varies with the level of economic development of the host country; especially in more developed economies larger banks can fully reap the benefits of cost efficiency, which is reflected in higher markups. Our results further show that the Lerner index of the parent bank is negatively correlated with the size of the subsidiaries' markup. In combination with the finding of generally higher markups of subsidiaries in CESEE, this result implies that especially banks with rather low profitability at home chose to enter new markets. We do not find empirical evidence that macroeconomic or institutional factors play a role in determining the size of the markup.

From a policy perspective and in a world of increased financial globalization, our study highlights the need for policy coordination between home and host countries. First, the expansionary business model of Austrian parent banks conquering markets in CESEE seems justified from a profitability perspective. Our results empirically underpin the important role the CESEE region plays for the Austrian

banking sector. They also show that higher profitability often goes hand in hand with higher risks. That said, an exogenous shock – as witnessed in 2008 – can also hit the home country, turning a regionally diversified profit base into an important risk buffer. Second, also host-country authorities have to closely monitor the macroeconomic environment of the parent banks' home countries: as evidenced in this study, investment opportunities in home countries may result in a decrease of markups in host countries, which in turn impacts on financial stability in the host countries.

References

Agoraki, M., M. Delis and F. Pasiouras. 2011. Regulations, competition and bank risk-taking in transition countries. In: Journal of Financial Stability 7(1). 38–48.

Angelini, P. and N. Cetorelli. 2003. The Effects of Regulatory Reform on Competition in the Banking Industry. In: Journal of Money, Credit and Banking 35(5). 663–684.

Barisitz, S. 2008. Banking Transformation (1989–2006) in Central and Eastern Europe – with Special Reference to Balkans. Bank of Greece Working Paper 78/2008.

Barisitz, S. and S. Gardó. 2009. Banking Sector Transformation in CESEE. In: Focus on European Economic Integration. Special Issue. December. Vienna: OeNB. 92–100.

Beck, T., O. De Jonghe and G. Schepens. 2013. Bank competition and stability: Cross-country heterogeneity. In: Journal of Financial Intermediation 22(2). 218–244.

Beckmann, E. 2017. How does foreign currency debt relief affect households' loan demand? Evidence from the OeNB Euro Survey in CESEE. In: Focus on European Economic Integration Q1/17. Vienna: OeNB. 8–32.

Bonin, J., I. Hasan and P. Wachtel. 2005. Bank performance, efficiency and ownership in transition countries. In: Journal of Banking & Finance 29(1). 31–53.

Brambor, T., W. Clark and M. Golder. 2006. Understanding Interaction Models: Improving Empirical Analyses. In: Political Analysis 14(1). 63–82.

Bresnahan, T. 1989. Empirical Studies of Industries with Market Power. In: Schmalensee, R. and R.D. Willig (eds.). Handbook of Industrial Organization. Amsterdam: North Holland.

Breusch, T. and A. Pagan. 1980. The Lagrange Multiplier Test and its Applications to Model Specification in Econometrics. In: Review of Economic Studies 47(1). 239–253.

Buch, C. 2000. Why Do Banks Go Abroad? – Evidence from German Data. In: Financial Markets, Institutions & Instruments 9(1). 33–67.

Carbó Valverde, S. and F. Rodríguez Fernández. 2007. The determinants of bank margins in European banking. In: Journal of Banking & Finance 31(7). 2043–2063.

Claessens, S. and N. van Horen. 2012. Being a foreigner among domestic banks: Asset or liability? In: Journal of Banking & Finance 36(5). 1276–1290.

Coccorese, P. 2009. Market power in local banking monopolies. In: Journal of Banking & Finance 33(7). 1196–1210.

Coccorese, P. 2014. Estimating the Lerner index for the banking industry: a stochastic frontier approach. In: Applied Financial Economics 24(2). 73–88.

Cull, R., M. S. Martinez Peria and J. Verrier. 2017. Bank Ownership: Trends and Implications. IMF Working Paper 17/60.

De Haas, R. and I. Van Lelyveld. 2006. Foreign banks and credit stability in Central and Eastern Europe: A panel data analysis. In: Journal of Banking & Finance 30(7). 1927–1952.

Delis, M. 2012. Bank competition, financial reform, and institutions: the importance of being developed. In: Journal of Development Economics 97(2). 450–465.

Detragiache, E., T. Tressel and P. Gupta. 2008. Foreign banks in poor countries: theory and evidence. In: The Journal of Finance 63(5). 2123–2160.

Efthyvoulou, G. and C. Yildirim. 2014. Market power in CEE banking sectors and the impact of the global financial crisis. In: Journal of Banking and Finance 40. 11–27.

Fernández de Guevara, J. and J. Maudos. 2007. Explanatory factor of market power in the banking system. In: The Manchester School 75(3). 275–296.

Fischer, K. and H. Hempel. 2006. Regional Markets, Oligopoly, and Market Power in Banking. Unpublished.

Furnival, G. and R. Wilson. 1974. Regressions by Leaps and Bounds. In Technometrics 16(4). 499–511.

Gormley, T. A. 2014. Costly information, entry, and credit access. In: Journal of Economic Theory 154. 633–667.

Green, C., V. Murinde and I. Nikolov. 2004. The Efficiency of Foreign and Domestic Banks in Central and Eastern Europe: Evidence on Economies of Scale and Scope. In: Journal of Emerging Market Finance 3(2). 175–205.

Gunter, U., G. Krenn and M. Sigmund. 2013. Macroeconomic, Market and Bank-Specific Determinants of the Net Interest Margin in Austria. In: Financial Stability Report 25. Vienna: OeNB. 87–101.

Hausman, J. 1978. Specification tests in econometrics. In: Econometrica 46(6). 1251–1271.

Havrylchyk, O. and E. Jurzyk. 2011. Profitability of foreign banks in Central and Eastern Europe. In: Economics of Transition 19(3). 443–472.

Honda, Y. 1985. Testing the Error Components Model with Non-Normal Disturbances. In: Review of Economic Studies 52(4). 681–690.

Jeon, B., M. Olivero and J. Wu. 2011. Do foreign banks increase competition? Evidence from emerging Asian and Latin American banking markets. In: Journal of Banking & Finance 37(3). 952–972.

Kavan, S. and F. Martin. 2015. The profitability of Austrian banks' subsidiaries in Croatia, Hungary and Romania and how the financial crisis affected their business models. In: Financial Stability Report 29. Vienna: OeNB. 58–71.

Kavan, S. and D. Widhalm. 2014. Austrian subsidiaries' profitability in the Czech Republic and Slovakia – CESEE margins with an Austrian risk profile. In: Financial Stability Report 28. Vienna: OeNB. 59–68.

Kavan, S., G. Ebner, E. Endlich, A. Greiner, M. Gruber, G. Hobl, M. Ohms, V. Redak, A. Schober-Rhomberg, P. Stockert, D. Widhalm and T. Wittenberger. 2016. The profitability of Austrian banking subsidiaries in CESEE: driving forces, current challenges and opportunities. In: Financial Stability Report 32. Vienna: OeNB. 64–79.

Lerner, A. P. 1934. The Concept of Monopoly and the Measurement of Monopoly Power. In: The Review of Economic Studies 1(3). 157–175.

Moshirian, F. 2001. International investment in financial services. In: Journal of Banking & Finance 25(2). 317–337.

Pawłowska, M. 2012. Competition, concentration and foreign capital in the Polish banking sector (prior and during the financial crisis). National Bank of Poland Working Paper 130.

Poghosyan, T., and A. Poghosyan. 2010. Foreign bank entry, bank efficiency and market power in Central and Eastern European countries. In: Economics of Transition 18(3). 571–598.

Schmitz, S., M. Sigmund and L. Valderrama. 2017. Bank Solvency and Funding Cost: New Data and New Results. IMF Working Paper 17/116.

Siebenbrunner, C., M. Sigmund and S. Kerbl. 2017. Can bank-specific variables predict contagion effects? In: Quantitative Finance. Forthcoming.

Sigmund, M., U. Gunter, and G. Krenn 2017. How do Macroeconomic and Bank-Specific Variables Influence Profitability in the Austrian Banking Sector? Evidence from a Panel Vector Autoregression Analysis. In: Economic Notes. Forthcoming.

Turk-Ariss, R. 2010. On the implications of market power in banking: Evidence from developing countries. In: Journal of Banking & Finance 34(4). 765–775.

Weill, L. 2013. Bank competition in the EU. How has it evolved? In: Journal of International Financial Markets, Institutions & Money 26. 100–112.

Wittenberger, T., D. Widhalm, M. Lahnsteiner and S. Barisitz. 2014. Macrofinancial developments in Ukraine, Russia and Turkey form an Austrian financial stability perspective. In: Financial Stability Report 27. Vienna: OeNB. 64–73.

World Bank. 2012. Global Financial Development Report 2013. Rethinking the Role of the State in Finance.