Bank Capital and Risk in Europe and Central Asia Ten Years After the Crisis

Deniz Anginer
Asli Demirgüç-Kunt
Davide S. Mare

Abstract

This paper examines changes in bank capital and capital regulations since the global financial crisis, in the Europe and Central Asia region. It shows that banks in Europe and Central Asia are better capitalized, as measured by regulatory capital ratios, than they were prior to the crisis. However, the increase in simple equity ratios for the same banks has been smaller over the past 10 years. The increases in regulatory capital ratios have coincided with a reduction in the stringency of the definition of Tier 1 capital and reduction in risk-weights. Further analyses show that

bank risk in Europe and Central Asia is more sensitive to changes in simple leverage ratios than in regulatory capital ratios, consistent with the notion that equity ratios only include high-quality capital and do not rely on internal risk models to compute risk-weights. Although there has been some effort to increase capital and liquidity requirements for institutions deemed systemically important, the region has been lagging in addressing the resolution of these institutions.

Bank Capital and Risk in Europe and Central Asia Ten Years After the Crisis

Deniz Anginer, Asli Demirgüç-Kunt, Davide S. Mare[1]

I   Introduction

The Global Financial Crisis (GFC) sparked by the failure of Lehman Brothers in September 2008 caused severe economic damage across the globe. Countries in the Europe and Central Asia (ECA) region were particularly hit by the crisis.[2] Ten years after the failure of Lehman, economic outputs of many countries in ECA are still well below levels that would have prevailed had output followed its pre-crisis trend (IMF 2018). Figure 1 shows the cumulative output loss as percentage of trend GDP for a sample of ECA countries. In addition to direct economic costs associated with lost output and lost investments, there are also significant long-term societal costs that result from lower economic activity and higher unemployment. Ten years later, the region is still recovering from the economic damage caused by the financial crisis.

Figure 1: Cumulative Output Loss (% of Trend GDP)
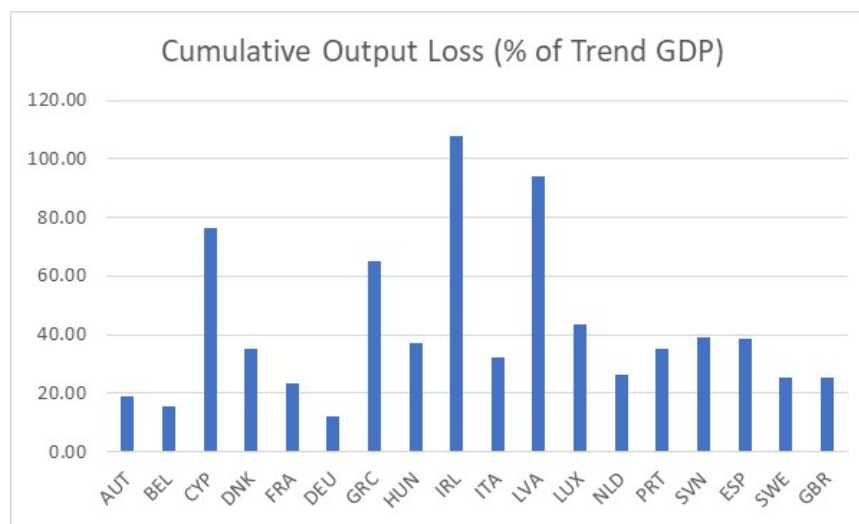
Source: Laeven and Valencia (2018). For economy codes, see https://www.nationsonline.org/oneworld/economy_code_list.htm.

Although, there were many fault lines that triggered the GFC, the thin capital buffers held at many banks to cover unexpected losses resulted in greater spillovers into the real economy, increasing the severity of the crisis. Many banks lacked high-quality capital to absorb losses, requiring governments to step in and provide liquidity and capital support using taxpayer funds. [3] The fiscal costs of this financial support have been especially high in the ECA region. Figure 2 below shows the peak amount of liquidity

---

[2] See Table A1 in the Appendix for the list of countries included in ECA and the sub-regional classification. For an account of the crisis in Emerging Europe see Bakker and Klinge (2012).

[3] How the crisis unfolded in the different countries was driven by specific characteristics of their banking systems. For example, in Central, Eastern, and South Eastern Europe banking systems are dominated by banks headquartered in Western Europe (see Fontán et al. (2019).

1

support as a percentage of GDP in a selected number of countries. In addition to direct costs of capital and liquidity support and state guarantees, there are indirect economic costs that are more difficult to quantify. In particular, distortions to incentives for risk-taking and monitoring of financial institutions as a result of bailouts will likely have long-lasting effects.

Figure 2: Peak Liquidity Support (% of GDP)

Source: Laeven and Valencia (2018). For economy codes, see https://www.nationsonline.org/oneworld/economy_code_list.htm.

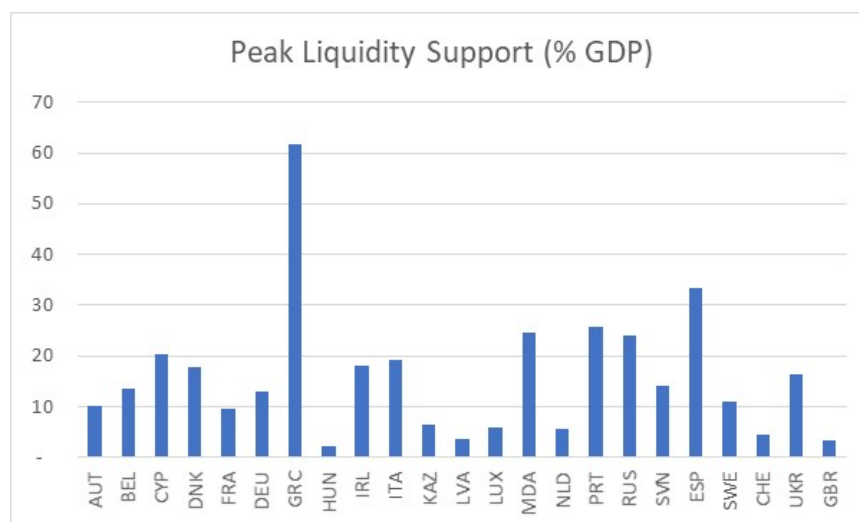In response to the GFC, following policy goals set by the Basel Committee on Banking Supervision (BCBS), a number of ECA countries introduced legislation and regulatory reforms to strengthen capital requirements, particularly in Western Europe with the introduction of Capital Requirements Directive IV (CRD IV, Directive 2013/36/EU), the Capital Requirements Regulation (CRR, Regulation 575/2013), and the Bank Recovery and Resolution Directive (BRRD, Directive 2014/59/EU).[4] These reforms include increasing regulatory capital requirements as well as changes in what constitutes higher quality capital. The reforms also introduced or updated frameworks for the recovery and resolution of credit institutions and surcharges for institutions deemed systemically important, both domestically and globally to help limit the economic damage posed by large financial institutions and to strengthen market discipline.

In this paper, using data from the most recent Bank Regulation and Supervision Survey (BRSS) conducted by the World Bank (Anginer et al., 2019), we examine changes in capital structure for banks in the ECA region as well as changes in capital regulations that have been implemented in the aftermath

---

[4] Reforms introduced in Western Europe have a direct impact on other countries in the ECA region through direct compliance of financial groups headquartered in one of these countries and indirectly through for example the signaling function of the new standards or the need to adopt regulatory standards in countries that seek accession to the European Union.

of the GFC. In discussing capital regulations, it is important to keep in mind that the banking systems in ECA differ from the rest of the world in four key aspects.

First, banks in the ECA region are more interconnected through shared regulation, shared ownership structures and shared risk exposures. Due to geographical proximity, it is not uncommon to find banks operating in several ECA countries located nearby. Competing in the same markets exposes banks to common sources of market and credit risk shocks. Within the region, merger and acquisition (M&A) activity was at an all-time high prior to the GFC (Dermine, 2006) creating shared ownership structures within ECA. Banks located in countries that are members of the Euro Zone share a common currency and come under the regulatory purview of the European Central Bank and the European Banking Authority. All these interlinkages amplify risks and result in spillovers across national borders.

Second, banking sectors in ECA countries are highly concentrated. Figure 3 shows the share of assets held by the top three and top five largest banks. The figure shows average values for ECA countries grouped into different regions (see Table A1 for region classifications). Concentration is especially high in the EU group of countries (i.e., Western Europe, Southern Europe, Northern Europe) and in Central Asia. There is variation with some of the larger countries having more fragmented markets, whereas smaller countries are characterized by more concentrated banking sectors. The Russian Federation, in particular, has seen a substantial increase in bank concentration over the past 10 years.[5]

---

[5] As reported in the BRSS 2019, part of the increase in concentration may be attributed to small bank failures during the period 2011-2016.

Figure 3: Five bank concentration index (2007-2017, equally weighted)
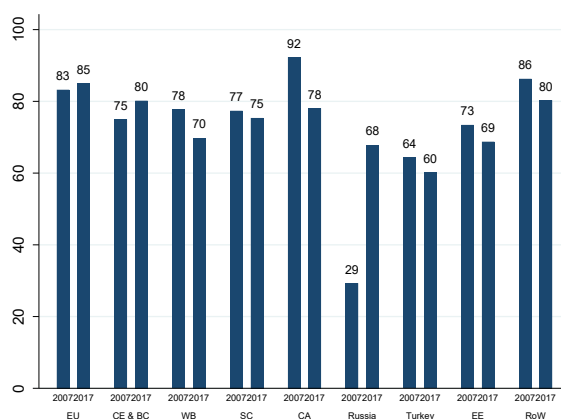
Source: Global Financial Development Database (World Bank).
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW** for the rest of the world.

Third, state ownership of banks is a key feature in the ECA region (Figure 4). State ownership is especially high in Eastern Europe and in Russia. Even in large high-income countries like Germany, the public authorities are still active players in the banking sector. After the GFC, governments stepped in to rescue distressed banks by injecting capital in order to stabilize markets (for instance in Belgium, The Netherlands, Slovenia and the United Kingdom). Government ownership naturally brings up issues of efficiency and political influence (Altunbas et al., 2001; Bonin et al., 2005; Dinç, 2005). Within the context of capital regulations, state ownership affects transparency, risk-taking and market discipline.

Figure 4: State Ownership (% of Banking Sector Assets, equally weighted)
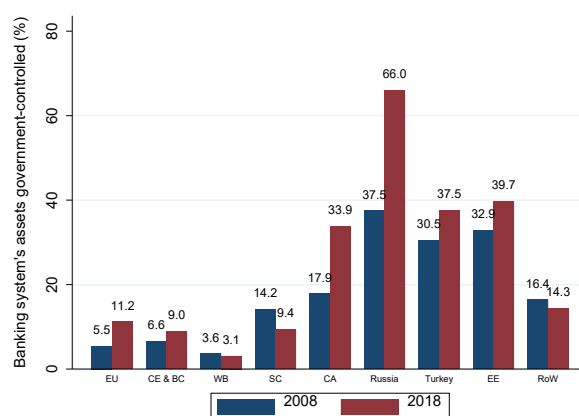
Source: Bank Regulation and Supervision Survey conducted by the World Bank and national sources.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus – data not available for 2008; **CA** for Central Asia; **EE** for Eastern Europe; **ROW** for the rest of the world. Data for ECA sub-regions is as per year end 2018 and is obtained from national sources with the help of colleagues in Finance, Competitiveness and Innovation global practice of the World Bank. Data from the ROW is per year-end 2016.

4

Finally, the region includes a number of smaller economies at different stages of development. For smaller, developing economies in the region, the principle of proportionality must be kept in mind when thinking about policies designed to enhance capital rules. The level of public intervention should not exceed what is appropriate to achieve the social objectives. Developing countries in the region may lack market depth, scale and may face institutional capacity constraints. Therefore, some of the macro-prudential regulations designed for more sophisticated banking sectors may not be appropriate for smaller countries in ECA, with banks engaging in traditional lending activities (i.e., raise deposits and provide loans).

II   Changes in Bank Capital Structure Since the Crisis

Bank capital is an integral part of financial stability as it provides a cushion for absorbing losses during times of distress (for example, Repullo, 2004; von Thadden, 2004). Capital requirements also have indirect stabilizing effects through their effect on the incentives of bank owners to improve risk management and curb excessive risk-taking. Consistent with this argument, a number of theories emphasize that higher capitalization improves the borrower screening and risk monitoring functions of banks, and thereby reduces bank risk (Coval and Thakor, 2005; Allen et al., 2011; Holmstrom and Tirole, 1997; Mehran and Thakor, 2011). It is thus not surprising that high capitalized banks had better performance during the GFC. Figure 5 shows the average return-on-assets (ROA) during the GFC for high and low capitalized banks in the ECA region. On average, highly capitalized banks have suffered lower losses. Central Asia is the only sub-region where highly capitalized banks have seen negative return on assets though low capitalized banks sustained larger losses.

Figure 5: Average ROA 2008-2010 for High and Low Capitalized Banks.

Source: Archived data from Bureau van Dijk's Bankscope and BankFocus.
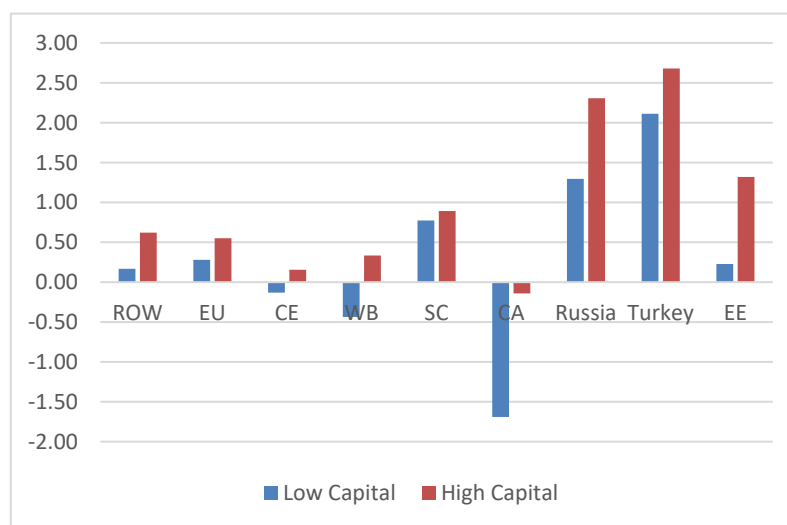
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW** for the rest of the world. Capital is calculated using simple leverage (Equity/Total Assets). High (Low) capital banks are those that have capital ratios above (below) the median in a given country in 2007.

In discussions of bank capital, it is important to distinguish between economic capital and regulatory capital. Bank economic capital can be defined as the value of the equity of a bank that can withstand losses. It has the lowest priority if the bank liquidates. Although there are several types of equity instruments, equity consists mainly of common equity and profits retained by a bank or obtained from selling shares to investors.[6]

Regulatory capital is the amount of capital that banks are required to hold by domestic supervisors and regulators. Regulatory capital can include financial instruments other than common equity and is typically divided up into tiers. Tier 1 consists of higher quality capital that is made mostly of common stock held by a bank. Tier 2 capital is designated as supplementary capital and includes items such as revaluation reserves, undisclosed reserves, hybrid instruments, and subordinated debt. Items (other than common equity) that can be included as part of Tier 1 capital varies across countries. Regulatory capital ratio is calculated as the sum of Tier 1 and Tier 2 capital divided by risk-weighted assets (RWA). To calculate RWA, the assets on a bank's balance sheet are assigned weights based on their risk level. Domestic sovereign bonds, for instance, typically receive a weight of zero.[7] The notion of risk-

---

[6] Measuring equity is not simple because its value depends on how all financial instruments and on– and off–balance sheet assets of banks are valued (Berger et al., 1995).

[7] The regulatory treatment of sovereign debt has been subject to heated debate especially in Europe following the 2012 sovereign debt crisis (BCBS 2017). Sovereign bonds of fiscally distressed countries such as Greece receive a risk-weight of zero for the purposes of regulatory capital calculation.

weighting assets was introduced by the first Basel capital accord (BCBS, 1988) to distinguish risk of different asset types and require banks to hold more capital against portfolio items with higher risk.

Figure 6 below shows the minimum regulatory capital requirements. On average most of the ECA sub-regions set capital requirements (as % of RWA) well above the average for the rest of the world. There are, however, some important differences. On average EU countries set the lowest capital requirements, but these countries are also more apt to have in place additional capital surcharges, meaning that the minimum regulatory capital set for banks is, in practice, higher than before the financial crisis. Countries in Central Europe and Baltic countries, Turkey and Russia had higher capital requirements than the EU in 2008 but lowered their capital regulatory requisites by the end of 2016.

Figure 6: Mean regulatory capital requirements (% of RWA, equally weighted)
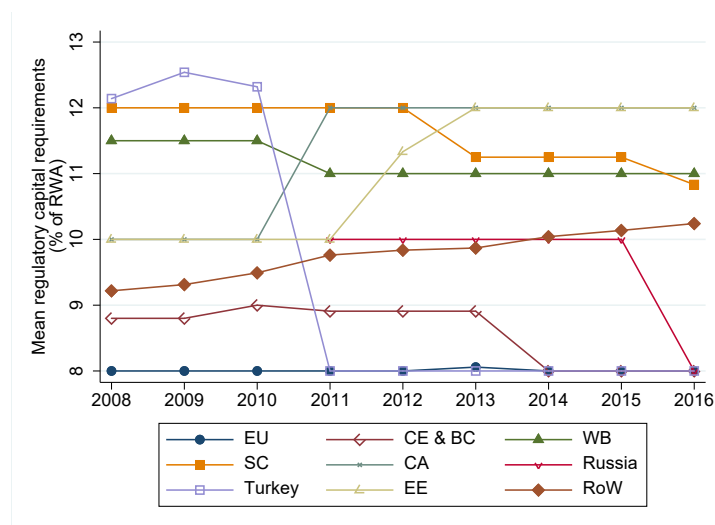
Source: Bank Regulation and Supervision Survey conducted by the World Bank.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW** for the rest of the world.

Since capital acts as a buffer against liquidity, information and economic shocks, the quality of capital is important in determining the solvency of a bank. Lower quality capital tends to be made of components that are difficult to value and can be subject to information asymmetries. Capital elements other than common equity can thus be significantly undervalued during times of distress, reducing their effectiveness to act as a cushion against shocks. Risk exposures are also difficult to estimate, and current regulations provide substantial discretion to banks in determining risk-weights. Risk-weights can thus be manipulated by banks to meet or to improve regulatory requirements. A number of studies have shown that risk-weights only weakly reflect the actual risks of banks' operations and can be manipulated through securitization and use of complex risk models (Le Leslé and Avramova, 2012; Acharya et al., 2013; Mariathasan and Merrouche, 2014). Consistent with the notion that there is significant discretion

in the computation of regulatory capital ratio, Demirguc-Kunt et al. (2013) find that stock returns of banks during the financial crisis were more sensitive to simple leverage ratios using common equity rather than regulatory risk-based ratios.
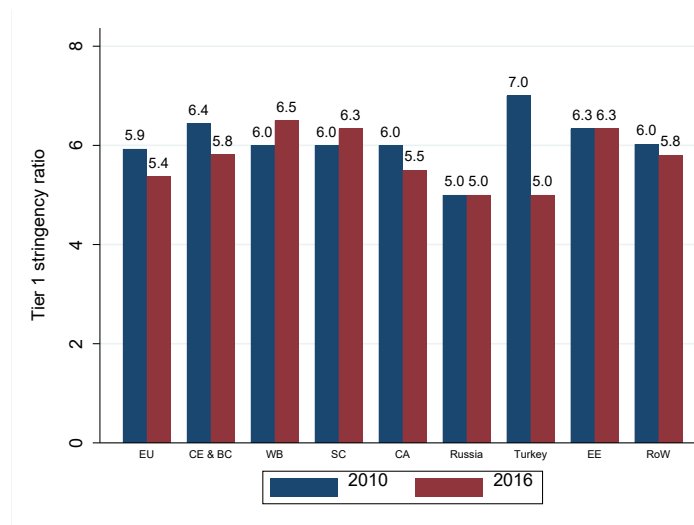
The recent Global Financial Development Report (GFDR) also highlights the importance of defining capital more narrowly. GFDR (2019/2020) shows that there was a relaxation in the definition of the elements that enter the computation of Tier 1 capital, with an increase in the number of countries now allowing hybrid debt capital instruments, asset revaluation gains and subordinated debt to be used in the computation of Tier 1 capital. Although there has been an increase in regulatory capital ratios after the crisis, GFDR (2019/2020) shows that these were largely driven by declines in risk-weighted assets. Improvements in simple leverage ratios were more limited especially for larger banks located in high-income countries.

The definition of the capital elements that constitute Tier 1 capital has also become less stringent in the ECA region.[8] Figure 7 below shows the changes in an index that captures the stringency of the Tier 1 capital definition. The index ranges between 0 and 8, and is based on the number of components that are allowed as part of Tier 1 regulatory capital (less stringent) and those that are not allowed as part of Tier 1 regulatory capital (more stringent).[9] The capital instruments that may be allowed into the definition of Tier 1 capital are: a) hybrid debt capital instruments, b) asset revaluation gains, and c) subordinated debt. The instruments that might be deducted from Tier 1 capital are: a) goodwill, b) deferred tax assets, c) intangibles, d) unrealized losses in fair valued exposures, and e) investment in the capital of certain financial intermediaries. Overall, in most of the ECA sub-regions the definition of Tier 1 capital was less stringent in 2016 than in 2010, except for Western Balkans, South Caucasus and Russia.

Figure 7: Tier 1 Stringency Index (equally weighted)

---

[8] One of the intended goals of the Basel III capital framework was to improve the quality of bank regulatory capital. To this end, the proportion of Tier 1 capital in the total regulatory capital has been increased. The additional items that are included in the Tier 1 capital are also now subject to more stringent eligibility criteria. Nonetheless, the quality of Tier 1 capital gets diluted when additional instruments other than common equity are allowed in its computation.

[9] For an in-depth explanation on how the Tier 1 stringency index is computed, see Anginer et al. (2019).

Tier 1 stringency ratio

EU: 5.9 / 5.4
CE & BC: 6.4 / 5.8
WB: 6.0 / 6.5
SC: 6.0 / 6.3
CA: 6.0 / 5.5
Russia: 5.0 / 5.0
Turkey: 7.0 / 5.0
EE: 6.3 / 6.3
RoW: 6.0 / 5.8

■ 2010   ■ 2016

Source: Bank Regulation and Supervision Survey conducted by the World Bank.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW** for the rest of the world.

Having made a distinction between regulatory and economic capital, we examine how these capital ratios have changed in the region over the past 10 years using bank-level information on over 20,000 banks. In the analyses that follow, regulatory capital (RC/RWA) is calculated as the sum of Tier 1 and Tier 2 capital divided by risk weighted assets. The equity ratio (Equity/TA), also referred to as the simple leverage ratio, is calculated as total common equity divided by total assets. We also examine how risk-weighted assets have changed over time by calculating risk-weighted assets as a percentage of total assets (RWA/TA).[10] Figure 8 shows the evolution of regulatory capital ratios in the ECA sub-regions. Because many countries are dominated by a few large banks, we show changes in capital ratios for both large and small banks. Large banks are defined as banks that are in top 20th percentile in terms of total assets in a given country for each year. Although there is variation across countries, overall there has been an increase in regulatory capital ratios especially for larger banks. Excluding EU countries, on average in ECA regulatory capital has increased 5 percentage points between 2007 and 2017.

---

[10] The time trends for the ratios in Figures 8, 9 and 10 are given in the appendix (Figures A1, A2, and A3, respectively).

Figure 8: Regulatory capital over RWA

| Panel A: Top 20% banks | Panel B: Bottom 80% banks |
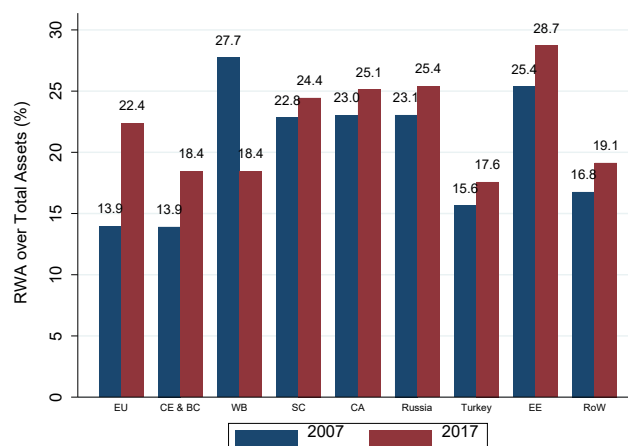
Source: Archived data from Bureau van Dijk's Bankscope and BankFocus.
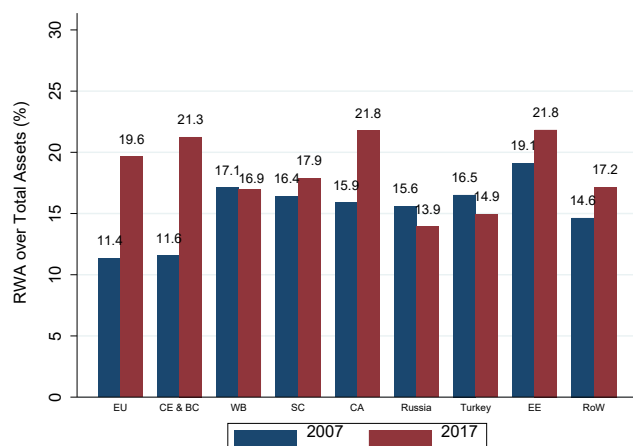Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe. We report means weighted by bank size.

While regulatory capital has been increasing, the increases in simple leverage ratios have been more limited. Figure 9 shows how average capital over total assets ratio (simple leverage ratio) has changed over the past ten years. EU countries started from a lower base in 2007 and have increased their leverage ratios more than other ECA sub-regions over time. Nonetheless, on average large banks in EU still have lower capital holdings than large banks in other ECA sub-regions. In general, by the end of 2017 smaller banks hold more capital (as a % of total assets) than their larger counterparts except for Central Europe and Baltic countries, Turkey and Western Balkans. In the same vein, by the end of 2017 there appears to be on average a wide gap between leverage ratios of small banks and large banks, especially in Russia, Eastern Europe and South Caucasus. Overall, simple leverage ratios increased 1.3 percentage points between 2007 and 2017 excluding ECA EU countries.

Figure 9: Capital over Total Assets (%) – top 20% banks and bottom 80%

Panel A: Top 20% banks   **Panel B: Bottom 80% banks**

Source: Archived data from Bureau van Dijk's Bankscope and BankFocus.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe. We report means weighted by bank size.

Regulatory capital could have increased because of increases in the level and quality of regulatory capital or because of decreases in the measures factored into calculating total risk exposure. As we have seen, Tier 1 stringency has declined. We examine if there has been a similar decline in risk-weighted assets. Figure 10 shows the development over time of RWA (as a % of total assets). In general, for both small and large banks, the RWA ratio has declined over the past 10 years. This is especially true for EU banks that have the lowest average value in 2017. This development could be explained in part by a portfolio composition effect with an increase in the share of government bonds, which carry lower risk weights, due to the introduction of the Basel III liquidity requirements (Bonner, 2016), and the monetary policy interventions of the European Central Bank (Krishnamurthy et al., 2018).

Figure 10: RWA over Total Assets (%) – top 20% banks and bottom 80%

Panel A: Top 20% banks   Panel B: Bottom 80% banks
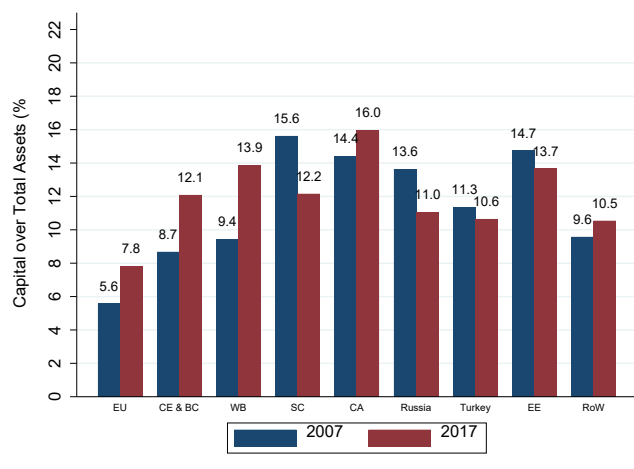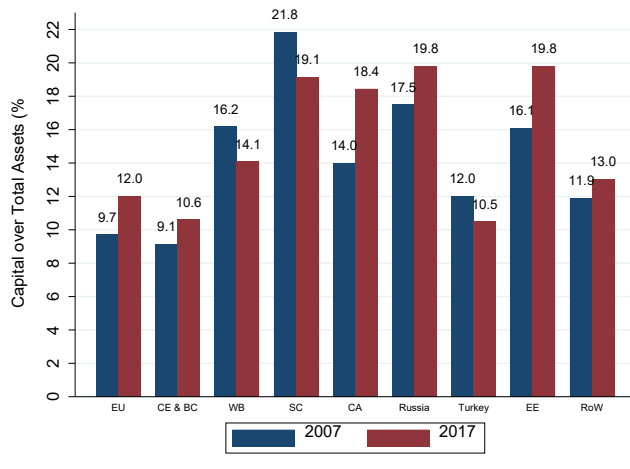

Source: Archived data from Bureau van Dijk's Bankscope and BankFocus.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe. We report means weighted by bank size.

The declines in risk-weighted assets could be driven by improvements in asset quality in the aftermath of the crisis. As risk-weights only weakly reflected the true asset risks of banks prior to the crisis, this decline raises concerns about the accuracy of measures of risk-weighted assets and questions about the improvements in regulatory capital ratios. When we examine the difference between regulatory capital ratios and simple leverage ratios, we find that the gap between the two ratios has been widening over the past decade. Figure 11 shows the gap or the difference between these two ratios. We observe that in most ECA regions the gap between total regulatory capital and capital to assets ratios has increased between 2007 and 2017. The gap is larger for the largest institutions and for banks located in the EU, Central Europe and the Baltic countries, Eastern Europe and for large banks in Central Asia. This suggestive evidence highlights the importance of the computation of risk weights in the assessment of the capital adequacy of banks in ECA countries.

Figure 11: Difference (gap) between regulatory capital over RWA and capital over total assets

| Panel A: Top 20% banks | Panel B: Bottom 80% banks |

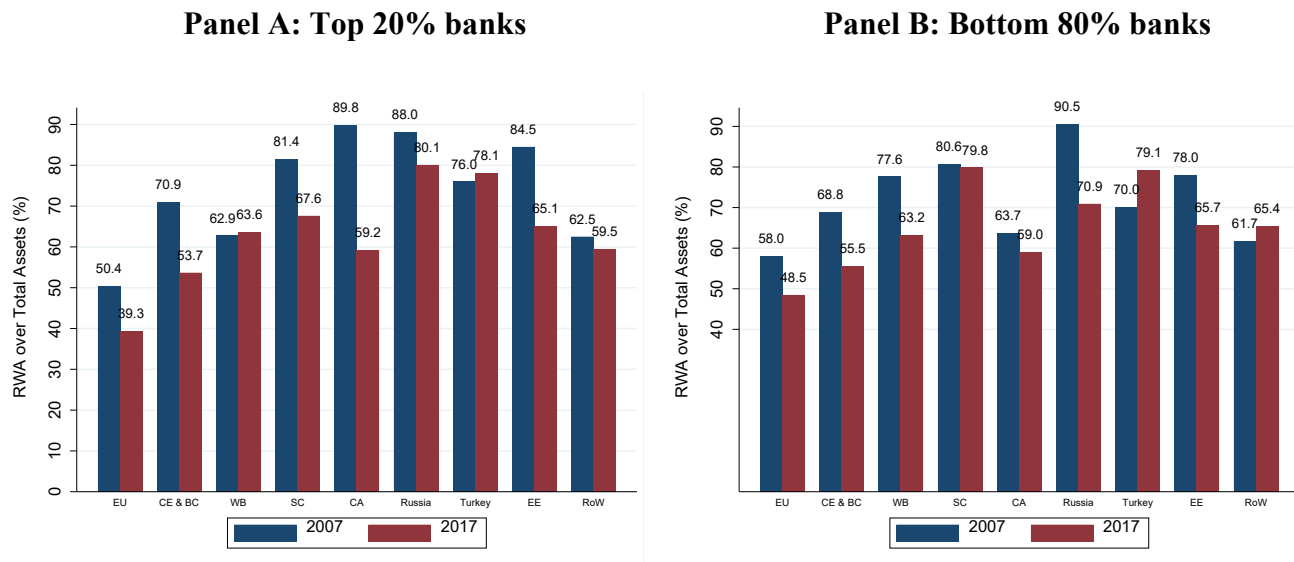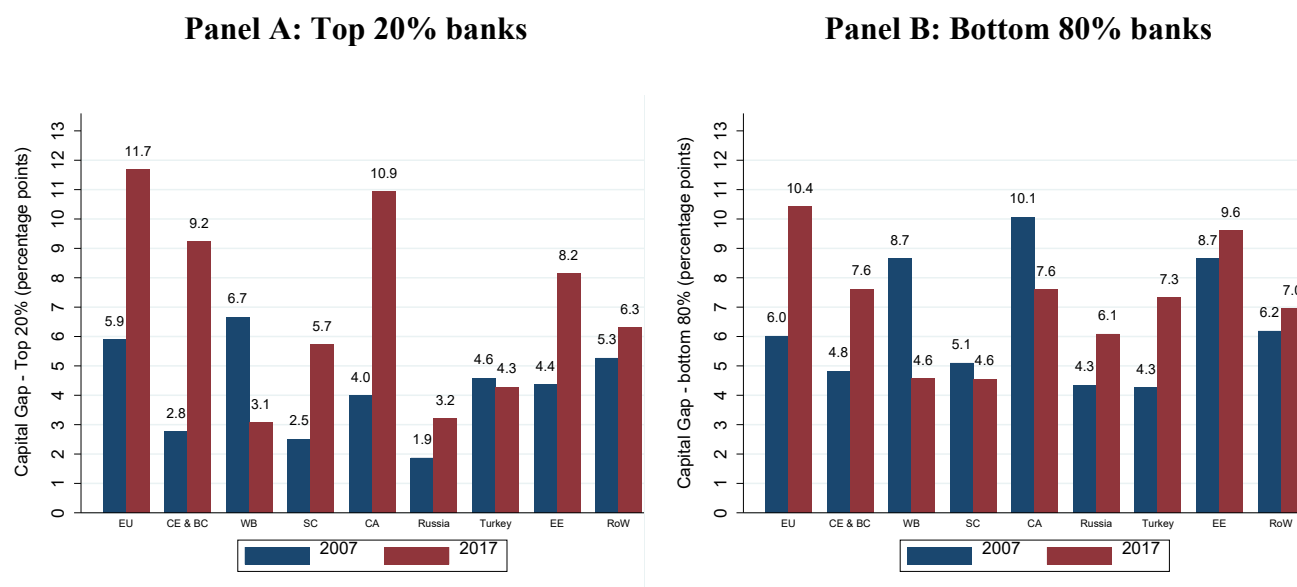Source: Own calculation using archived data from Bureau van Dijk's Bankscope and BankFocus.

Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe.

Significant changes in risk-weights and declines in the stringency of what constitutes Tier 1 capital call into question how informative these indicators are for bank risk. To test the importance of these variables, we next examine how bank risk is related to the quality of bank capital and risk-weights using bank-level information collected through Bankscope and Bank Orbis. Our measure of bank risk is the z-score, which is calculated as the sum of average bank returns on assets (net income divided by total assets) and the bank equity to assets ratio, scaled by the standard deviation of return on assets over a four-year rolling window. A higher z-score indicates lower bank risk (Mare et al., 2017).

In the first analyses we examine the relationship between bank risk (z-score) and regulatory capital (RC/RWA) and simple leverage (Equity/TA). The sample includes only developing countries in the ECA region and excludes high-income countries. In the analyses we control for a number of bank-level variables. These controls are: bank size (log(TA)), which is the natural logarithm of total assets; bank liquidity, which is liquid assets divided by total assets (LiquidA/TA); bank profitability measured as return-on-assets (ROA); reliance on short-term funding measured as short-term funding divided by total assets (ShortFund/TA); and loan ratio which is net loans divided by total assets (Loans/TA). All capital ratios and controls are lagged by one year. We also include year and region fixed effects to control for macro and region-specific factors that may affect the relationship between capital and bank risk. The descriptive statistics of the variables used in the regression analyses are reported in Table 1.

Table 1: Descriptive statistics

Variables	Obs	mean	St Dev	min	median	max
Z-Score	117209	51.406	80.964	0.003	24.640	518.494
RC/RWA	112559	18.322	9.735	0.010	15.790	100.000
Equity/TA	144116	12.209	10.107	0.000	9.888	81.818
RC/RWA - Equity/TA	112497	7.273	6.046	-4.054	5.957	35.518
T1C/TC	95711	90.280	9.212	0.521	92.518	100.000
RWA/TA	93078	64.203	15.856	0.007	65.363	100.000
size	144451	6.115	1.971	2.304	5.793	15.203
ROA	144100	0.718	2.511	-97.328	0.707	8.333
ShortFunds/TA	142766	9.143	13.530	0.000	3.575	70.990
Loans/TA	142845	59.011	18.569	0.000	61.465	92.130
Liquid A/TA	143980	17.158	16.326	0.000	11.888	85.586

The results are reported in Table 2 below. We find that both regulatory capital and simple leverage reduce bank risk (columns 1 and 2). However, when we run a horse race between the two capital ratios (column 3), we find that only the simple leverage ratio retains its significance in reducing bank risk. In other words, after controlling for simple leverage, regulatory capital ratios do not have explanatory power for bank risk. In the last column (column 4), we examine how the gap between regulatory capital and simple leverage ratios (RC/RWA - Equity/TA) is related to bank risk. We find that after controlling for regulatory capital, bank risk increases with the gap. That is, the higher the gap, the higher becomes the banks' risk.

Table 2: Relationship Between Bank risk and Capital Ratios (developing ECA)

VARIABLES	(1) Z-Score	(2) Z-Score	(3) Z-Score	(4) Z-Score
size	-0.417	0.025	0.083	0.038
	(0.724)	(0.712)	(0.716)	(0.704)
ROA	0.261	0.093	0.091	0.090
	(0.285)	(0.301)	(0.303)	(0.301)
ShortFunds/TA	-0.205***	-0.185***	-0.189***	-0.189***
	(0.061)	(0.059)	(0.060)	(0.061)
Loans/TA	-0.001	-0.045	-0.026	-0.027
	(0.087)	(0.090)	(0.087)	(0.088)
Liquid A/TA	-0.172**	-0.136	-0.146*	-0.135
	(0.087)	(0.088)	(0.087)	(0.087)
RC/RWA	0.422***		0.161	0.687***
	(0.137)		(0.151)	(0.158)
Equity/TA		0.655***	0.510***	
		(0.175)	(0.183)	
RC/RWA - Equity/TA				-0.668***
				(0.239)
Constant	30.077***	27.661***	25.234***	25.973***

	(9.370)	(9.242)	(9.397)	(9.319)
Observations	4,276	4,276	4,276	4,276
R-squared	0.130	0.133	0.133	0.133
Year x Country FE	Yes	Yes	Yes	Yes

Note: *, **, and *** represent statistical significance at 10%, 5%, and 1% two-tailed level, respectively. Robust standard errors in parentheses clustered at the bank level. All independent variables are lagged one year.

Figure 12 shows the estimates from the regression results reported in column 3, Table 2. The figure shows the impact on z-score of increasing capital ratios by 10% after all controls. The lines represent one standard error around the point estimates. The impact of simple leverage ratios on bank risk is both economically and statistically more significant than the impact of regulatory ratios on bank risk. A 10% increase in simple leverage would result in a bank moving from median to the 60th percentile in risk rankings after all controls and after holding regulatory capital constant.

Figure 12: Relationship Between Bank Risk and Regulatory Capital and Simple Leverage
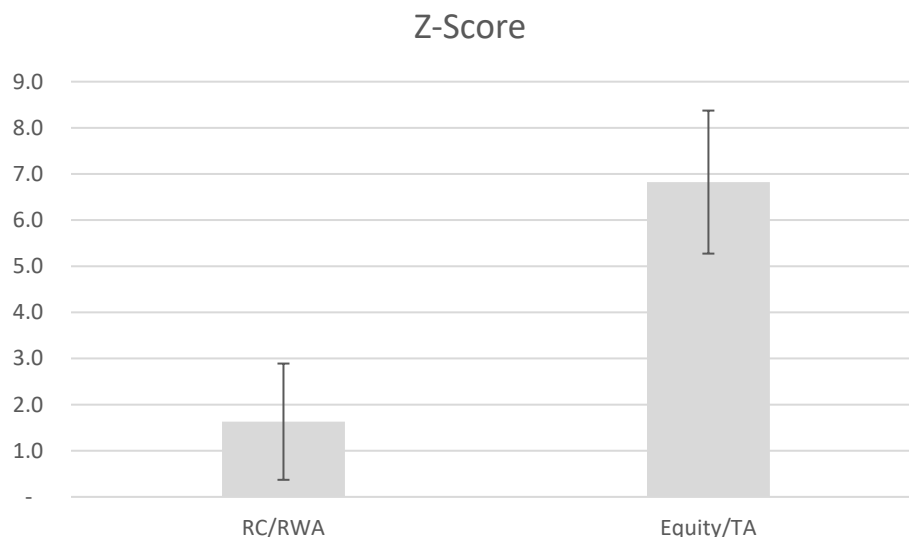
Source: Own calculation using archived data from Bureau van Dijk's Bankscope and BankFocus.

Note: We report the effect on the Z-Score of moving from increasing regulatory capital (RC/RWA) and simple leverage (Equity/TA) by 10%. The estimates are obtained after controlling for bank size (log(TA)), bank liquidity (LiquidA/TA), bank profitability (ROA), reliance on short-term funding (ShortFund/TA), and loan ratio (Loans/TA).

We also examine the impact on bank risk of having a higher proportion of bank capital in the form of Tier 1, which is captured by the coefficient on the variable Tier 1 Capital over Regulatory Capital (Tier 1C/ RC). In the second specification we capture the impact of having a higher portion of risk-weighted assets, which is captured by the coefficient on the variable RWA/TA. We use the same bank control variables in both specifications reported in Table 1. All capital ratios and controls are lagged by one year. The coefficient on the Tier 1C/ RC variable captures the impact of having higher proportion of capital in the form of Tier 1. Since we control for the overall level of regulatory capital, the coefficient

on this variable captures the marginal impact of having greater proportion of capital in the form of Tier 1 capital, holding the overall capital ratio constant. Similarly, the coefficient on the RWA/TA variable captures the impact of having higher proportion of bank assets with higher risk-weights. We interact these variables with dummy variables for ECA high-income and ECA developing countries to estimate their differential impact by level of economic development.

The results are reported in Table 3 below. Overall, we find that risk-weights are less informative in the ECA region in both high-income and developing countries, though for high-income countries the magnitude of the negative relationship is higher. Higher regulatory risk-weights are associated with higher future bank risk. But this relationship is significantly muted for banks located in the ECA region (Table 3, columns 1 and 3). The results suggest that risk-weights are less informative in the ECA region compared to the rest of the world.

Table 3: Relationship Between Risk-weights, Capital Quality and Bank Risk

	(1)	(2)	(3)	(4)
VARIABLES	Z-Score	Z-Score	Z-Score	Z-Score
Size	-1.555***	-1.086***	-1.451***	-0.759***
	(0.235)	(0.245)	(0.277)	(0.291)
ROA	6.007***	5.780***	5.527***	5.121***
	(0.244)	(0.264)	(0.283)	(0.282)
ShortFunds/TA	-0.149***	-0.193***	-0.329***	-0.322***
	(0.040)	(0.039)	(0.046)	(0.045)
Loans/TA	-0.194***	-0.367***	-0.179***	-0.411***
	(0.042)	(0.037)	(0.046)	(0.041)
Liquid A/TA	-0.950***	-0.944***	-0.952***	-0.953***
	(0.044)	(0.045)	(0.050)	(0.051)
RC/RWA	1.163***	1.393***	1.190***	1.343***
	(0.096)	(0.101)	(0.099)	(0.104)
ECA High Income	-4.328	118.950***		
	(4.489)	(8.522)		
ECA Emerging			-36.760***	38.170***
			(6.713)	(8.851)
RWA/TA	-0.496***		-0.522***	
	(0.045)		(0.046)	
ECA High Income * RWA/TA	0.372***			
	(0.069)			
ECA Emerging* RWA/TA			0.488***	
			(0.090)	
T1C/RC		0.362***		0.456***
		(0.060)		(0.061)

ECA High Income * T1C/TC		-1.094***		
		(0.096)		
ECA Emerging* T1C/TC				-0.524***
				(0.103)
Constant	90.862***	28.654***	93.608***	24.845***
	(4.502)	(6.810)	(4.727)	(7.292)
Observations	78,022	81,661	67,671	69,672
R-squared	0.105	0.104	0.094	0.090
Year FE	Yes	Yes	Yes	Yes

Note: *, **, and *** represent statistical significance at 10%, 5%, and 1% two-tailed level, respectively. Robust standard errors in parentheses clustered at the bank level. All independent variables are lagged one year.

The figure below shows the estimates from the regression analyses. A 10% increase in RWA/TA results in a significant increase in risk (-3.5 decline in the z-score) in countries excluding ECA, which is represented by the first bar in the figure. However, the impact of a similar increase in the ECA high-income and developing regions is negligible, which are represented by the other two bars in the figure.

Figure 13: Relationship Between Risk-weights and Bank Risk
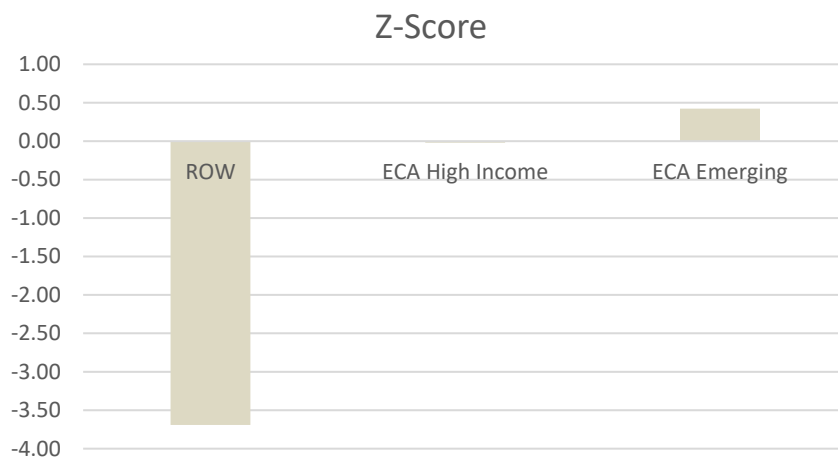
Source: Own calculation using archived data from Bureau van Dijk's Bankscope and BankFocus.
Note: We report the effect on the Z-Score of increasing risk weighted assets (RWA/TA) by 10% for EU ECA countries and the other ECA countries (Emerging ECA). The estimates are obtained after controlling for bank size (log(TA)), bank liquidity (LiquidA/TA), bank profitability (ROA), reliance on short-term funding (ShortFund/TA), and loan ratio (Loans/TA).

Examining the impact of the proportion of Tier 1 in regulatory capital, we find that the quality of capital matters in reducing bank risk. Consistent with the notion that capital that is not Tier 1 can be severely undervalued during times of distress and not able to absorb shocks, we find that capital is less effective in reducing bank risk if a higher proportion of it is in the form of Tier 2 capital. However, as mentioned earlier, what constitutes Tier 1 capital varies across countries and Tier 1 stringency is lower in the ECA region. If supervisors can limit what can be included as Tier 1, we would expect a greater

17

proportion of Tier 1 capital to have a greater impact in reducing risk in countries that impose greater stringency. The results suggest that a higher proportion of Tier 1 is less effective in reducing risk in the ECA region in both high-income and developing countries (Table 3, columns 2 and 4).

These results highlight the importance of how capital is defined. In particular, we find that simple leverage ratios are more informative than regulatory capital when it comes to explaining bank risk. Lower quality capital that is not common equity has lower loss absorptive capacity. Properly measuring risk exposure for computing risk-weights is also very difficult especially for large and complex financial organizations. There is also much discretion in the calculation of risk-weights, which creates the possibility of manipulation. As a growing number of countries in ECA have adopted or implemented components of Basel II and III, more banks (especially large banks) are relying on internal models for the calculation of risk-weights. Figure 14 below shows Basel implementation in each ECA group. While smaller, low-income countries have been shifting out of Basel I, most have adopted Basel II/III compared to other developing countries.

Figure 14: Basel Implementation as of 2016
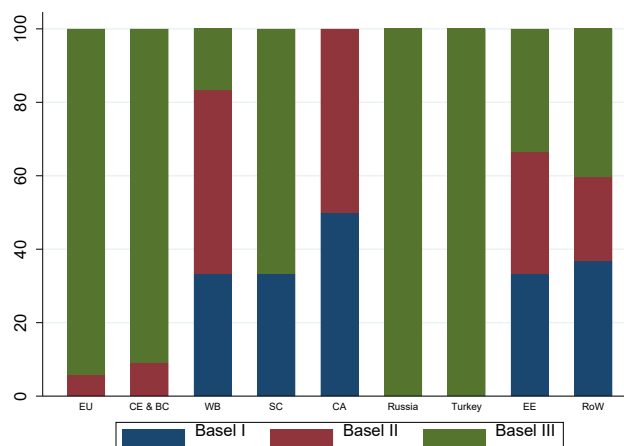
Source: Bank Regulation and Supervision Survey conducted by the World Bank.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW** for the rest of the world.

Basel III addresses some of the weaknesses related to quantity and quality of capital that we have highlighted. In particular, under Basel III the common equity ratio is 4.5% of risk-weighted assets, up from 2% under Basel II. Basel III also introduces an additional capital conservation buffer of 2.5% of common equity. Tier III capital is eliminated, and a supplemental minimum 3% leverage ratio is imposed as a backstop to the risk-based capital requirement. This leverage ratio is calculated as Tier 1 capital over total assets and is thus not based on risk-weighted assets. Although the use of a simple

leverage ratio is a step in the right direction, it is not clear whether 3% will be enough to cover bank losses should a crisis of a similar magnitude as the GFC occur again.

Reliance on internal models to compute risk-weights continues under Basel III. Figure 15 shows the percentage of countries in each ECA group adopting different approaches for calculating capital requirements for credit risk. Russia, Turkey and all countries in the CE and BC regions use an internal model for computing credit risk which determines risk-weights used in regulatory capital. Other developing countries in the ECA region have been selective in adopting some of the Basel II/III provisions, opting to use a standardized approach to calculating credit risk. As our analyses have shown, this is not necessarily a bad thing. It makes more sense to focus on a framework that is transparent and robust for computing credit risk. It is also important to keep in mind the notion of proportionality and incorporate the framework that reflects the characteristics of the local financial systems and refrain from incorporating unnecessarily complex and costly elements of Basel II/III.

Figure 15: Approach for Calculating Capital Requirements for Credit Risk as of 2016

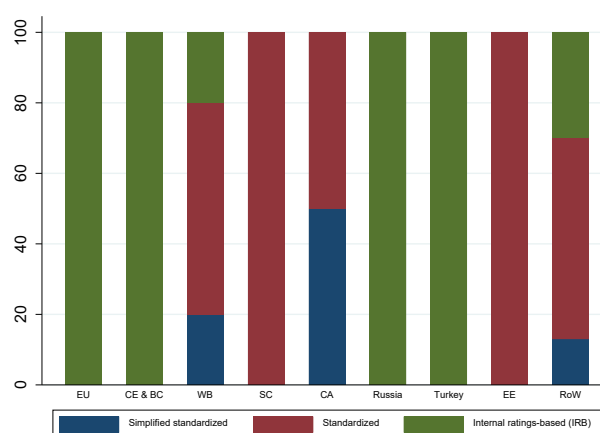Source: Bank Regulation and Supervision Survey conducted by the World Bank.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for WesternBalkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW** for the rest of the world.

III   Regulation of Systemically Important Financial Institutions in ECA

One of the important objectives of the new capital regulations introduced after the GFC has been to protect the public from the economic damage caused by the failure of the so called systemically important financial institutions (SIFIs). Because of the market's perception that these institutions are too-big and too-interconnected to fail, there is a concern that SIFIs may engage in excessive and correlated risk-taking. The governments are then forced to step in and provide capital and liquidity

support in order to avoid costly liquidation.[11] Growing size and concentration of banks poses a critical challenge for ECA because of the economic and political ramifications connected to the failure of these large financial institutions. Although the banks in the ECA developing region are small in absolute terms, they are large in comparison to the local economies. Sberbank in Russia with assets over US$400 billion, for instance, is one of the largest banks in Europe. Since 2007, the top 5 banks by asset size have grown larger in all ECA sub-regions except in Central Europe and the Baltic countries (Figure 16).

Figure 16: Top 5 Bank Assets as a % of GDP

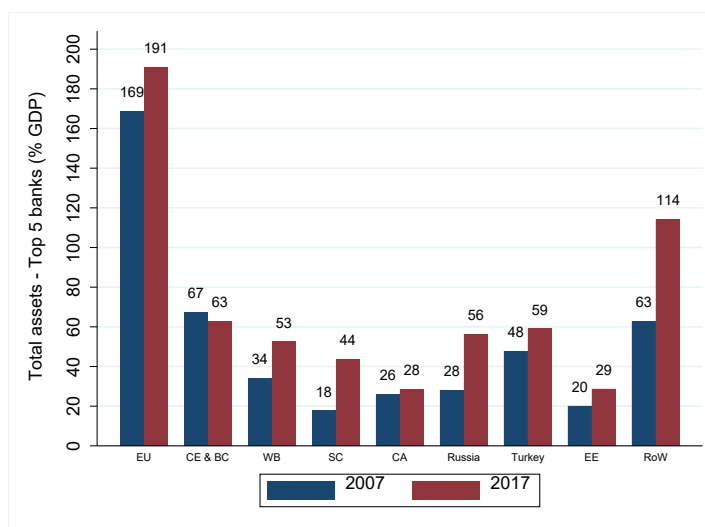Source: Own calculation using archived data from Bureau van Dijk's Bankscope and BankFocus.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe.

Following guidelines and international standards set by the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS), new rules and regulations have been put in place to limit economic damage posed by SIFIs and to strengthen market discipline. Specifically, there are higher capital and liquidity requirements overall and additional surcharges for institutions deemed systemically important. There are also new rules for the orderly resolution of large banks and new requirements for these banks to hold bail-in debt.[12] These additional capital requirements are intended to provide enough equity cushion to make these institutions more resilient and to internalize the social impact of their failure.

---

[11] Government interventions to support national banking systems were widespread during the global financial crisis, especially because of the systemic relevance of the distressed institutions. Systemic risk grows with bank size (Laeven et al., 2016) and with the degree of interconnection with the interbank network (Drehmann and Tarashev, 2013).

[12] The BCBS set guidelines to identify both global and domestic systemically important banks. The assessment is based on the average of 12 indicators associated with five dimensions of systemic risk: size, interconnectedness, substitutability/financial institution infrastructure, complexity, and cross-jurisdictional activity (BCBS, 2018).

The implementation of these new rules and regulations has been uneven across different countries in the region. Figure 17 below shows the percentage of countries in each ECA group that have implemented new capital and liquidity requirements according to the latest BRSS survey. Russia and Turkey, where some of the largest banks are located, have imposed new capital surcharges for banks deemed systemically important. Additional liquidity requirements are still to be implemented in the majority of ECA countries.

Figure 17: Capital and Liqudity Requirements on SIFIs
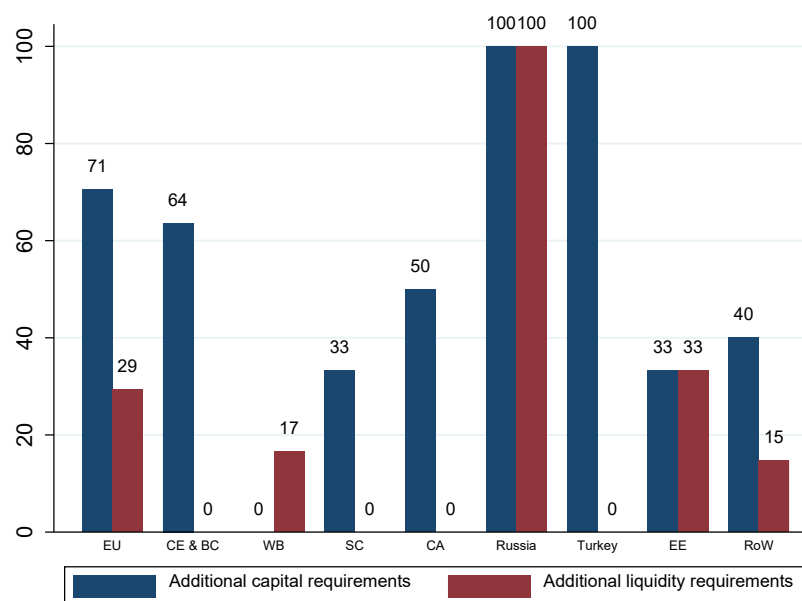
Source: Bank Regulation and Supervision Survey conducted by the World Bank.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW for** the rest of the world.

Another important element of new regulations has been to provide a robust framework for the resolution of systemically important banks. The bankruptcy of Lehman Brothers in 2008 highlighted the many difficulties in resolving large banks with multiple business lines in different countries subject to local regulations in those countries. Moreover, without a specific resolution regime for large/interconnected financial institutions, supervisory authorities lack the tools to intervene in the pre-insolvency stage and activate contingent plans to resolve large financial institutions in an orderly manner, preventing major disruptions to the financial system and the real economy, and minimizing the risk of loss for taxpayers. Figure 18 below shows the percentage of countries in each region that have implemented policies for the resolution of large financial institutions. The ECA region lags behind the rest of the world in addressing resolution of SIFIs. This is especially a concern for Turkey and Russia which host some of the largest banks that are internationally active in the ECA region.
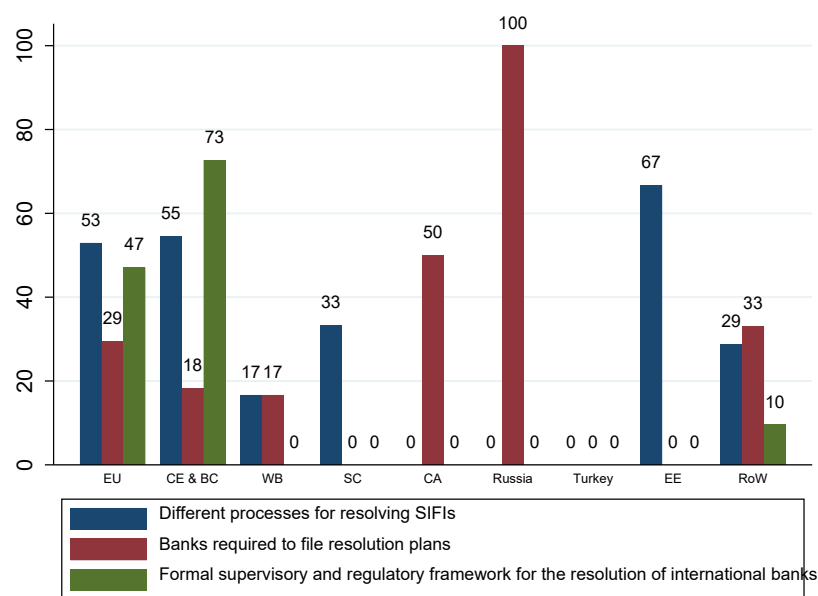
Figure 18: Resolution of SIFIs

Source: Bank Regulation and Supervision Survey conducted by the World Bank.
Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe; **ROW for** the rest of the world**.**

Finally, it is important to note that some of the largest banks in the region are partially or wholly owned by the state. Hence, there is a concern that resolution procedures may not be fully implemented due to political and public pressures. Moreover, the resolution rules may also not have the intended effect of strengthening market discipline as bank managers and investors expect the governments to step in and rescue these institutions that they perceive to be too-important to fail. By the same token, there are challenges that arise in introducing the core bank resolution building blocks proposed after the GFC. For instance, in the absence of well-developed financial markets in many ECA countries, there is no market for contingent convertible debt that can turn into equity if a pre-specified financial stress occurs (Fontán et al., 2019; GFDR 2019/2020).

IV Conclusion

The global financial crisis revealed significant weaknesses in capital regulations that were in place prior to the crisis. Financial institutions lacked high-quality capital to weather the crisis, resulting in government support to rescue these financial institutions. After the GFC, several reforms have been implemented to strengthen capital requirements and to address risk posed by systemically important financial institutions.

Ten years after the crisis, the banks in the ECA region are better capitalized as measured by regulatory capital ratios. However, the increase in simple equity ratios for the same banks has been much more limited. Moreover, the increases in regulatory capital ratios have coincided with a reduction in Tier 1 stringency and reduction in risk-weights. We show that bank risk in ECA is more sensitive to changes in simple leverage ratios than it is for regulatory capital ratios. This is because the equity ratios only include high-quality capital and do not rely on internal risk models to compute risk-weights. Whether the regulatory capital proves to be adequate in the next crisis will depend on the accuracy of risk weights in truly capturing forward-looking risk and on the loss absorbing capacity of lower quality capital that is now part of Tier 1 during a crisis.

Although small in absolute terms, developing countries in the ECA region host some of the largest banks relative to the size of their economies. The region has been lagging behind in addressing the resolution of systemically important institutions within their borders. A number of these SIFIs are also internationally active and operate outside national borders. Progress has been slow in setting up international co-operation for cross-border resolution. Given the significant state ownership of banks in ECA, how resolution will work in practice also remains unclear.

References

Acharya, V. V., Schnabl, P., Suarez, G., 2013. Securitization without risk transfer. J. financ. econ. 107, 515–536. https://doi.org/10.1016/j.jfineco.2012.09.004

Allen, F., Carletti, E., Marquez, R., 2011. Credit Market Competition and Capital Regulation. Rev. Financ. Stud. 24, 983–1018. https://doi.org/10.1093/rfs/hhp089

Altunbas, Y., Evans, L., Molyneux, P., 2001. Bank Ownership and Efficiency. J. Money, Credit Bank. 33, 926. https://doi.org/10.2307/2673929

Anginer, D., Can Bertay, A., Cull, R., Demirgüç-Kunt, A., Mare, D.S., 2019. Bank Regulation and Supervision ten years after the Global Financial Crisis (No. WPS 9044), Policy Research Working Papers. Washington, DC.

Bakker, B.B., Klinge, C., 2012. How Emerging Europe Came Through the 2008/09 Crisis : An Account by the Staff of the IMF's European Department. The International Monetary Fund, Washington, DC, USA. https://doi.org/http://dx.doi.org/10.5089/9781616353810.071

Basel Committee on Banking Supervision, 2018. Global Systemically Important Banks: Revised Assessment Methodology and the Higher Loss Absorbency Requirement. Basel, Switzerland.

Basel Committee on Banking Supervision, 1988. International Convergence of Capital Measurement and Capital Standards. Basel.

Bonin, J.P., Hasan, I., Wachtel, P., 2005. Bank performance, efficiency and ownership in transition countries. J. Bank. Financ. 29, 31–53. https://doi.org/10.1016/j.jbankfin.2004.06.015

Bonner, C., 2016. Preferential Regulatory Treatment and Banks' Demand for Government Bonds. J. Money, Credit Bank. 48, 1195–1221. https://doi.org/10.1111/jmcb.12331

Coval, J.D., Thakor, A. V., 2005. Financial intermediation as a beliefs-bridge between optimists and pessimists. J. financ. econ. 75, 535–569. https://doi.org/10.1016/J.JFINECO.2004.02.005

Demirguc-Kunt, A., Detragiache, E., Merrouche, O., 2013. Bank capital: Lessons from the financial crisis. J. Money, Credit Bank. 45, 1147–1164. https://doi.org/10.1111/jmcb.12047

Dermine, J., 2006. European banking integration: Don't put the cart before the horse. Financ. Mark. Institutions Instruments. https://doi.org/10.1111/j.0963-8008.2006.00114.x

Dinç, I.S., 2005. Politicians and banks: Political influences on government-owned banks in emerging markets. J. financ. econ. 77, 453–479. https://doi.org/10.1016/j.jfineco.2004.06.011

Fontán, I.A., Beck, T., D'Hulster, K., Lintner, P., Unsal, D.F., 2019. Banking regulation and supervision in the EU. Effects on small host countries in central, eastern, and south eastern Europe. Vienna.

Holmstrom, B., Tirole, J., 1997. Financial Intermediation, Loanable Funds, and The Real Sector. Q. J. Econ. 112, 663–691. https://doi.org/10.1162/003355397555316

Krishnamurthy, A., Nagel, S., Vissing-Jorgensen, A., 2018. ECB Policies Involving Government Bond Purchases: Impact and Channels*. Rev. Financ. 22, 1–44. https://doi.org/10.1093/rof/rfx053

Laeven, L., Valencia, F., 2018. Systemic banking crises revisited (No. WP/18/206), IMF Working Paper. Washington, DC.

Le Leslé, V., Avramova, S., 2012. Revisiting Risk-Weighted Assets. Why Do RWAs Differ Across Countries and What Can Be Done About It ? (No. WP/12/90), IMF Working Paper. Washington, DC.

Mare, D.S., Moreira, F., Rossi, R., 2017. Nonstationary Z-Score measures. Eur. J. Oper. Res. 260. https://doi.org/10.1016/j.ejor.2016.12.001

Mariathasan, M., Merrouche, O., 2014. The manipulation of basel risk-weights. J. Financ. Intermediation 23, 300–321. https://doi.org/10.1016/j.jfi.2014.04.004

Mehran, H., Thakor, A., 2011. Bank capital and value in the cross-section. Rev. Financ. Stud. 24, 1019–1067. https://doi.org/10.1093/rfs/hhq022

Repullo, R., 2004. Capital requirements, market power, and risk-taking in banking. J. Financ. Intermediation 13, 156–182. https://doi.org/10.1016/j.jfi.2003.08.005

The World Bank, 2020. Global Financial Development Report 2019/2020 - Bank Regulation and Supervision a Decade after the Global Financial Crisis. The World Bank, Washington, DC.

von Thadden, E.L., 2004. Bank capital adequacy regulation under the new Basel accord. J. Financ. Intermediation 13, 90–95. https://doi.org/10.1016/j.jfi.2003.04.002

APPENDIX

Table A1: ECA regions used in the analyses

Europe and Central Asia	European Union (EU) and Western Balkans	European Union - OECD (EU)			Central Europe and Baltic Countries (CE)	Western Balkans (WB)
		Western Europe (WE)	**Southern Europe (SE)**	**Northern Europe (NE)**		
		Austria	Cyprus	Denmark	Bulgaria	Albania
		Belgium	Greece	Finland	Croatia	Bosnia and Herzegovina
		France	Italy	Sweden	Czech Republic	Kosovo
		Germany	Malta		Estonia	Montenegro
		Ireland	Portugal		Hungary	Republic of North Macedonia
		Luxembourg	Spain		Latvia	Serbia
		The Netherlands			Lithuania	
		United Kingdom			Poland	
					Romania	
					Slovak Republic	
					Slovenia	
	Eastern Europe and Central Asia	**South Caucasus (SC)**	**Central Asia (CA)**	**Russia**	**Turkey**	**Eastern Europe (EE)**
		Armenia	Kazakhstan			Belarus
		Azerbaijan	Kyrgyz Republic			Moldova
		Georgia	Tajikistan			Ukraine
			Turkmenistan			
			Uzbekistan			

Table A2: Bank capital in ECA (average in 2017, banks equally weighted)

Economy	Equity/TA	RC / RWA	RWA / TA	Tier 1 C / RC	RC/RWA – Equity/TA
Albania	12.268	18.884	54.265	91.347	6.581
Armenia	18.464	26.056	77.348	76.176	7.155
Austria	11.133	21.315	49.803	89.999	11.020
Azerbaijan	17.948	23.909	63.894	80.706	8.022
Belarus	23.563	27.420	74.834	78.033	6.140
Belgium	16.685	24.203	38.483	93.958	14.781
Bosnia and Herzegovina	15.391	17.591	70.299	93.293	2.386
Bulgaria	13.301	20.378	56.879	95.021	7.538
Croatia	11.255	18.484	55.005	86.111	7.478
Cyprus	12.189	20.248	54.637	96.141	9.251
Czech Republic	11.091	18.674	45.838	95.352	9.072
Denmark	12.880	20.501	60.763	94.593	7.621
Estonia	14.794	26.939	54.733	91.825	12.145
Finland	15.048	50.518	32.732	99.099	35.523
France	11.373	20.890	36.341	89.480	8.737
Georgia	22.653	27.814	84.324	73.091	5.161
Germany	10.239	18.654	58.725	86.298	8.542
Greece	16.089	19.144	78.114	97.733	3.056
Hungary	9.648	17.469	50.452	89.230	6.932
Ireland	17.905	20.119	43.145	92.580	7.718
Italy	10.661	20.374	50.283	96.678	9.849
Kazakhstan	21.027	32.539	62.229	82.958	12.113
Kyrgyz Republic	21.321	27.418	53.808	89.685	7.843
Latvia	11.838	20.580	58.253	81.004	8.846
Lithuania	10.048	18.662	49.038	96.418	8.614
Luxembourg	14.438	25.727	38.569	96.596	15.718
North Macedonia	12.093	17.349	74.338	-	5.256
Malta	8.991	18.351	49.401	95.808	8.991
Moldova	21.388	41.284	43.836	98.135	20.352
Montenegro	14.817	23.143	52.759	-	8.128
Netherlands	17.630	22.494	43.941	92.338	9.630
Poland	9.867	17.753	59.857	91.207	7.899
Portugal	12.528	23.362	46.894	96.334	11.976
Romania	11.606	22.018	50.458	88.154	12.053
Russian Federation	23.502	27.611	73.054	77.083	5.442
Serbia	19.930	26.852	65.007	89.569	6.922
Slovak Republic	9.906	16.240	59.166	93.668	6.257
Slovenia	10.584	16.961	57.923	93.514	6.377
Spain	13.682	18.289	47.268	93.436	9.021
Sweden	14.947	21.808	54.395	97.206	6.862
Tajikistan	26.512	-	-	-	-
Turkey	19.995	19.914	73.661	80.913	6.652
Turkmenistan	6.632	-	-	-	-
Ukraine	26.016	34.952	62.137	87.200	8.946
United Kingdom	20.859	25.244	48.351	88.282	11.941
Uzbekistan	19.129	29.124	62.724	75.192	3.282
ECA	13.534	22.609	54.846	89.207	10.033

Source: Bureau van Dijk's BankFocus.

Table A3: Regulation of SIFIs

	Does the banking supervisor have any additional tools to oversee more closely and/or limit the activities of large/interconnected institutions?				
	a. Additional capital requirements	b. Additional liquidity requirements	c. Asset/risk diversification requirements	d. Restrictions/limits on activities	e. Restrictions/limits on size of institution
Austria	0	0	0	0	0
Belgium	1	0	0	1	0
Denmark	0	0	0	0	0
Finland	1	0	0	1	0
France	0	0	0	0	0
Germany	1	0	0	0	0
Ireland	0	0	0	0	0
Luxembourg	1	1	1	1	1
Netherlands	1	1	1	1	0
Sweden	1	1	0	0	0
United Kingdom	1	0	0	1	0
Cyprus	1	0	0	0	0
Greece	1	0	0	0	0
Italy	1	0	0	0	0
Malta	1	0	1	1	0
Portugal	0	1	0	0	0
Spain	1	1	0	1	0
Albania	0	0	0	0	0
Bosnia and Herzegovina	0	0	0	0	0
Bulgaria	0	0	0	0	0
Croatia	1	0	0	0	0
Czech Republic	1	0	0	0	0
Estonia	0	0	0	0	0
Hungary	1	0	0	0	0
Kosovo	0	0	0	0	0
Latvia	1	0	0	0	0

	Does the banking supervisor have any additional tools to oversee more closely and/or limit the activities of large/interconnected institutions?				
	a. Additional capital requirements	b. Additional liquidity requirements	c. Asset/risk diversification requirements	d. Restrictions/limits on activities	e. Restrictions/limits on size of institution
Lithuania	0	0	0	0	0
Republic of N Macedonia	0	0	0	0	0
Montenegro	0	0	0	0	0
Poland	1	0	0	0	0
Romania	1	0	0	0	0
Serbia	0	1	1	1	1
Slovak Republic	0	0	0	0	0
Slovenia	1	0	0	0	0
Armenia	0	0	0	0	0
Azerbaijan	0	0	0	0	0
Belarus	0	0	0	0	0
Georgia	1	0	0	0	0
Kyrgyz Republic	1	0	0	0	0
Moldova	0	0	0	0	0
Tajikistan	0	0	0	0	0
Ukraine	1	1	0	0	0
Turkey	1	0	0	0	0
Russian Federation	1	1	0	0	0

Source: Bank Regulation and Supervision Survey conducted by the World Bank.
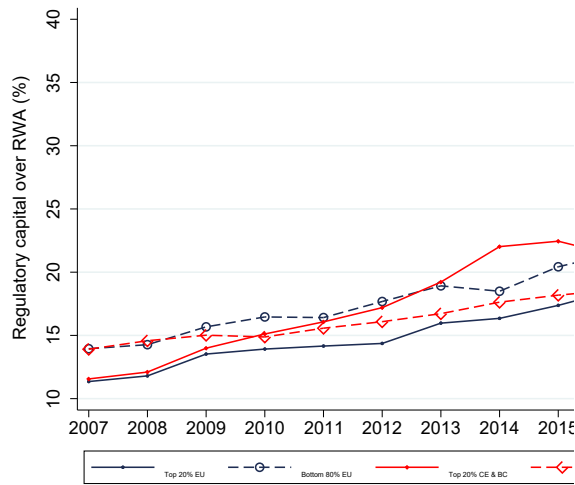
Table A4: Bank Resolution

Economy	Bank Resolution			Resolving SIFIs		
	Have you introduced separate bank insolvency framework among domestic authorities in your country as a result of the 2007-2009 global financial crisis?	Have you implemented coordination arrangements among domestic authorities in your country as a result of the 2007-2009 global financial crisis?	Are there clear and workable rules on burden sharing in case of an international bank resolution?	Do you have different processes for resolving Systemically Important Financial Institutions (SIFIs) and other financial institutions?	Are banks required to have sufficient bail-in funding to be able to resolve them as a going concern?	Are banks required to file resolution plans (i.e., strategy for rapid and orderly resolution in case of financial distress or failure)?
Austria	0	1	0	1	1	0
Belgium	0	0	1	1	1	0
Denmark	0	1	1	1	1	0
Finland	1	0	1	0	1	1
France	1	1	1		1	0
Germany	1	1	1	1	1	0
Ireland	1	1	1		1	1
Luxembourg	0	0	1	1	1	0
Netherlands	0	0	0	0	1	0
Sweden	1	0		1		1
United Kingdom	1	1	1	1	0	0
Cyprus	1	0	1	1	1	0
Greece	1	0	1	0	1	0
Italy	0	0	1		1	1
Malta	1	1		1	1	1
Portugal	0	0	1	0	1	0
Spain	0	0	1	0	1	0
Albania	1	1	0	0	0	0
Bosnia and Herzegovina	0	0	0	0		0
Bulgaria	0	0	1	0	1	1
Croatia	0	0	1	1	1	0
Czech Republic	0	0	1	1	1	0
Estonia	0	1	0	0	1	1

Country						
Hungary	0	0	1	1	1	0
Kosovo	1	1	0	0	0	0
Latvia	0	1	1	1	1	0
Lithuania	1	0	1	0	1	0
Republic of N Macedonia	0	0	0	0	0	1
Montenegro	0	0	0	0	0	0
Poland	1	1	1	0	1	0
Romania	0	1	1	0	1	0
Serbia	0	0	0	1	1	0
Slovak Republic	0	0	0	1	1	0
Slovenia	0	0	1	1	1	0
Armenia	0	1	0	0		0
Azerbaijan	0	0	0	1	0	0
Belarus	0	0	0	0	0	0
Georgia	0	0	0		0	0
Kyrgyz Republic	0	0	0		0	1
Moldova	0	0		1	1	0
Tajikistan	1	0	0	0	0	0
Ukraine	1	1	0	1	0	0
Turkey	0	0	0	0	0	0
Russian Federation	0	0		0	0	1

Source: Bank Regulation and Supervision Survey conducted by the World Bank.

Figure A1: Regulatory capital over RWA (%) – top 20% banks and bottom 80% (Weighted by total assets)

Panel A: EU and Central Europe & Baltic Countries

Panel B: Russia and Turkey
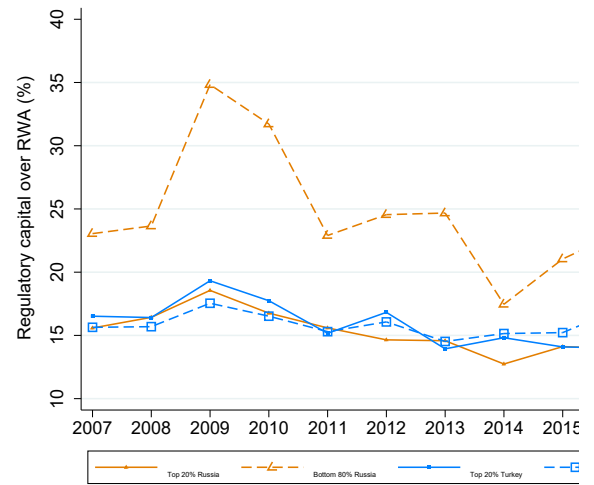
Panel C: Western Balkans and Eastern Europe
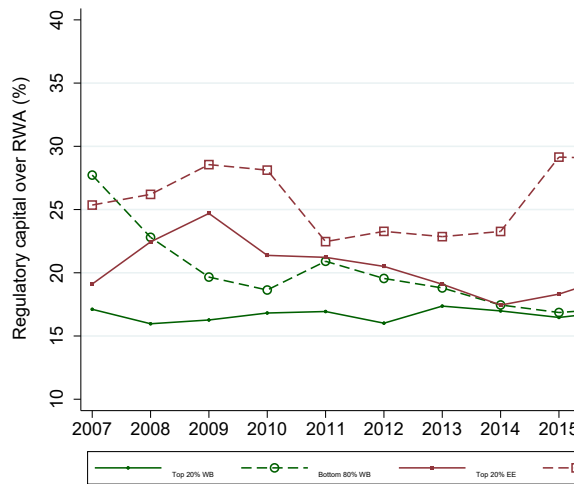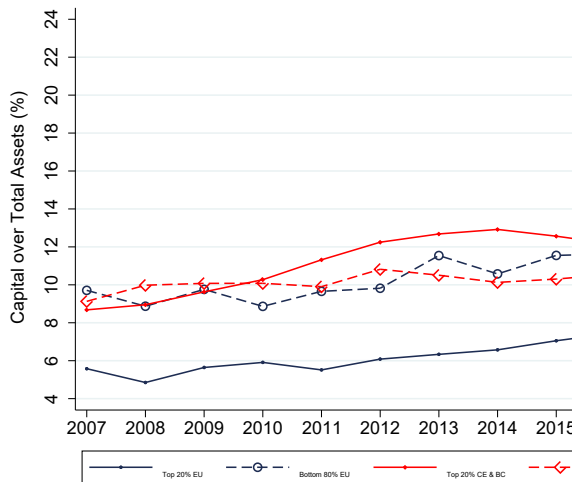
Panel D: South Caucasus and Central Asia
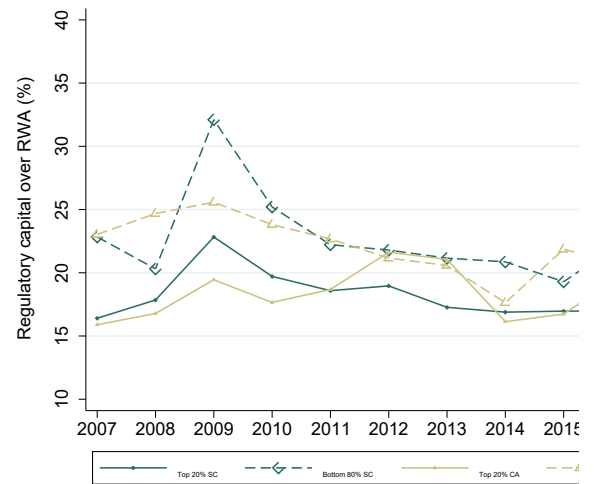
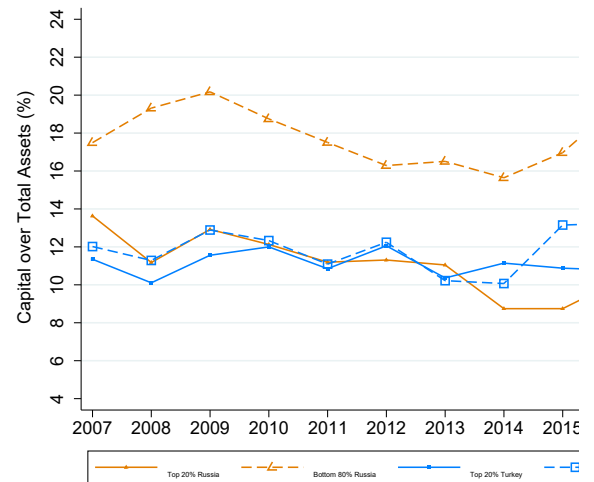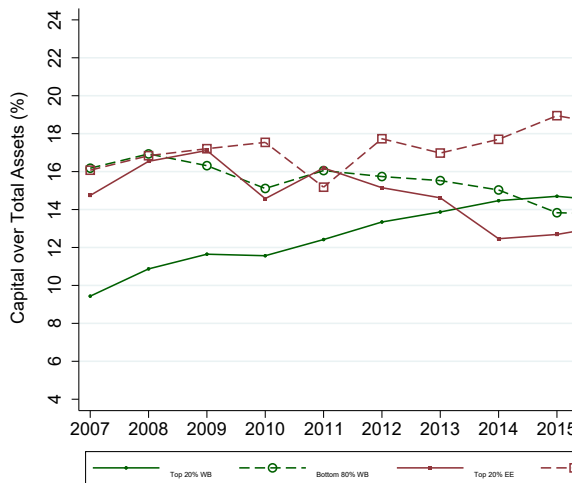Source: Archived data from Bureau van Dijk's Bankscope and BankFocus.

Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe.

Figure A2: Capital over Total Assets (%) – top 20% banks and bottom 80% (Weighted by total assets)

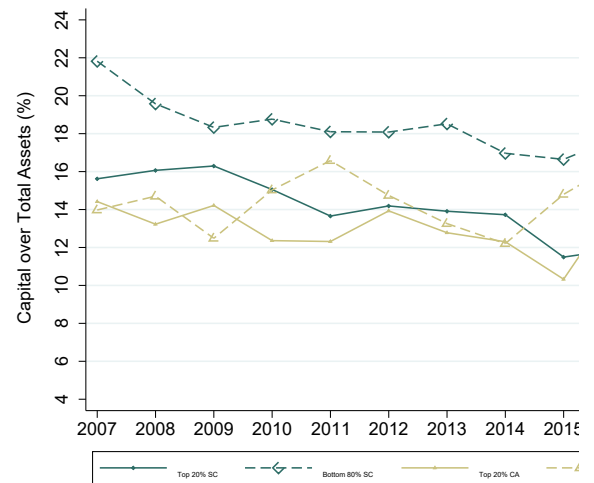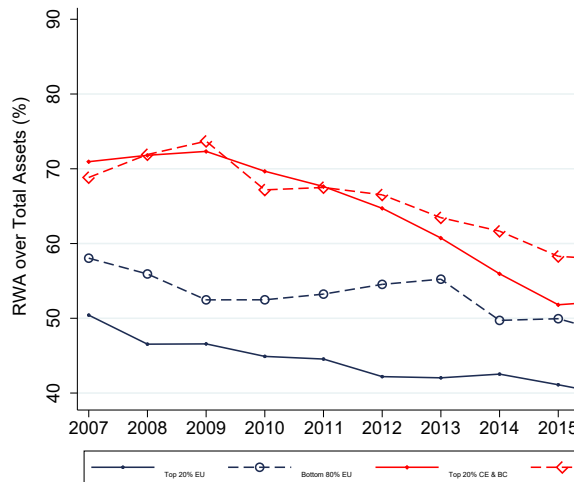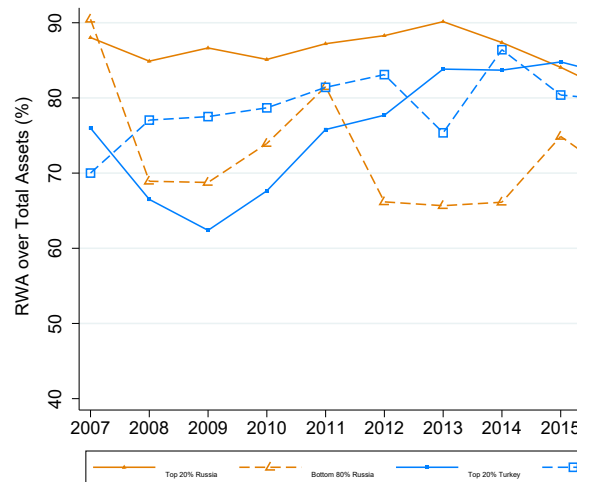**Panel A: EU and Central Europe & Baltic Countries**

Panel B: Russia and Turkey

Panel C: Western Balkans and Eastern Europe

Panel D: South Caucasus and Central Asia

Source: Archived data from Bureau van Dijk's Bankscope and BankFocus.

Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe.

Figure A3: RWA over Total Assets (%) – top 20% banks and bottom 80% (Weighted by total assets)
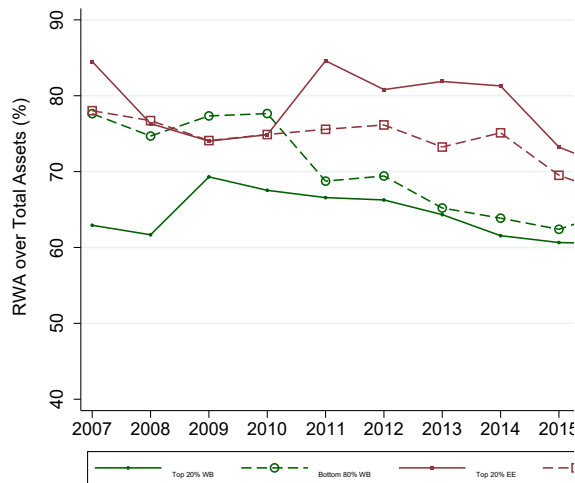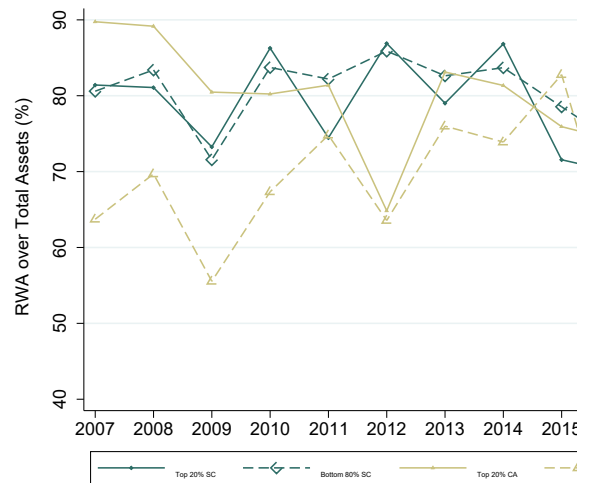
Panel A: EU and Central Europe & Baltic Countries

Panel B: Russia and Turkey

Panel C: Western Balkans and Eastern Europe

Panel D: South Caucasus and Central Asia

Source: Archived data from Bureau van Dijk's Bankscope and BankFocus.

Note: **EU** stands for Western Europe, Southern Europe, Northern Europe; **CE & BC** for Central Europe & Baltic Countries; **WB** for Western Balkans; **SC** for South Caucasus; **CA** for Central Asia; **EE** for Eastern Europe.