Which shocks matter? Macroprudential and political challenges for the European banking system.

PRELIMINARY AND INCOMPLETE

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Does Risk Governance matter for financial institutions? Post-crisis practices in the EU.

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Abstract

The project studies how various aspects of financial regulation interact with governance systems and performance in the banking industry. First chapter looks into the risk management system elements and their relation to bank' stability and outcomes. Analysis is run for top EU banking institutions in during the post-crisis period. We construct an index measuring the presence of typical elements of risk governance system. We then show that it's significantly and positively related to the bank's stability using a Z-score measure. Results are robust to inclusion of bank-level controls (balance sheet and income statement metrics and corporate governance elements) Results are robust to instrumenting the bank's index with the index of its peer group.

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Introduction

Failures in bank corporate governance mechanisms (and in particular risk management part) are often claimed to have played a key role in the financial crisis. The paper looks at the relation between the strength of financial institution's risk management unit and its post-crisis performance in the EU setting. We start with the index introduced by Ellul and Yerramilli (2013) and add on top a novel component identifying the presence of typical enterprise-wide initiatives. We then check whether risk management initiatives matter for banks' outcomes measured by market and accounting-based measures. The poor governance setting could have allowed the banks to profitably take more risks, but at the same time made them more vulnerable to shocks once the markets became highly unstable. Analysis done for crisis period (Beltratti and Stulz (2012), Falenbrah and Stulz (2011), Cerrasi and Oliveiro (2014)) demonstrated significant relation between bank risk taking, performance and selected governance mechanisms, e.g. board size, independence and compensation structure with the analysis done for samples of U.S. banks or for the international bank samples. Current analysis complements the previous ones by focusing on the European market.

Two major explanations for the governance-performance link are possible. The boards could be taking on the risks believing that it is in the best interest of shareholders. Alternatively, it might be the unawareness of decision makers of the risks implied by the decisions made. While risk governance on the top level was covered by previous empirical research, lower levels were not widely covered given the absence of structured datasets on the intra-institution initiatives. Looking at both top governance level and the presence of enterprise-level risk initiatives allows to see whether both of the levels matter for the institution's performance.

Analyzing the European market, we document the following. Strong risk management function is an attribute of larger banks with lower quality loan portfolios. Weaker risk management is an attribute of banks where the roles of CEO and Chairman of the Board are combined. Banks with CEO combining the two roles also tend to be less stable. Larger boards are associated with stronger risk governance, but lower risk norms.

The overall level of index increases over time. Following the regulatory changes in 2011 and 2013 there is an upward trend with larger banks introducing the elements of risk system before the official regulation publication in 2013. Smaller banks update their risk systems following the official CRD IV publication. The level of risk management strength tends to be higher for the larger banks. Overall the increase in the risk governance index was associated with less risk-taking as measured by the z-scores. This finding is confirmed when bank's risk governance strength is instrumented by the governance of the peer group.

The remainder of the paper is organized as follows. Section 1 covers the relevant literature. Section 2 briefly reviews the relevant regulation. Section 3 describes the dataset and provides descriptive statistics. Section 4 presents the results of empirical analysis. Section 5 gives the robustness checks. Section 6 concludes.

Literature and major hypotheses.

The paper makes contribution to the strand of literature on corporate governance and firm performance. This literature analyzes whether board of directors' composition (size, independence and female representation), ownership structure and compensation of executives are associated with better performance of the firms during the stable or crisis periods. Current paper is focusing on banks[1]. Together with the other financial institutions banks are often excluded from the corporate governance analysis given their distinct features: high levels of leverage with major reliance on deposit funding, complexity of their business models and the need to comply with strict regulatory requirements (e.g. to maintain a certain level capital. leverage and liquidity ratios). Adams and Mehran (2003), Macey and O'Hara (2003) – highlight the importance of the differences when evaluating the governance structures. As a result, the research on governance of financial institutions is also existent, but tends to be scattered. As stated by de Haan and Vlahu (2015) in their extensive survey on banks' governance "the papers have been published in very diverse journals and cross-references are often lacking".

The relation of governance measures to the banks crisis performance was assessed in several studies using the traditional governance metrics. Fahlenbrah and Stulz (2011) concentrated on CEO compensation schemes and ownership. Having performed the analysis for a sample of European banks they found no evidence of superior results for institutions with stronger CEO incentives. On the contrary it turned out that institutions with higher fraction of equity compensation for their CEOs were among the worst performers during the recent financial crisis. Beltratti and Stulz (2012) studied the international sample of banks in July 2007 - December 2008. They showed that institutions with shareholder friendly boards have on average shown worse performance during the crisis (more risk taking and greater loan reduction).

Worse stock performance during crisis was shown to be negatively related to board independence and institutional ownership (Erkens et al. (2010) for an international sample of banks) and positively related to board's financial expertise (Cornet (2010) for a sample of U.S. banks).

Cornet (2010) have looked into 300 publicly traded U.S. banks and demonstrated that setter corp governance (more independent board, higher pay-for-performance sensitivity, increase in insider

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[1] Shleifer and Vishny (1997), Adams (2010) provide detailed reviews on corporate governance for the non-financial institutions.

ownership) is positively related to performance. The impact of board composition was studied also by Aebi, Sabato and Schmid (2012) who found evidence against large boards. Adams and Mehran (2012) provided arguments in favor of board members independence given that the outsiders are supposed to be better monitors for the management.

Main takeaway of most papers was that the corporate governance mechanisms tend to work differently in financial and non-financial setups given the regulatory differences between the two groups of institutions. Laeven and Levine (2009) were looking at the interaction between banking regulation and the elements of corporate governance on an international sample of banks. They have shown that banks with large owners tend to take more risk. The ownership structure was also shown to alter the direction of relationship between the regulatory changes and risk-taking for banks: stricter capital regulations tended to be associated with more risk-taking in case of large owners and less risk-taking for widely held banks.

Aebi. Sabato and Schmid (2012) were one of the first to switch from the broader governance characteristics to the bank-specific area of risk governance. The importance of independent risk management function has been emphasized many times by regulators and policymakers. In fact the "role of risk management in the governance structure" is one of the distinct features of financial institutions. Hence the authors investigated whether the presence of the chief risk officer (CRO) and the line of reporting (to chief executive vs. to the Board of directors) had an impact on performance of banks during the 2007/08 crisis.

Contemporaneously Ellul and Yerramilli (2013) have studied the relation between the risk governance and performance for 74 U.S. bank holding companies. They used an index comprising the indicators related to CRO power within the bank as well as the presence and activeness of the risk committee. It was shown that stronger risk governance is positively related to banks' operating performance and negatively to the size of tail risk. Current paper is assessing whether risk governance is important for a sample of European banks.

This paper extends the previous studies by extending the set of risk governance characteristics under analysis. It looks into the usual measures of risk governance and adds on top the component which is a way to measure the "risk norms" of the organization. This component adds together the presence in institution of certain practices ensuring the risk awareness of personnel on multiple levels of organization.

The questions to be answered are the following. Firstly, we assess which banks tend to have strong risk governance. We then look into the episodes of regulation tightening and see which institutions adjust to the new standards faster. Next, we assess whether risk governance elements are related to firm performance. Finally, we check whether any of the banks' characteristics strengthen/weaken the link between the risk governance and performance.

1. Regulation changes.

The period for which we have available data corresponds to the period of regulatory changes in the banking sphere. Given the increased criticisms of bank governance structures European Banking Authority has introduced the two major legislative documents: Capital Requirements Directive (CRD) and Capital Requirements Regulation (CRR). The draft version of the regulation (published in 2011) introduced the disclosure requirements in the governance sphere, e.g. recruitment and diversity policies, risk committee activities, directorships held by the board members. Official version (released in 2013) contained the additional requirements for corporate governance emphasizing that institutions which were most significant in terms of "internal organization and the nature, scope and complexity of their activities" are the ones to introduce the risk committee.

2. Dataset and descriptive statistics.

We start from a list of banks which participated in the 2014 Stress Testing exercise which allowed to include the largest institutions at the EU level. We looked into the index components in from 2009 to 2014 using the publicly available annual, corporate governance and Pillar 3 disclosure reports. We were then left with the 99 institutions for which the data on index components and main control variables was available (Institutions are listed in Appendix 1).

2.1. Risk governance measure.

We start from the components of the original index of Ellul et al. (2013) related to the structure of bank's risk governance system which we are able to retrieve for European banks. We use two variables measuring the importance of an executive responsible for risk management at a bank level - Chief Risk Officer (CRO). First one indicates the presence of such a manager in the bank, second determines whether he is in the board of directors. Next two components are related to the board of directors' committee performing the risk oversight (Audit or Risk). First captures its activeness (meeting more frequently than median during the year). Second indicates that the committee is specialized in risk matters (which are separated from the audit and compliance matters). We add to the previously used risk governance measures the elements of what we refer to as risk norms of a bank. We check the reports looking for the three components of a sound risk management system mentioned in the respective guidelines of Bank of International Settlements, OECD and Financial Stability Board: statement of risk appetite, risk strategy and risk culture[2].

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[2] See Appendix 2 for the definitions

The baseline analysis is done for the equally weighted index Table 1 shows the summary statistics for the selected index elements.

Most of the banks (97% of bank-year observations) have a designated risk responsible while fewer institutions keep him/her on the board. Around half sample has a dedicated and/or active committee following the risk issues. Fewer banks have introduced the enterprise-wide initiatives.

Table 1. Summary statistics for the components of risk index

	CRO present	CRO in board	Dedicated committee	Active committee	Risk appetite	Risk strategy	Risk culture
Mean	0.97	0.36	0.45	0.53	0.80	0.74	0.51
St. dev.	0.21	0.48	0.50	0.50	0.40	0.44	0.50

Evolution of elements over time shows the tendency to strengthen the risk governance over time. As mentioned before, most institutions have had a designated risk officer in the beginning of the period or have assigned this role by 2014. Other elements tended to be introduced throughout the period creating the appropriate variation for the chosen measures.

Table 2. Evolution of risk index components over years

	CRO present	CRO in board	Dedicated committee	Active committee	Risk appetite	Risk strategy	Risk culture
2009	0.94	0.36	0.33	0.55	0.64	0.63	0.36
2010	0.96	0.34	0.39	0.52	0.74	0.70	0.41
2011	0.96	0.34	0.42	0.48	0.78	0.71	0.46
2012	0.97	0.34	0.45	0.53	0.83	0.74	0.53
2013	0.98	0.38	0.48	0.57	0.87	0.77	0.59
2014	0.98	0.40	0.61	0.53	0.94	0.88	0.68

Table 3 shows the correlations between the index elements. The correlations are mostly positive, so that the elements complement each other. Only exception is the negative association between committee dedication and activeness, i.e. if committee is risk-specific it meets less frequently

Table 3. Correlation between index elements

	CRO	In board	Dedicated committee	Active committee	Risk Appetite	Risk Strategy	Risk Culture
CRO	1						
In board	0.14***	1					
Dedicated Committee	0.08	0.14***	1				
Active	-0.07	-0.10*	-0.18***	1			
Risk Appetite	0.15***	0.19***	0.09*	-0.03	1		
Risk Strategy	0.17***	0.28***	0.15***	0.01	0.22***	1	
Risk Culture	0.12**	-0.07	0.20***	0.06	0.22***	0.00	1

$^{*}p < 0.05,\ ^{**}p < 0.01,\ ^{***}p < 0.001$

2.2. Bank stability measure

The baseline indicator of bank risk-taking used in the analysis is a z-score. It associates the amount of risk taken by the bank with the probability that a bank becomes insolvent, i.e. doesn't have enough equity to cover its losses (E<-π). With an assumption of a normal distribution of profits the inverse probability of insolvency the inverse of insolvency probability is defined as $\equiv \frac{E/A+\mu_{ROA}}{\sigma_{ROA}}$ [3], where $ROA = \frac{Net\ income}{Assets}$ is the return on assets and $\frac{E}{A}$ stands for the equity to assets ratio. A high z-score implies a lower chance of turning insolvent. There is no consensus on which is the best way to construct the time-varying z-scores for panel analysis. We use the approach which Le Petit and Strobel (2013) found to be superior when comparing the alternatives present in the literature suggests using the current value of equity to assets ratio together with the mean and standard deviation of ROA computed using the whole sample of available data. Given the high skewness of this measure a natural logarithm of the resulting z-scores is used for the regression analysis (we would further refer to the transformed indicator as z-score for simplicity). The data for computations were obtained from Bankscope.

Further analysis is performed using the return on assets and return on equity measures. Finally, we use the 5-year CDS spreads measuring the credit risk of the bank perceived by the investors and the stock market returns' volatility over a year following the change of risk index.

Table 4 lists the descriptive statistics for our dependent variables.

Table 4. Descriptive statistics for the bank performance measures

Variable	mean	sd	min	p25	p50	p75	max
Z-score	2.60	1.04	-0.74	2.10	2.74	3.29	4.56
ROA	0.05	0.93	-3.71	0.02	0.23	0.48	1.65

2.3. Bank level controls

We use the indicator of bank's size (measured by the logarithm of assets), capitalization (Tier 1 capital ratio), portfolio quality (ratio of non-performing loans to assets), funding structure (fraction of non-customer deposits), diversity of income sources composition and operating income growth. We add the characteristics of banks' corporate governance system such as board size, proportion of independent directors, separation of CEO and Chairman roles and the changes of CEO during

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[3] Insolvency occurs if $(CAR + ROA) \leq 0$. Assuming that ROA is normally distributed with mean μ_{ROA} and variance σ_{ROA}^2 the upper bound of insolvency probability can be written as $p(ROA \leq -CAR) \leq -Z^2, with\ Z \equiv \frac{CAR+\mu_{ROA}}{\sigma_{ROA}}$

the sample period. We control for large restructuring by adding a dummy for banks experiencing more than 20% growth in their assets. We also make sure that the institutions in the sample are indeed deposit-taking and restrict deposits to assets ratio to 20%.

Table 5 presents the descriptive statistics for control variables. We have a sample of large banks with a mean asset size of €277bn, Tier 1/Assets ratio of 6%, relatively high NPL ratios for certain institutions (mean proportion of 6% while maximum is reaching 25%).

Table 5. Descriptive statistics for the bank level control variables

Variable	Mean	SD	min	p25	p50	p75	max
Assets (bn. euro)	277.72	445.25	1.39	37.41	96.97	2471	2516
Tier 1/Assets	0.06	0.02	0.02	0.04	0.05	0.07	0.12
NPLs/Assets	0.06	0.06	0.00	0.02	0.03	0.07	0.25
Income diversity	0.33	0.21	-0.51	0.25	0.35	0.45	0.80
Funding fragility	0.35	0.23	0.01	0.19	0.31	0.46	0.98
Operating income growth	0.01	0.29	-1.03	-0.07	0.02	0.10	0.90
Board size	17.93	7.76	6	12	16	21	48
Board independence	0.50	0.21	0.12	0.33	0.52	0.67	0.89
CEO/Chairman separation	0.51	0.50	.	.	.	.	.
CEO change	0.16	0.37	.	.	.	.	.

The sample is also quite diverse in terms of deposit types with certain institutions relying heavily on non-customer deposits. Board size varies from 6 to 48 directors with a mean value of 18.

Table 6. Descriptive statistics for the bank level variables by value of risk index

		2011	2012	2013	2014	Overall
Assets	Low index	242.706	228.114	217.159	202.275	242.706
	High index	422.58	388.629	424.910	435.966	422.58
	Difference	-179.873	-160.515	-207.751[*]	-233.691[*]	-179.873
Tier 1 capital / Assets	Low index	0.05	0.05	0.06	0.06	0.06
	High index	0.05	0.05	0.06	0.06	0.05
	Difference	0.00	0.00	0.01	0.00	0.00
Tier 1 capital / RWA	Low index	0.11	0.13	0.14	0.15	0.13
	High index	0.11	0.12	0.14	0.14	0.12
	Difference	-0.01	0.01	0.00	0.02	0.01[**]
NPL/Assets	Low index	0.05	0.06	0.08	0.08	0.06
	High index	0.05	0.06	0.07	0.07	0.06
	Difference	-0.01	0.00	0.01	0.01	0.01

Funding fragility	Low index	0.39	0.42	0.35	0.37	0.37
	High index	0.35	0.30	0.32	0.29	0.33
	Difference	0.04	0.12**	0.03	0.07	0.04*
Diversity of income sources	Low index	0.74	0.67	0.82	0.92	0.79
	High index	0.78	0.80	0.82	0.67	0.74
	Difference	-0.03	-0.13	0.00	0.246**	0.05
Operating income growth	Low index	-0.03	-0.01	0.01	0.03	0.02
	High index	-0.10	0.07	0.07	-0.06	-0.01
	Difference	0.07	-0.08	-0.06	0.08	0.02
Board Size	Low index	16.02	15.46	16.57	16.19	16.53
	High index	20.85	20.33	19.57	18.51	20.19
	Difference	-4.832**	-4.863**	-3.001	-2.328	-3.652***
Board Independence	Low index	0.48	0.50	0.51	0.51	0.49
	High index	0.53	0.53	0.54	0.53	0.53
	Difference	-0.06	-0.03	-0.03	-0.02	-0.040*
CEO/ Chairman combination	Low index	0.49	0.45	0.44	0.42	0.47
	High index	0.55	0.55	0.54	0.49	0.54
	Difference	-0.06	-0.10	-0.10	-0.07	-0.08
CEO change	Low index	0.22	0.21	0.10	0.16	0.18
	High index	0.10	0.26	0.21	0.08	0.17
	Difference	0.12	-0.05	-0.12	0.08	0.00

We find significant differences in terms of asset size (larger institutions tend to have stronger risk governance) and larger boards (larger boards associated with stronger risk governance). On top of that we do not observe significant differences in our selected controls excluding the income diversity in 2014. The results however have to be taken with a degree of caution as they are coming from the univariate tests. We will test the multivariate association between the risk governance index and the bank-level variables in the following sections.

3. Empirical analysis

## 3.1. Risk index evolution over time

As an initial step, we illustrate the time series dynamics for the index. Top panel shows that on average the banks strengthened their governance arrangements starting 2011 when the new directives came into force. Top panel demonstrates the dynamics for the five size groups (in terms of assets), Bottom splits out the top 20% of banks. There we observe that the biggest banks

(typically named the target of the regulatory changes) were initially at higher level of risk governance standards while the group of smaller institutions tended to converge once the official regulations came into force.

Figure 1. Dynamics of index components by size group.
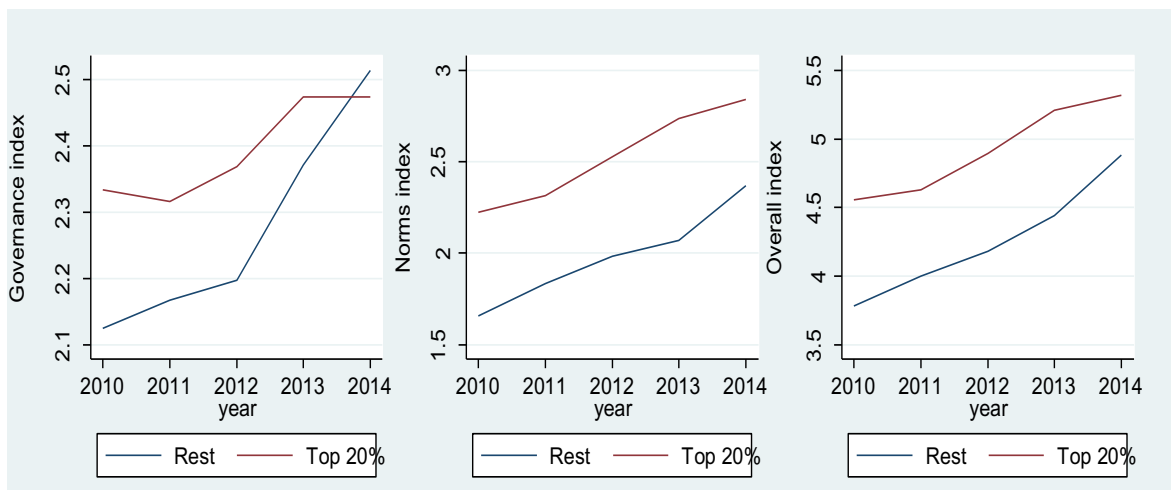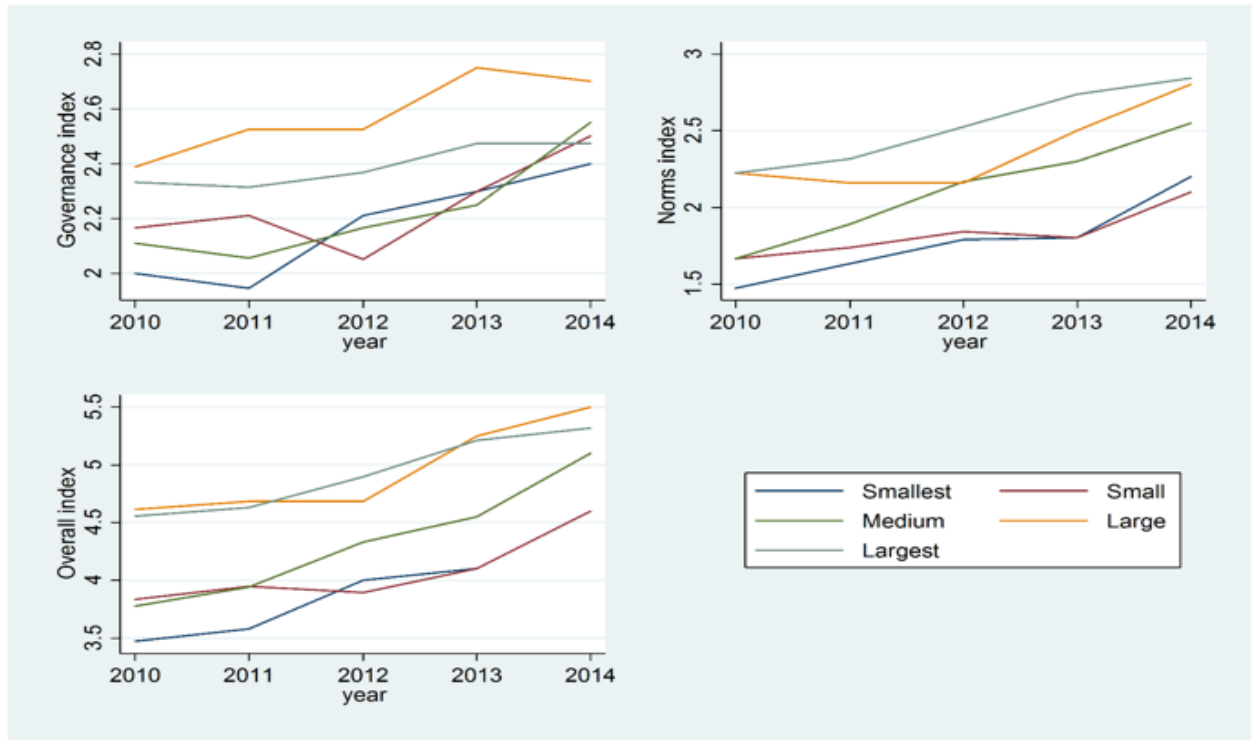
We confirm these observations estimating the following specifications for the overall index and two sub-indices:

$$\Delta Index_{i,2011-14} = \alpha + \beta Index_{i,2011} + \gamma Controls_{i,2011} + \epsilon_{i,t}$$

$$\Delta Index_{i,2013-14} = \alpha + \beta Index_{i,2013} + \gamma Controls_{i,2013} + \epsilon_{i,t}$$

2011 and 2013 are chosen since they were marked by the publication of preliminary and final versions of CRD IV – major regulation in the sphere of risk governance. The results shown in tables 6 and 7 confirm the evidence presented in the previous section. Banks tend to "catch up" to a given level of risk governance, hence controlling for the initial levels other elements matter less..

Table 6. 2011/14 risk index change

VARIABLES	(1) Total index	(2) Governance index	(3) Norms index
Total index 2011	-0.768***		
	(0.126)		
Governance index 2011		-0.901***	
		(0.122)	
Norms index 2011			-0.770***
			(0.163)
L3.Size	-0.109	-0.0107	-0.0842
	(0.106)	(0.0698)	(0.0700)
L3.T1/Assets	-8.130	-2.586	-5.184
	(8.151)	(4.760)	(4.280)
L3.NPL/Assets	0.0135	-0.0120	0.0453
	(0.119)	(0.0774)	(0.0632)
Constant	5.581***	2.523**	3.296***
	(1.496)	(1.016)	(0.779)
Observations	83	83	83
R-squared	0.375	0.466	0.364

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7. 2013/14 risk index change

VARIABLES	(1) Total index	(2) Governance index	(3) Norms index
Total index 2013	-0.947***		
	(0.112)		
Governance index 2013		-0.953***	
		(0.0911)	
Norms index 2013			-1.098***
			(0.146)
L3.Size	-0.0192	-0.00774	0.0161
	(0.0973)	(0.0718)	(0.0572)
L3.T1/Assets	7.253	2.342	4.902
	(6.790)	(6.601)	(4.017)
L3.NPL/Assets	0.0774	0.0868	0.000472
	(0.110)	(0.0923)	(0.0613)
Constant	4.812***	2.642**	2.286***
	(1.425)	(1.180)	(0.724)
Observations	85	85	85

R-squared	0.488	0.494	0.536

3.2. Risk governance and bank characteristics

We proceed with further check the results in a panel data setup with bank and year fixed effects and bank level control variables (lagged for one year).

$$Index_{i,t} = \alpha + \boldsymbol{\gamma} Controls_{i,t-1} + \epsilon_{i,t}$$

Table 8 presents the panel estimation results. We first run the fixed effects regressions controlling for bank balance sheet and income statement characteristics. We then add the set of corporate governance indicators to see whether the estimates remain relevant. Standard errors are clustered at the bank level.

We obtain the following results. Stronger governance is associated with larger size and worse portfolio quality. Larger boards tend to adopt more elements of risk governance at the board level and less enterprise-wide measures. Splitting the roles of chief executive and board of directors' chairman is associated with more risk governance elements adopted. Finally, large restructuring (measured by large asset changes) is associated with more risk governance measures adopted.

Table 8. Risk governance and bank characteristics in 2009-14

VARIABLES	Total index	Total index	Gov. index	Gov. index	Norms index	Norms index
Size	1.247**	1.184**	0.665**	0.541	0.582**	0.643**
	(0.489)	(0.546)	(0.322)	(0.380)	(0.288)	(0.304)
Tier 1/Assets	-5.265	-4.039	-1.497	-0.680	-3.768	-3.359
	(5.649)	(5.814)	(3.247)	(3.397)	(3.726)	(3.308)
NPL/Assets	4.010**	2.683	1.002	0.832	3.009**	1.851
	(1.532)	(1.675)	(1.174)	(1.128)	(1.266)	(1.341)
Income diversity	-0.0842	-0.101	-0.0661	-0.0842	-0.0180	-0.0165
	(0.108)	(0.122)	(0.0722)	(0.0813)	(0.0704)	(0.0844)
Funding fragility	-0.660	-0.917	-0.696	-0.668	0.0355	-0.249
	(0.611)	(0.696)	(0.427)	(0.465)	(0.411)	(0.416)
Operating income growth	0.0769	0.0459	0.0604	-0.0334	0.0166	0.0793
	(0.0777)	(0.0834)	(0.0683)	(0.0526)	(0.0473)	(0.0740)
Board size		-0.303		0.532*		-0.836***
		(0.384)		(0.281)		(0.246)
Board independence		1.057**		0.509		0.548
		(0.508)		(0.368)		(0.361)
CEO/Chairman combination		-1.015***		-0.471***		-0.544***
		(0.214)		(0.153)		(0.191)
Change of CEO		-0.0797		-0.104		0.0245
		(0.107)		(0.0770)		(0.0739)
Large restructuring		0.411**		0.234		0.178
		(0.189)		(0.150)		(0.172)
Observations	411	396	411	396	411	396
R-squared	0.830	0.846	0.788	0.808	0.785	0.803
Year FE	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

3.3. Risk governance and risk-taking

Moving to the performance evaluation we estimate the following specification:

$$Performance_{i,t} = \alpha + \beta RiskIndex_{i,t-1} + \gamma Controls_{i,t-1} + \delta_t + \theta_i + \varepsilon_{i,t}$$

The first performance indicator we consider is Z-score measuring the banks' stability (i.e. distance to default). We run the separate panel regressions including bank balance sheet and income statement data first. We then add the corporate governance controls and see whether the indicators showing the risk governance strength still matter. All variables are lagged one year with respect to the performance measure. Table 9 shows the relevant outcomes for specifications including the overall index as well as the ones separating the two components.

Controlling for the bank-level characteristics we find that risk elements still matter. I.e. institutions increasing the strength of risk management unit tend to be more stable. This holds both when the elements are assessed as a sum and when the sub-indices are considered separately. In addition, the separation of CEO and Chairman roles matters for stability as well.

4. Robustness checks
4.1. Instrumental variables analysis

Panel setting allows us to overcome the issue of potentially omitted (and unobservable) factors influencing both risk governance strength and bank outcome. Certain time-varying characteristics might still matter however.

We address it in the following way. The banks tend to follow the practices of their competitors. This allows to suggest as instrument the average risk index from the same country group for a given year. The instrumental variable regression confirms the initial finding in terms of sign of association. The index however becomes significant only at 20% level.

Table 9. Z-scores and bank characteristics in 2009-14

VARIABLES	Total index	Total index	Subindices	Subindices	Governance index	Governance index	Norms index	Norms index
Total index	0.0921**	0.135***						
	(0.0420)	(0.0460)						
Governance index			0.125*	0.157**	0.130*	0.163**		
			(0.0726)	(0.0645)	(0.0716)	(0.0642)		
Norms index			0.0622	0.115			0.0701	0.124*
			(0.0649)	(0.0695)			(0.0640)	(0.0694)
Size	-0.0148	0.0811	-0.0176	0.0835	-0.000870	0.122	0.0236	0.113
	(0.179)	(0.203)	(0.180)	(0.202)	(0.179)	(0.199)	(0.173)	(0.190)
Tier 1/Assets	7.386**	6.810*	7.453**	6.872**	7.430**	6.934**	7.146**	6.475*
	(3.354)	(3.458)	(3.367)	(3.444)	(3.372)	(3.440)	(3.320)	(3.394)
NPL/Assets	-2.921***	-2.475***	-2.886***	-2.471***	-2.760***	-2.356***	-2.798***	-2.366***
	(0.864)	(0.854)	(0.844)	(0.849)	(0.876)	(0.858)	(0.845)	(0.864)
Income diversity	0.0330	0.0263	0.0350	0.0261	0.0321	0.0162	0.0217	0.0155
	(0.0632)	(0.0691)	(0.0631)	(0.0691)	(0.0634)	(0.0697)	(0.0646)	(0.0700)
Funding fragility	-0.814*	-0.790*	-0.799	-0.781*	-0.780	-0.759*	-0.823*	-0.817*
	(0.469)	(0.423)	(0.481)	(0.435)	(0.476)	(0.441)	(0.482)	(0.438)
Op. income growth	0.0974	0.00394	0.0997	0.00595	0.0989	0.00970	0.0890	-0.00478
	(0.0638)	(0.0867)	(0.0625)	(0.0867)	(0.0611)	(0.0861)	(0.0661)	(0.0923)
Board size		-0.195		-0.217		-0.283		-0.130
		(0.213)		(0.201)		(0.216)		(0.194)
Board independence		0.000365		-0.00812		-0.000506		0.0657
		(0.377)		(0.372)		(0.371)		(0.391)
CEO/Chairman combination		0.547***		0.540***		0.465***		0.502***
		(0.173)		(0.176)		(0.176)		(0.180)
Change of CEO		0.0890		0.0870		0.0801		0.0933
Observations	500	485	500	485	500	485	500	485
R-squared	0.855	0.865	0.856	0.865	0.855	0.863	0.853	0.861
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

4.2. Interrelation between the index components

Interconnection between the two indices is checked via the following specification:

$$\Delta rminew_{i,2009-14} = \alpha + \beta rmigov_{i,2009} + \gamma * \Delta X_i + \varepsilon_i$$

Here we assess whether the initial level of risk governance matters for the subsequent changes in risk norms (to address the issue that new risk norms initiatives might be the automatic consequence of strong risk governance at the board level). We find no significance for the overall risk governance level in the beginning of the period. We find more enterprise-wide measures implemented by growing banks. We also find that banks with growing boards are slower to introduce the new enterprise-wide initiatives which is expected given that more parties get involved into approval of new initiatives.

Table 10. Change in risk norms conditional on 2009 governance level.

	$\Delta Normsindex_{09-14}$		
Governance index$_{2009}$	-0.105		
CRO in board$_{2009}$		-0.61*	
Dedicated committee$_{2009}$			-0.033
$\Delta Size_{09-14}$	0.882**	0.830**	0.966**
$\Delta NPL/Assets_{09-14}$	0.235*	0.177*	0.232*
$\Delta Board\ Size_{09-14}$	-1.304*	-1.533**	-1.377*
BANL LEVEL CONTROLS	YES	YES	YES
R-squared	0.272	0.319	0.264

*** p<0.01, ** p<0.05, * p<0.1

4.3. Subsamples analysis

Risk governance mechanisms (especially those related to organizational structure) are likely to be related to the traditional corporate governance mechanisms which were proven to matter for firms' performance in the corporate governance literature.

One important difference between the U.S. and EU is related to the structure of board of directors. While U.S. banks typically have a 1-level board, some of the European banks have two levels – executive board and supervisory board. Separate calculations for two samples – banks with 1-tier or 2-tier board structures confirm the initial findings.

Similarly (as demonstrated in the analysis of risk governance determinants) the results might be driven by banks' size, capitalization or by the independence of board members. We repeat the

estimation excluding the top/bottom banks by size/capitalization/board independence (Table11). The results remain valid for both samples.

Directions for future research.

We've performed the analysis of relation between risk governance elements and performance of financial institutions during the post-crisis period. Making comparisons to the U.S. setting we noticed the following. European financial institutions tended to strengthen their risk management arms following the crisis period similarly to their U.S. counterparties. Larger institutions were faster to implement the new practices (consistently with higher regulatory pressure and the tendency to follow the peer banks). Introduction of new practices tends to increase the institution`s stability measured by the z-scores. The finding is confirmed by the instrumental variable analysis when institution's risk governance levels are instrumented by the average of the peers within the same country-year.

The following developments are planned for the future research. Current version refers only to few elements of enterprise-wide system of risk governance. An appropriate extension would consider a larger number of elements focusing on the recent versions of risk governance guidelines.

Additional instruments which could be assessed refer to the country-level measures of risk attitudes. Those could be used to instrument for the risk governance strength.

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Appendix 1. List of the covered institutions

	Bank	Country
1	Aareal Bank AG	Germany
2	ABLV Bank	Latvia
3	ABN AMRO Bank N.V.	Netherlands
4	Allied Irish Banks plc	Ireland
5	Alpha Bank	Greece
6	AXA Bank Europe SA	Belgium
7	Banca Carige S.P.A. - Cassa di Risparmio di Genova e Imperia	Italy
8	Banca Monte dei Paschi di Siena S.p.a.	Italy
9	Banca Piccolo Credito Valtellinese	Italy
10	Banca Popolare Dell'Emilia Romagna - Società Cooperativa	Italy
11	Banca Popolare Di Milano - Società Cooperativa A Responsabilità Limitata	Italy
12	Banco Bilbao Vizcaya Argentaria	Spain
13	Banco BPI	Portugal
14	Banco Comercial Português	Portugal
15	Banco de Sabadell	Spain
16	Banco Financiero y de Ahorros	Spain
17	Banco Mare Nostrum	Spain
18	Banco Popolare - Società Cooperativa	Italy
19	Banco Popular Español	Spain
20	Banco Santander	Spain
21	BANK BPH SA	Poland
22	BANK HANDLOWY W WARSZAWIE SA	Poland
23	Bank Nederlandse Gemeenten N.V.	Netherlands
24	Bank of Cyprus Public Company Ltd	Cyprus
25	Bank of Valletta plc	Malta
26	Bankinter	Spain
27	Banque PSA Finance	France
28	Barclays plc	United Kingdom
29	BAWAG P.S.K. Bank für Arbeit und Wirtschaft und Österreichische Postsparkasse AG	Austria
30	Bayerische Landesbank	Germany
31	Belfius Banque SA	Belgium
32	BNP Paribas	France
33	Caixa Geral de Depósitos	Portugal
34	Caja de Ahorros y M.P. de Zaragoza	Spain
35	Cajas Rurales Unidas	Spain
36	Co-operative Central Bank Ltd	Cyprus
37	Commerzbank AG	Germany
38	Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A.	Netherlands
39	Credito Emiliano S.p.A.	Italy
40	Danske Bank	Denmark
41	DekaBank Deutsche Girozentrale	Germany
42	Deutsche Apotheker- und Ärztebank eG	Germany
43	Deutsche Bank AG	Germany
44	Dexia NV*	Belgium

45	DNB Bank Group	Norway
46	DZ Bank AG Deutsche Zentral-Genossenschaftsbank	Germany
47	Erste Group Bank AG	Austria
48	Eurobank Ergasias	Greece
49	GETIN NOBLE BANK SA	Poland
50	Groupe BPCE	France
51	Groupe Crédit Agricole	France
52	Groupe Crédit Mutuel	France
53	HASPA Finanzholding	Germany
54	Hellenic Bank Public Company Ltd	Cyprus
55	HSBC Holdings plc	United Kingdom
56	HSH Nordbank AG	Germany
57	IKB Deutsche Industriebank AG	Germany
58	ING Bank N.V.	Netherlands
59	Intesa Sanpaolo S.p.A.	Italy
60	Jyske Bank	Denmark
61	KBC Group NV	Belgium
62	KfW IPEX-Bank GmbH	Germany
63	Kutxabank	Spain
64	La Banque Postale	France
65	Landesbank Baden-Württemberg	Germany
66	Landesbank Hessen-Thüringen Girozentrale	Germany
67	Landwirtschaftliche Rentenbank	Germany
68	Liberbank	Austria
69	Lloyds Banking Group plc	United Kingdom
70	Mediobanca - Banca di Credito Finanziario S.p.A.	Italy
71	Münchener Hypothekenbank eG	Germany
72	National Bank of Greece	Greece
73	Nederlandse Waterschapsbank N.V.	Netherlands
74	Norddeutsche Landesbank-Girozentrale	Germany
75	Nordea Bank AB (publ)	Sweden
76	Nova Kreditna Banka Maribor d.d.	Slovenia
77	Nova Ljubljanska banka d. d.	Slovenia
78	NRW.Bank	Germany
79	OP-Pohjola Group	Finland
80	Österreichische Volksbanken-AG with credit institutions affiliated according to Article 10 of the CR	Austria
81	OTP Bank Ltd	Hungary
82	Permanent tsb plc.	Ireland
83	Piraeus Bank	Greece
84	POWSZECHNA KASA OSZCZEDNOSCI BANK POLSKI S.A. (PKO BANK POLSKI)	Poland
85	Raiffeisen Zentralbank Österreich AG	Austria
86	Raiffeisenlandesbank Niederösterreich-Wien AG	Austria
87	Raiffeisenlandesbank Oberösterreich AG	Austria
88	Royal Bank of Scotland Group plc	United Kingdom
89	SID - Slovenska izvozna in razvojna banka	Slovenia
90	Skandinaviska Enskilda Banken AB (publ) (SEB)	Sweden
91	SNS Bank N.V.	Netherlands
92	Société Générale	France
93	Svenska Handelsbanken AB (publ)	Sweden
94	Swedbank AB (publ)	Sweden
95	Sydbank	Denmark

96	The Governor and Company of the Bank of Ireland	Ireland
97	UniCredit S.p.A.	Italy
98	Unione Di Banche Italiane Società Cooperativa Per Azioni	Italy
99	Volkswagen Financial Services AG	Germany

Appendix 2. Definitions of risk elements included into the risk norms index.

Risk Governance – mechanisms related to measurement, control and reporting of risk levels

Risk appetite – defined capacity to take risk and the managers' willingness to use it

Risk strategy – risk elements in bank's strategy

Risk culture – activities to promote risk awareness and risk training

Appendix 3. Elements of strong risk governance emphasized by the supervisory institutions

Chief Risk Officer (CRO) - a designated senior executive responsible for all aspects of risk management

Board of directors with clear oversight and risk governance responsibilities

Board committee with risk oversight responsibilities with a regular schedule of meetings

Internal audit function clearly separated from the risk management function

Emphasis on risk culture and risk elements in overall bank strategy

Changes in remuneration structure. Do bonus caps matter?

Ekaterina Seregina*

Abstract

The project studies whether the cap on variable to fixed salary ratio matters for the investors and for the subsequent performance of financial institutions. We split out the treated group of banks which had the ratio above the cap for the CEOs and/or management board members. Event study across the regulation announcements shows a larger increase in CDS spreads around the announcement of remuneration guidelines. hence the new rules are perceived by the market as undermining the stability of the affected banks which is expected given the higher efforts expected for compliance. The official approval of the law, however, does not produce the divergent reaction. Difference in difference analysis around the implementation date confirms the finding since the affected group experiences lower changes in CDS spreads, higher stability and higher profitability.

Introduction

The paper analyses the relation between remuneration structure and bank performance making use of the post-crisis regulatory changes. We have the two instances in which there was an explicit regulatory pressure for the changes in bonus structure. In 2010 the European Banking Authority issued the Guidelines for sound remuneration practices pushing the institutions towards the proper balance between the fixed and variable components of the bankers' compensation. In 2013 the Capital Requirements Directive has set a threshold of 100% for the variable to fixed ratio (with a possibility to increase the threshold to 200% upon shareholders' approval). We analyse the impact of those shocks in several ways. We first document for which institutions the shock was in fact relevant. We focus on the list of institutions subject to the Single Supervisory Mechanism and collect the data on the ratios in 2013 to see which of them would in fact be obliged to adjust the compensation structure. We then see the markets' reaction to the announcements (looking at the stock markets and CDS markets). We then look at longer horizons and assess whether the adjustments were relevant for bank's outcomes. Here we look into the profitability outcomes, stability indicators (z-scores), portfolio quality (NPL proportion) and the measures of systemic risk. The first set of measures is available at a low frequency. Systemic risk measures, however are market based. We then check both the average outcomes and the extremes over the selected time horizons. We are thus able to compare the short-term investor reaction and the longer-term consequences for affected institutions.

Regulatory background and relevant timeline

The most recent EU-level reform of managerial remuneration practices was implemented within the Capital Requirements Directive (CRD IV). The preliminary draft issued in 2011 stipulated the need for better disclosure of remuneration practices while the official 2013 Directive complemented those requirements with a quantitative rule (effective January 1st 2014). This new rule regulated the ratio between variable and fixed components of remuneration package (referred to as the bonus ratio further on). The Directive set a maximum limit of 100% for this ratio with an option for shareholders of an entity to increase the limit to 200%. The Directive was further clarified through a series of technical standards and guidelines to ensure appropriate implementation in the related institutions.

Initial post-crisis adjustments to remuneration regulations were implemented within the Capital Requirements Directive III (CRD III) effective from January 1st 2011. As part of implementation the Commission of European Banking Supervisors has approved and published the Guidelines on Remuneration Policies and practices on December 10th 2010. The preliminary draft of the next

Directive issued in 2011 stipulated the need for the better disclosure of remuneration practices. The most recent European-level Directive (CRD IV) approved on April 2013 complemented the disclosure requirements with a quantitative rule on the ratio between the variable and fixed components of remuneration package (referred to as the bonus cap further on). The Directive has set the maximum limit of 100% for this ratio with an option for shareholders of an entity to increase the limit to 200%. Further implementation was still expected through national regulations. None of the countries, however, eventually removed the cap.

Second caveat relates to the anticipation of the regulation changes (i.e. whether the regulation was a shock to banks under analysis). As mentioned above the quantitative threshold appeared in the 2013 version of the document only. Remuneration policies are not easily changed; hence it is reasonable to assume that banks had little freedom of adjustment before the chosen effective date. To still see whether some reaction was observed in advance we perform the analysis with shorter and longer time horizons. As an additional control check we checked the news related to banks' bonuses in the relevant period in Financial Times. First articles on the topic appeared in January 2013. Multiple articles confirm that the financial institutions were taken by surprise with the new regulation and several attempts were made to counteract the upcoming regulation. (see Appendix for the sample of relevant citations).

Related studies and contribution

The paper contributes to the two major strands of literature. First strand examines a series of regulatory changes which occurred after the 2007-08 financial crisis. Broad country-level reforms in the were covered by Schrafer, Schnabel and Weder de Mauro (2015). Focusing on major legislative changes in Germany (), Switzerland (), United Kingdom () and the USA (Dodd-Frank Act) they found significant reactions in terms of stock market returns and CDS spreads with results differing by type of banks (investment vs non-investment), bank size (systemically important vs non-systemically important) and bank stability (high vs low z-scores). Acharya, Anginer, and Warburton (2014) looked into the Dodd-Frank act impact Neretina, Sahin and de Haan (2015) looked into the impact of stress testing announcements (methodologies and results) and found them to be relevant for CDS spreads and betas with no significant impact on the stock market returns. Moenninghoff, Ongena and Wieandt (2015) looked into the impact of the announcements regarding Global Systemically Important banks (G-SIBs). The relevant regulations negatively affected the value of targeted group of banks consistently with the presence of additional regulatory burden. The announcement of the G-SIBs identity was associated with an offsetting positive reaction since G-SIBs designation is associated with implicit government guarantees in case of failure. The subsequent study of Schäfer, Schnabel and Weder di Mauro (2016) looked

into the bail-in cases which instead lowered the markets' expectations for bailouts once the bail-in precedents were established. Here again the markets' reaction differed depending on the type of bail-in event (junior vs senior) bank group (GSIB-s vs non GSIB-s, GIIPs vs non-GIIPs origin) and country's fiscal capacity to perform the bailout procedure. Carletti, Colla and Gulati (2016) looked into the impact of new collective actions clauses in European bonds contracts and found significant reaction for the CDS market.

Second strand looks into the relation between remuneration of executives and the institutions financial and real outcomes. Theoretical contributions in this field are discussed below. Thanassoulis (2012) who considered high remuneration to be a negative outcome of competition for managers. In the related study Thanassoulis (2014) suggested remuneration caps (in proportion to bank's assets) to be a better risk reduction tool than the introduction of additional capital requirements. Benabou and Tirole (2015) studied the interaction between the labour competition and the incentive schemes. Caps on remuneration were shown to be a Pareto deterioration while caps on bonuses were seen as a tool reducing the riskiness of operations. Acharya, Pagano and Volpin (2016) saw high salaries as a tool intensifying the employee mobility and preventing the proper talent allocation thus being detrimental to the performance.

These studies produce two sets of hypotheses. Lower bonuses can reduce short-term risk-taking incentives since the management is less motivated to sacrifice long-term goals for short-term opportunities. On the other hand, higher fraction of fixed salary results in lower flexibility in terms of costs and demotivates the managers from the achievement of performance-related targets.

Empirical contributions in the field find the positive relation between the risks taken and compensation sensitivity to stock volatility and stock price (Mehran and Rosenberg (2008), De Young et. al. 2013). Studies focusing on crisis periods however do not confirm that banks paying higher bonuses were the worst crisis performers Beltratti and Stulz (2012), Fahlenbrah and Stulz (2011). The country-level studies were done by Conyon, Core, and Guay (2011) for UK and US, Chizema (2008) for Germany.

Current study makes a contribution by examining empirically the two shocks to the European banks' remuneration practices. First one occurred in the end of 2010 when the new EBA guidelines on sound remuneration practices came into force. The guidelines haven't set any explicit thresholds for the bonus levels. However, the necessity to maintain the appropriate balance between the two components of remuneration packages was emphasized. 2013 version made the requirement explicit forcing the compliance to a threshold (with options of adjustments before the implementation at the national level). Using the two shocks we are thus able to compare the outcomes for relevant bank groups.

Data and Methodology

Sample

The sample includes top European banks (those falling under the Single Supervisory Mechanism). We then take those for which the stock market/CDS data is available for the estimation and event periods leaving us with a total of 56 (51) banks. Resulting list is split into subsamples according to the 2013 ratio of variable to fixed remuneration. We assign the banks to treated group in case the 100% threshold is binding either at CEO or at the management board level. Similarly, we construct the continuous treatment measure by computing the distance from the threshold for the banks which exceed the 100% cap in 2013.

Event study

We evaluate the market model for the banks under analysis and

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_k \gamma_{jk}^{before} \delta_{kt}^{before} + \sum_k \gamma_{jk}^{after} \delta_{kt}^{after} + \epsilon_{jt}$$

with r_{mt} standing for the respective local market indices and δ_{kt}^{before} and δ_{kt}^{after} are dummies taking the value of 1 at k^{th} day before and after the event respectively and k varying from -120 to 0 and from 0 to 120. Market models are estimated over the -250 to 250 days around the event. Respective γ_{jk} coefficients would give us the abnormal returns for each bank for periods around the event date. Using those we arrive to the abnormal returns for various groups.

Tables 1 to 3 present the resulting cumulative abnormal returns and significance tests for the difference between the two groups of banks for 3 dates: December 10th 2010 – publication date for EBA guidelines on remuneration policies; April 16th 2013 – CRD IV approval by the European Parliament and June 27th 2013 – CRD IV official publication.

We document the following results. Once the remuneration guidelines are announced there is no negative reaction in the stock markets. The group of treated banks however exhibits lower returns in the 3 weeks before and two weeks after the announcement. Once the regulation is approved both groups exhibit negative reactions. The only significant difference is for the second day after the approval when the less affected banks tend to outperform the other group. Finally, upon the publication of results we observe the similar picture. New regulatory burden tends to produce the negative market reaction. This reaction, however, is uniform across the two groups of institutions.

Similar analysis of CDS spread returns using the constant returns model gives an estimate of change in the credit risk of the bank perceived by the market participants. The following specification is used for the abnormal changes in CDS spreads.

$$cr_{jt} = \alpha + \gamma_{kj}^{before} \sum_{k=-K}^{0} \delta_{kt}^{before} + \gamma_{kj}^{after} \sum_{k=1}^{K} \delta_{kt}^{after} + \epsilon_{jt}$$

Here we observe the reaction which is different from the stock market results. The group of treated banks experiences a larger increase in CDS spreads around the announcement of remuneration guidelines, hence the new rules are perceived by the market as undermining the stability of the affected banks which is expected given the higher efforts expected for compliance. The official approval of the law, however, does not produce the divergent reactions. Spreads go down for both groups (few differences around the approval day compensate each other). Same holds for the publication date when pre-publication spread changes for the less affected group are significantly larger while the reverse is true post-publication.

Table 1. Cumulative abnormal returns around the announcement of remuneration guidelines (10 December 2010)

	[-20;0]	[-10;0]	[-5;0]	[-2;0]	[-1;0]	[0]	[0;1]	[1;2]	[1;5]	[1;10]	[1;20]
All banks	0.051***	0.076***	0.032***	0.024***	0.009**	-0.009***	-0.004	0.006***	-0.012**	-0.001	-0.010
	-0.014	-0.016	-0.007	-0.004	-0.004	-0.003	-0.003	-0.002	-0.006	-0.007	-0.009
Untreated	0.066***	0.085***	0.035***	0.024***	0.008*	-0.010**	-0.006	0.007***	-0.006	-0.002	-0.016
	-0.018	-0.021	-0.010	-0.005	-0.004	-0.004	-0.004	-0.002	-0.007	-0.010	-0.012
Treated	0.009	0.049***	0.024**	0.026***	0.011*	-0.006**	0.0002	0.006**	-0.029***	0.0004	0.006
	-0.009	-0.007	-0.009	-0.007	-0.006	-0.003	-0.003	-0.002	-0.007	-0.005	-0.012
Difference	0.057**	0.037	0.011	-0.003	-0.003	-0.004	-0.006	0	0.023**	-0.002	-0.022

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2. Cumulative abnormal returns around the CRD IV approval date (16 April 2013)

	[-20;0]	[-10;0]	[-5;0]	[-2;0]	[-1;0]	[0]	[0;1]	[1;2]	[1;5]	[1;10]	[1;20]
All banks	-0.096***	0.000	0.044***	-0.047***	-0.023**	-0.005	-0.016***	-0.018***	0.032**	0.058***	0.117***
	-0.011	-0.008	-0.007	-0.011	-0.009	-0.004	-0.003	-0.004	-0.012	-0.014	-0.030
Untreated	-0.096***	-0.002	0.044***	-0.055***	-0.029**	-0.008	-0.017***	-0.013**	0.035**	0.059***	0.126***
	-0.014	-0.010	-0.009	-0.015	-0.012	-0.005	-0.004	-0.005	-0.017	-0.019	-0.041
Treated	-0.097***	0.006	0.042***	-0.024***	-0.006*	0.002	-0.015***	-0.031***	0.024**	0.055***	0.093***
	-0.013	-0.008	-0.009	-0.004	-0.00303	-0.002	-0.005	-0.006	-0.009	-0.012	-0.012
Difference	0.001	-0.008	0.002	-0.031*	-0.023	-0.01	-0.002	0.018*	0.011	0.004	0.034

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3. Cumulative abnormal returns around the CRD IV publication date (26 June 2013)

Windows	[-10;0]	[-5;0]	[-2;0]	[-1;0]	[0]	[0;1]	[1;2]	[1;5]	[1;10]
All banks	-0.024**	-0.009	-0.036***	-0.024***	-0.016***	-0.0179***	-0.00826**	-0.0174*	-0.016***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.004)	(0.009)	(0.005)
Treated group	-0.010	-0.010	-0.026***	0.010***	-0.016***	-0.023***	-0.008*	-0.020	-0.016***
	(0.012)	(0.010)	(0.006)	(0.002)	(0.002)	(0.005)	(0.005)	(0.013)	(0.002)
Untreated group	-0.0294*	-0.00828	-0.040***	0.002	-0.015**	-0.016**	-0.008*	-0.011**	-0.015**
	(0.015)	(0.014)	(0.013)	(0.005)	(0.007)	(0.007)	(0.004)	(0.004)	(0.007)
Diff-ce (untreated-treated)	-0.029	-0.008	-0.014	-0.003	0.001	0.008	-0.000	-0.010	0.001

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4. Cumulative abnormal cds returns around the remuneration guidelines publication (10 December 2010)

Windows	[-10;0]	[-5;0]	[-2;0]	[-1;0]	[0]	[0;1]	[1;2]	[1;5]	[1;10]
All banks	0.007	-0.012	0.019***	0.017***	0.009***	0.0139***	0.009*	0.001	0.0362***
	-0.0109	-0.009	-0.00632	-0.00458	-0.00266	-0.00331	-0.005	-0.0073	-0.00896
Untreated	0.017	-0.0217**	0.008	0.007*	0.006**	0.011***	0.014**	0.0106	0.0387***
	-0.0124	-0.009	-0.006	-0.004	-0.00276	-0.00378	-0.005	-0.0079	-0.0107
Treated	-0.040**	0.036	0.070***	0.063***	0.025***	0.029***	-0.011	-0.0433***	0.0244**
	-0.015	-0.021	-0.007	-0.010	-0.005	-0.003	-0.010	-0.00963	-0.00912
Difference	0.05**	-0.057*	-0.062***	-0.057***	-0.018*	-0.019***	0.0135**	0.054***	0.014

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5. Cumulative abnormal CDS returns around the CRD IV approval date (16 April 2013)

Windows	[-20;0]	[-10;0]	[-5;0]	[-2;0]	[-1;0]	[0]	[0;1]	[1;2]	[1;5]	[1;10]	[1;20]
All banks	0.099***	-0.022***	0.008**	0.030***	0.015***	0.001	0.005***	0.013***	-0.015***	-0.047***	-0.065***
	-0.01	-0.008	-0.004	-0.004	-0.003	-0.001	-0.002	-0.002	-0.004	-0.007	-0.010
Untreated	0.096***	-0.008	0.008*	0.023***	0.012***	0.001	0.003*	0.011***	-0.012***	-0.037***	-0.056***
	-0.011	-0.0081	-0.005	-0.004	-0.004	-0.001	-0.002	-0.002	-0.004	-0.008	-0.012
Treated	0.114***	-0.088***	0.007	0.060***	0.027***	0.005	0.014**	0.026***	-0.032***	-0.093***	-0.105***
	-0.0249	-0.0113	-0.005	-0.008	-0.006	-0.004	-0.005	-0.007	-0.008	-0.01	-0.013
Difference	-0.018	0.080***	0.001	-0.036**	-0.015*	-0.004	-0.01	-0.016	0.020*	0.056***	0.049**

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6. Cumulative abnormal CDS returns around the CRD IV publication date (26 June 2013)

Windows	[-20;0]	[-10;0]	[-5;0]	[-2;0]	[-1;0]	[0]	[0;1]	[1;2]	[1;5]	[1;10]	[1;20]
All banks	0.166***	0.0778***	0.0738***	-0.0502***	-0.0358***	-0.0187***	-0.00784**	0.0141***	0.0274***	0.0119*	0.0209**
	-0.0122	-0.00839	-0.00756	-0.0117	-0.00905	-0.00351	-0.00327	-0.00344	-0.00484	-0.00635	-0.00928
Treated	0.204***	0.0826***	0.0744***	-0.150***	-0.108***	-0.0466***	-0.00745	0.0380***	0.0594***	0.0243	-0.000992
	-0.0276	-0.0245	-0.0123	-0.022	-0.0171	-0.00591	-0.00566	-0.00538	-0.0115	-0.0158	-0.0253
Untreated	0.157***	0.0768***	0.0736***	-0.0288**	-0.0205**	-0.0127***	-0.00792**	0.00897**	0.0205***	0.00925	0.0256**
	-0.0134	-0.00889	-0.00885	-0.0109	-0.00875	-0.00344	-0.00381	-0.00356	-0.00476	-0.00695	-0.00988
Difference	-0.047	-0.006	-0.001	0.121***	0.087***	0.034***	0.000	-0.029***	-0.039**	-0.015	0.027

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Analysis of longer-term outcomes.

The next step is to assess whether new rules were associated with different outcomes in terms of longer term performance. We use the difference-in-difference setup around the beginning of 2014 when the Directive came into force with the following specification:

$$Performance_{i,t} = \alpha + \beta * Post13_t + \gamma * Cont.Treatment_i + \delta * Cont.Treatment_i * Post13_t + Controls_{i,t}$$

Here performance measures include the Z-scores measuring the distance for default for a given bank, the credit risk perception by investors measured with the changes in 10-year CDS spreads and the profitability measures – Return on Assets. The analysis is performed on an annual basis. Results in Table 7 confirm the importance of regulation for the treated group upon inclusion of the basic set of control variables (we use the continuous treatment indicator).

Descriptive statistics for the dependent variables are shown in Table 7.

Table 7. Descriptive statistics for the outcome variables.

Variable	mean	sd	min	p25	p50	p75	max
Z-score	2.60	1.04	-0.74	2.10	2.74	3.29	4.56
ROA	0.05	0.93	-3.71	0.02	0.23	0.48	1.65
10y CDS spread	302.55	353.07	55.17	116.44	182.22	314.29	2469.29
SRISK	1.25	1.96	0.00	0.09	0.35	1.49	7.75
LRMES	50.23	11.84	17.57	43.45	51.47	57.93	77.48

Table 8. Longer term performance.

	(1)	(2)	(3)
VARIABLES	D.cds10	lnz1	ROA
Cont. treat	9.189	-0.179***	-0.369**
	(12.44)	(0.0460)	(0.151)
Cont. treat*After	-43.18**	0.0922*	0.289**
	(16.50)	(0.0490)	(0.131)
After 2013	85.53***	0.0177	0.0328
	(29.22)	(0.0561)	(0.130)
Size	25.93	0.180***	0.0267
	(19.50)	(0.0575)	(0.0812)
Tier 1/Assets	258.4	18.23***	12.07**
	(1,174)	(3.579)	(5.164)
NPLs/Assets	-942.9**	-9.493***	-7.764***
	(379.5)	(1.182)	(1.903)
Constant	-409.5	0.0367	-0.398
	(304.5)	(0.861)	(1.201)
Observations	82	160	160
R-squared	0.374	0.499	0.325

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Systemic risk analysis

We also consider banks' contribution to systemic risk measured by Long Run Marginal Expected Shortfall (LRMES) and SRISK (scaled by institution's market capitalization).

LRMES represents the expected loss of firm's equity value in case of system-wide crisis.

Table 9. Systemic risk outcomes

	(1)	(2)	(3)	(4)
VARIABLES	lrmes	sigma	beta	Srisk/mcap
Continious measure (CT)	-0.0133***	-2.53e-05	-0.0489**	0.0674
	(0.00444)	(0.000105)	(0.0193)	(0.100)
After	-0.0547***	-0.00121***	-0.277***	-1.692***
	(0.00895)	(0.000409)	(0.0461)	(0.485)
CT*After	0.00931	0.000683*	0.0488	0.567***
	(0.00843)	(0.000346)	(0.0312)	(0.185)
T1/Assets	-0.452	-0.0192	-2.350	-37.57***
	(0.565)	(0.0138)	(2.231)	(13.00)
Bad loans proportion	-0.124	0.00155	-0.489	0.558
	(0.114)	(0.00413)	(0.500)	(3.120)
Size (Assets)	-0.00415	-0.000269	-0.0224	-0.116
	(0.0121)	(0.000292)	(0.0445)	(0.266)
Constant	0.602***	0.00268	1.905***	-0.154
	(0.171)	(0.00425)	(0.646)	(3.859)
Observations	771	771	771	771
R-squared	0.350	0.496	0.362	0.714
Country FE	YES	YES	YES	YES

Directions for future research.

The split of banks into two groups would be adjusted by looking into the remuneration or risk management systems in greater detail. While variable-to-fixed salary ratio was the most controversial of the elements, the guidelines and directives have introduced other elements with the differentiated implementation across countries. A higher-dimensional measure of remuneration schemes could be produced resulting in more comparable groups of banks.

Another way to continue the analysis would include the analysis of reactions to the actual transposition of the new regulation into national laws and the series of publications clarifying the rules for banks in terms of remuneration calculations.

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Borrower and lender-based macroprudential policies. Propagation in the European banking sector

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Abstract

We investigate the impact of macro-prudential policies on systemic risk in the Euro area. We look into the impact of macro-prudential tools on systemic risk on the country level. Wee study how local macro-prudential regulation may spread out through the banking network. Decomposing macro-prudential instruments into two groups: borrower-based and financial institution-based, we explore how different macro-prudential policies are transmitted through upstream and downstream propagation subnetworks.

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