IMPACT OF REGULATION AND SUPERVISION ON EUROPEAN BANKS' STABILITY

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Abstract

This article applies the Generalized Method of Moments technique for dynamic panels, using bank-level data for the selected European countries over the period 2005 to 2011, to investigate the impact of regulation and supervision on risk taking. Three conclusions are reached. First, in France, Germany and UK, restriction on bank activities boosts banking stability. However, supervisors' power and capital adequacy encourage risk taking. Second, in Italy, Greece and Spain, we find that with more supervisors' power, largest banks tend to take greater risks and strengthening regulation and supervision weakens the bank's stability. However, the capital requirements decrease the risk taking. Third, strengthening regulatory and supervisory framework, and compliance with Basel principles enhance financial stability in Europe. These different results between European countries show that the application of regulation and supervision depends on the monitoring mode and the rhythm of application of regulatory policies.

Keywords: Restriction on Bank Activities, Capital Adequacy, Banking Supervision, Risk Taking, Dynamic Panel, European Banks

JEL classification: G 28, G 21, G 32, C 23

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1 Introduction

Risk taking has been widely debated in the financial literature since the eighties, with mainly Tversky and Kahneman (1981), and McCrimmon and Wehrung (1986). Nowadays, further to the recent international crisis of 2007/2008, the risk taking has been specifically emphasized. Indeed, it becomes worth pointing out the determinants of managerial risk taking. In fact, this crisis makes risk taking a fundamental economic theme, bringing also attention to supervisory and regulatory environment, and thereby becoming the most challenging topic of worldwide research.

Although, the fact that banking regulation and supervision are being rewritten and restructured in response to the global financial crisis, their implementation requires complex steps depending on each country's national policies and they could have different effects on bank risk taking depending on financial and institutional environment where banks operate, it is thus no surprise that the relationship between bank regulation and risk has recently become a cause for concern, especially as the level of supervision may give rise to both beneficial and adverse effects on bank risk taking strategy (Ben Bouheni, 2013a). Hence, empirical studies on the topic are ambiguous. For example Demirguc-Kunt and Detragiache, 2002; Beck et al., 2006; Chortareas et al., 2012, found that banking supervisory reforms were positively associated to the stability of banks. Alternatively, powerful supervisors may exert a negative influence on bank stability. Powerful supervisors may use their powers to benefit favored constituents, attract campaign donations, and extract bribes (Shleifer and Vishny, 1998). However, according to Barth et al. (2001), there is mixed evidence regarding the impact of regulatory restrictions on bank stability. Leaven and Levine (2009) conclude that capital requirements do not have an independent effect on bank stability and activity restrictions are associated with a particularly large increase in bank risk taking. . Recently, Murphy (2013) shows that the pending EU regulations restrictions will increase rather than decrease incentives for excessive risk taking

In this paper, we analyze the effects of regulation and supervision on risk taking by European banks over the period 2005-2011. The main contribution of this paper to the literature is by increasing significantly the focus on European countries groups, adopting the dynamic panel data and the Generalized Method of Moments (GMM) technique. We specifically focus on the 10 biggest

banks of two groups. The first group is composed of three European leaders: France, Germany and UK. Indeed, last years Germany and in somehow France are considered as European leaders because of their involvement in important European decisions. Although UK do not belongs to the euro zone and it is a monetary independent European country, UK is treated also as a leader and has its own economic regime. The second one regroups three most affected European countries by the recent financial crisis: Spain, Italy and Greece. Steglitz (2013) mentioned, "*While Europe's leaders shy away from the word, the reality is that much of the European Union is in depression. The loss of output in Italy since the beginning of the crisis is as great as it was in the 1930's. Greece's youth unemployment rate now exceeds 60%, and Spain's is above 50%. With the destruction of human capital, Europe's social fabric is tearing, and its future is being thrown into jeopardy*"[46].

This study applies the two-steps dynamic panel data approach suggested by Blundell and Bond (1998) and also uses dynamic panel GMM method to address potential problems in the data[47]. Nevertheless, using panel data produces problem in which different countries are treated together as an entity and not as a separate unit. Therefore, one cannot identify the differences in the relationships among regulation, supervision and risk taking. This study thus classifies countries in two groups, each group has similar features, since European countries do not react with the same manner to the recent financial crisis, which confirms that Europe is heterogeneous, while empirical studies, which ignore specific features of countries and influence factors, consider European countries as an entity.

Ignoring specific features and influence factors, the extant literature presents an ambiguous impact of banking regulation and supervision on risk taking. However, when these elements are taken into consideration, three conclusions are reached. First, restriction on bank activities decreases risk taking and enhances banking stability. However, supervisors' power and capital adequacy encourage risk taking by the biggest banks in France, Germany and UK. Second, we find that with more powerful supervisors banks tend to take greater risks, and strengthening regulation and supervision weakens the banking stability. However, the capital requirements decrease the risk taking by banks in Italy, Greece and Spain. Third, strengthening regulation and supervision, and compliance with Basel principles raise financial stability in Europe. This difference in results between European countries shows that the application of regulation and supervision depends also on the monitoring mode and the rhythm of application.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature.

Section 3 describes the methodology and the data employed herein, Section 4 discusses the empirical results, and in Section 5 we conclude.

2 Literature review: regulation, supervision and risk taking

Theory predicts that each category of regulations and supervisions influence the risk-taking differently. For example, deposit insurance intensifies the ability and incentives of stockholders to increase risk (Merton, 1977; Keeley, 1990). The impetus for greater risk taking generated by deposit insurance is due to the moral hazard.

As a second example, consider capital regulations. One purpose of capital regulations is to reduce the risk-taking incentives of owners by forcing owners to place more of their personal wealth at risk in the bank (Kim and Santomero, 1988). Specifically, although capital regulations might induce the bank to raise capital, they might not force influential owners to invest more of their wealth in the bank. Furthermore, capital regulations might increase risk-taking. Owners might compensate for the loss of utility from more stringent capital requirements by selecting a riskier investment portfolio (Koehn and Santomero, 1980; Buser et al., 1981).

As a third example, many countries attempt to reduce bank risk by restricting banks from engaging in non lending activities, such as securities and insurance underwriting (Boyd et al., 1998). As with capital requirements, however, these activity restrictions could reduce the utility of owning a bank, intensifying the risk-taking incentives of stakeholders. As a finale example, the banking supervisions are aiming to reduce risk taking. Buch et al. (2008) used the database compiled by Barth et al. (2001), they find that the supervisory systems influence the total risk of cross-bank mergers. Thus, the impact of banking reforms on risk depends on the influence of each category of regulations and supervisions.

The managerial risk taking must not be led in the same way as the legal setting varies through activities. It seems that legislation wholly discourages managers from incurring risks but also punishes them when they do not maximize the firm value. Its impact on managerial risk taking is then confused and it depends on the specificity of the business itself (Beasley et al., 2005). In countries with low accounting and auditing requirements more power on official supervisory authorities may reduce risk taking behavior from the perspectives of managers (Buch et DeLong, 2008), and the higher restrictions on bank

[46] Joseph E.Stoglitz, May 03, 2013, What is Italy saying ?, les Echos.fr. (http://lecercle.lesechos.fr/economistes-project-syndicate/joseph-e-stiglitz/221167267/what-is-italy-saying)

[47] The vantage of using the two-step dynamic panel data approach suggested by Arellano and Bover (1995) and Blundell and Bond (2000) and dynamic panel GMM technique is to address potential endogeneity, heteroskedasticity, and autocorrelation problems in the data (Doytch and Uctum, 2011).

activities can diminish the probability of a banking crisis.

Alternatively, Barth et al. (2001), find that there is mixed evidence regarding the impact of regulatory and supervisory policies on bank stability. Thus, Barth et al. (2004) provide empirical evidence on the impact of specific regulatory and supervisory practices on bank development, performance and stability using survey data for a sample of 107 countries. The results suggest that there is no statistically significant relationship between capital stringency, official supervisory power, bank performance and stability. However, they conclude that regulatory and supervisory practices that force accurate information disclosure empower private sector monitoring of banks, and foster incentives for private agents to exert corporate control work best to promote bank performance and stability. Specifically, in a cross-country setting they show that regulatory and supervisory regimes with these features have suffered fewer crises in the past two decades, have lower non-performing loans, and have deeper credit markets.

Traditional approaches to bank regulation emphasize the positive features of capital adequacy requirements. Capital serves as a buffer against losses and failure. Furthermore, with limited liability, the proclivity for banks to engage in higher risk activities is curtailed with greater amounts of capital at risk. Capital adequacy requirements, especially with deposit insurance, play a crucial role in aligning the incentives of bank owners with depositors and other creditors (Berger et al., 1995; Keeley and Furlong, 1990).

Recently, in his report, Murphy (2013), based on the decision of European Union in 2013 that has focused on limiting the ratio of variable remuneration to fixed remuneration, demonstrated that the pending EU regulations restrictions will: (1) increase rather than decrease incentives for excessive risk taking; (2) result in significant increase in fixed remuneration; (3) reduce incentives to create value; (4) reduce the competitiveness of the EU banking sector; and (5) result in a general degradation in the quality of EU investment bankers, thereby decreasing access to capital and increasing the cost of capital in the European Union.

Ben Shlomo et al. (2013) discussed, from a literature overview and empirical evidence, the recent reforms in European law regarding remuneration policy. They argued that an efficient regulation of remuneration policy should be directed at ensuring that remuneration policies and practices are aligned with effective risk management, and that he financial authorities should therefore closely observe market developments in this perspective and take countermeasures if necessary. Moreover, Ben Shlomo and Nguyen (2013) demonstrated that excessive risk-taking in the banking industry has led to the default of firms and to increased systemic risks as demonstrated during the previous financial crisis, and that inappropriate remuneration structures can contribute to excessive risk taking. Their analysis showed also the reform efforts to aim in the right direction. They concluded that (1) efficient regulation should ensure remuneration policies and structures to be aligned with an effective risk management; (2) the financial authorities should therefore closely observe the market development in this perspective and take countermeasures, and (3) an elimination of existing regulatory flaws in national laws is needed.

3 Methodological issues and data sources

To determine whether and how banking supervision and regulation influence risk taking by banks, we use a sample of the 10 biggest banks from six European countries, divided in two groups: the first one is composed of the European leaders (France, UK and Germany) and the second one is composed of the most influenced countries by the financial crisis (Italy, Spain and Greece), over the period 2005 – 2011. Because the applicable entry of IFRS[48] was in 2005, thus data of European banks are not available before this year. For each country in the sample, we identify the 10 largest banks (defined by total assets) that lend money to firms. We do not include central banks, postal banks which generally do not lend money to firms and are described as nonbanking institutions (La Porta et.al., 2002).

This study applies the two-step dynamic panel data approach suggested by Blundell and Bond (2000) and uses dynamic panel GMM method. The GMM approach is superior to traditional OLS in examining financial variable movements. Driffill et al. (1998) indicate that a conventional OLS analysis of the actual change in the short rate on the relevant lagged term spread yields coefficients with some wrong signs and wrong size.

There are two different estimators for the dynamic panel models: (1) the difference panel estimator eliminates a potential source of omitted variable bias in the estimation, and (2) the system panel model estimator combines the regression difference with the regression in levels in order to reduce the potential biases and imprecision associated with the difference estimator (Arellano and Bover, 1995). Linear GMM estimators have one- and two-step variants. The two-step estimator that we use is generally more efficient than the one-step estimator, especially for the system GMM.

The dynamic panel model technique and the GMM model are particularly well-suited to handling short macro panels with endogenous variables and are also helpful in amending the bias induced by omitted variables in cross-sectional estimates and the inconsistency caused by endogeneity. Our study

[48] International Financial Reporting Standards.

adopts the dynamic panel data approach and GMM two-steps method to estimate the parameters. Even though there is correlation or heteroskedasticity among the equations, the estimated standard deviation still appears to be robust (Lee and Hsieh, 2013).

To specify whether the instruments are valid, we adopt the specification test suggested by Blundell and Bond (2000) and use the Sargan test of over-identifying restrictions, which examines the validity of the instruments. If the null hypothesis of the Sargan test for validity over-identifying restrictions cannot be rejected, then the instrumental variables are valid. On the contrary, if we reject the null hypothesis, then the instrumental variables are inappropriate. The second test examines the hypothesis that the error term is not serially correlated, we test whether the residuals are second-order serially correlated or not.

The dependent variable "risk-taking" is measured by the following five proxies: standard deviation of return on assets (VOL_ROA), standard deviation of return on equities (VOL_ROE), standard deviation of return on average equities (VOL_ROAE), standard deviation of return on average assets (VOL_ROAA) and risk of insolvency (RISK_INSOLV=1/z-score). The z-score measures the distance from insolvency (Roy,1952). Insolvency is defined as a state in which losses surmounte profits. A higher z-score indicates that the bank is more stable. The z-score, therefore, equals (ROA+CAR)/ δ (ROA), where ROA is the return on assets, δ (ROA) is the standard deviation of ROA and CAR is the capital asset ratio. Following the literature[49], we define the inverse of the z-score as the risk of insolvency. A lower risk of insolvency indicates that the bank is more stable. Thus those five measures of risk taking indicate the stability of banks in Europe.

Panel 1. Risk-taking: Regulations, supervisions and capital adequacy

$$\begin{aligned}\text{RISK\_TAKING}_{i,t} &= b_0 + b_1(\text{RISK\_TAKING})_{i,t-1} \\ &+ b_2\left(\text{RESTRICT}\right)_{i,t} + b_3\left(\text{DEPO\_INSR}\right)_{i,t} \\ &+ b_4\left(\text{CAP\_ADQ}\right)_{i,t} \\ &+ b_5(\text{SRP})_{i,t} + b_6(\text{ISA})_{i,t} \\ &+ b_7(\text{BS})_{i,t} + b_8(\text{CAR})_{i,t} + b_9(\text{LLGL})_{i,t} \\ &+ b_{10}(\text{NLTA})_{i,t} + b_{11}(\text{NPL})_{i,t} + e_{i,t}\end{aligned}$$

Where,

i represent the biggest banks from the six European countries of our sample: i = 60 ; t denotes the time period from 2005 to 2011 : t = 7 ;

$ß_i$ are the parameters to be estimated. While b_1 is the estimated persistence coefficient for risk, a significant b_1 implies that risk will last from one year to the next (Goddard et al., 2004, 2010); $ß_0$ is the constant of the model and ε_{it} is the error term.

RISK_TAKING_{it}: refers to i th bank's risk taking in year t, it is measured by five alternatives proxies: the volatility of return on assets (VOL_ROA), the volatility of return on equities (VOL_ROE), the volatility of return on average equities (VOL_ROAE), the volatility of return on average assets (VOL_ROAA) and the risk of insolvency (RISK_INSOLV).

The financial regulations and supervisions followed from Lee and Hsieh (2013), Chortareas et al. (2012), Agoraki et al. (2011), Delis et al. (2011), Laeven and Levine (2009) and Barth et al. (2001, 2004, 2006, 2008) are: RESTRICT: restriction on banking activities measures the degree to which national regulatory authorities allow banks to engage in some activities. The summation value for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities, (2) insurance activities, (3) real estate activities, and (4) bank ownership of voting shares in nonfinancial firms. These activities can be unrestricted, permitted, restricted, or prohibited and receive values of 1, 2, 3, or 4, respectively. We create an overall index by calculating the natural logarithm of summation value of the four categories. The higher values indicate higher restrictions on banking activities.

DEPO_INSR: deposit insurance is calculated by answering eleven questions (see Appendix 1). Our method sums the individual zero/one answers, then uses the natural logarithm of the summation value to get an index. According to Demirguc-Kunt and Kane (2002), under the explicit deposit insurance schemes banks have more incentives for risk-taking.

CAP_ADQ: capital adequacy is measured by total equity/total assets (TE_TA) and total Capital Ratio (CAPR), referring to IMF (2000).

SRP: supervisors power measure the extent to which official supervisory authorities have the authority to take specific actions to prevent and correct problems. This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each of the six questions presented in appendix 1. ISA: independence of supervisory authority measures the degree to which the supervisory authority is independent from government (political influence) and legally protected from the banking industry (big financial institutions influence). This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each of the four questions presented in Appendix 1.

[49] Laeven and Levine (2009); Agoraki et al. (2011); Soedarmono et al. (2013).

As for the related control variables, according to Lee and Hsieh (2013), Chortareas et al. (2012) and Klomp and De Haan (2011), they include: CAR: Bank capital to assets ratio. The traditional view suggests a higher CAR is linked with a lower profitability because a higher CAR decreases the risk on equity the tax subsidy provided by interest deductibility (Ben Nacer and Omran, 2011). NPL: Bank nonperforming loans to total gross loan (%). NLTA: Net loans/total assets. LLGL: Loan loss reserve/Gross loans (%) and BS: Bank size measured by the log of total assets. A higher level of loans implies a higher risk will be generated. Empirical studies find that a higher loan ratio is associated with higher interest margins, which suggest that risk averse shareholders seek larger earnings to compensate higher credit risk (Demirguc-Kunt and Huizingua, 1999, Maudos and Guevara, 2004 and Flamini et al., 2009).

The data is sourced from Bankscope (2012) for banking financial indicators, and Bank regulation and supervision database, World Bank; Barth et al., 2001, 2003, 2004, 2006, 2008) for banking supervision and regulation (see Appendix 1 for data and sources)**.**

4 Empirical analysis

This study analyzes a panel dataset comprising six European countries, divided in two groups, over the period 2005 -2011. We did not use all the variables of regulations and supervisions (Restriction on bank activities, deposit insurance, supervisors power and independence of supervisory authority), because there is a persistent multicollinearity problem between variables. Nevertheless, the global index of regulations and supervisions regroups all of them.

The tables 1 and 2 report summary statistics of the main regression variables for France, Germany, UK, Italy, Spain and Greece. Sample consists of 60 banks from 6 countries, and includes the 10 largest banks in the country in terms of total assets, if available. Statistics based on annual data from the year 2005 to 2011. The average of the volatility of return on equity (VOL_ROE) for the first group (France, Germany and UK) is 0.1601 with 0.7251 as a standard deviation. However, for the second group (Italy, Spain and Greece), the average of the volatility of return on equity (VOL_ROE) is 0.0397 with 0.0751 as a standard deviation. The average of the volatility of return on assets, the average of return on average assets and the risk of insolvency do not vary greatly between the two groups of countries. Nevertheless, the average of return on average equities is more important for the first group (10.460) than the second one (3.3469). The global index of regulations and supervisions (GI_RS), the restrictions on bank activities (RESTRICT), the deposit insurance (DEPO_INSR), and the independence of supervisory authority (ISA) are higher in the case of the second group than the first one. However, only the supervisors' power (SRP) which is higher for the first group than the second one.

Table 3 provides the matrix of correlation coefficients. The correlation coefficients are usually less than 0.8, indicating that the correlation between variables has weak association (see Table 3 in Appendix 2). Kennedy (2008) indicates that multicollinearity is a critical problem when the correlation is above 0.80.

Table 1. Summary statistics for France, Germany and UK

Variable	Obs	Mean	Std. Dev.	Min	Max
VOL_ROE	133	0.1601	0.7251	0.0002	8.2953
VOL_ROA	133	0.0043	0.0109	7.0800	0.1030
VOL_ROAE	145	10.460	26.5209	0.0275	198.9982
VOL_ROAA	141	0.2970	0.3898	0	2.5964
RISK_INSOLV	133	0.0009	0.0024	1.2900	0.0220
TE_TA	189	3.5937	1.5646	-0.3600	7.8
CAPR	162	13.1240	4.7424	5.700	47
RESTRICT	210	0.8004	0.1475	0.6020	0.9542
DEPO_INSR	210	0.3920	0.2923	0	0.6989
SRP	210	0.5274	0.1678	0.3010	0.7781
ISA	210	0.5187	0.0590	0.4771	0.6020
GI_RS	210	2.2387	0.2872	1.9242	2.8293
BS	189	8.6856	0.4284	7.3175	9.4127
CAR	190	4.7368	0.6233	4.1000	6.1
LLGL	172	2.2235	1.3497	0	7.95
NLTA	181	60.3835	36.9983	0.01	223.88
NPL	170	2.8235	1.0611	0.9	4.2

Table 2. Summary statistics for Italy, Spain and Greece

Variable |	Obs	Mean	Std. Dev.	Min	Max
VOL_ROE |	79	0.0397	0.0751	0.0001	0.5209
VOL_ROA |	81	0.0036	0.0090	0.0001	0.0571
VOL_ROAE |	83	3.3469	4.3828	0.0212	27.3438
VOL_ROAA |	80	0.2975	0.4412	0.0070	2.7435
RISK_INSOLV |	81	0.0004	0.0012	3.3400	0.0080
TE_TA |	106	6.4722	2.1285	0.8800	12.09
CAPR |	92	11.5304	1.9553	8.73	17.75
RESTRICT |	140	0.9621	0.1174	0.8450	1.0791
DEPO_INSR |	140	0.6505	0.0486	0.6020	0.6989
SRP |	140	0.2223	0.2044	0	0.4771
ISA |	140	0.5395	0.2394	0.3010	0.7781
GI_RS |	140	2.3745	0.3698	1.8450	2.9365
BS |	109	8.3081	0.4028	7.0678	9.0974
CAR |	120	7.15	0.9280	5.9	9.3
LLGL |	97	3.1949	1.6828	0.03	8.87
NLTA |	106	63.2622	14.8005	6.75	83.66
NPL |	120	4.0333	2.2388	0.7	7.8

4.1 Results for the first group: France, Germany and UK

Table 4. Regulations, supervisions and capital adequacy: France, Germany and UK

	VOL_ROA	**VOL_ROE**	**VOL_ROAA**	**VOL_ROAE**	**RISK_INSOLV**
Lag	-0.044	-0.879	-0.257***	0.190*	-1.120***
	(-1.050)	(-0.780)	(-3.470)	(2.240)	(-3.800)
RESTRICT	0.293	1.076	-4.542*	5.400	-0.241
	(0.270)	(0.620)	(-2.060)	(4.340)	(-0.330)
DEPO_INSR	-0.072	1.609	0.881	5.490	0.087
	(-0.170)	(1.730)	(1.680)	(0.590)	(0.310)
SRP	-0.036	4.211**	0.317	14.950	-0.006
	(-1.490)	(3.170)	(1.100)	(0.780)	(-1.400)
TE_TA	-0.001	0.593**	0.102**	1.694	-0.001
	(-0.550)	(2.590)	(2.920)	(0.630)	(-2.470)
CAPR	-0.001	-0.115	-0.005	10.660***	0.001
	(-0.110)	(-1.500)	(-0.550)	(7.850)	(0.720)
BS	0.003	0.707	0.602	15.570**	-0.003*
	(0.680)	(0.980)	(1.890)	(3.150)	(-2.320)
CAR	-0.002	-0.138	-0.080	-10.940**	-0.001
	(-1.280)	(-0.910)	(-1.330)	(-2.900)	(-1.370)
NLTA	0.001	0.002	-0.003*	-1.062***	-0.001
	(0.730)	(0.210)	(-2.200)	(-12.420)	(-1.010)
LLGL	-0.001	-0.215	0.075	-9.764	-0.001
	(-0.080)	(-0.520)	(1.140)	(-1.690)	(-0.890)
NPL	0.002	-0.228	-0.167**	-9.987**	0.001
	(0.970)	(-0.690)	(-3.140)	(-2.820)	(1.330)
_cons	-0.212	-8.343	-0.915	-10.800***	0.210
	(-0.290)	(-1.140)	(-0.440)	(-4.770)	(0.430)
N	76	76	83	87	76
AR (2)	0.839	-1.238	-0.846	-1.054	-1.426
P-value AR (2)	(0.401)	(0.215)	(0.397)	(0.291)	(0.153)
Sargan Test	7.332	5.242	11.4702	11.169	6.056
P-value Sargan	*(0.291)*	*(0.513)*	*(0.404)*	*(0.429)*	*(0.416)*

, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.*

Table 4 summarizes the results of the impact of different types of regulation and supervision (RESTRICT, DEPO_INSR, SRP) and the Capital Adequacy (TE_TA and CAPR) on bank risk taking (VOL_ROA, VOL_ROE, VOL_ROAA, VOL_ROAE and RISK_INSOLV) for the group of leaders in Europe, namely Germany, UK and France. Therefore, we find that the restriction on bank activities is statistically significant and negatively correlated to bank risk taking at 10% level of significance. In fact, an increase by 1% of restrictions on banking activities reduces the VOL_ROAA by 4.542%. This confirms the view that restrictions reduce the sources of income of banks and limit excessive risk taking by managers.

Moreover, the power of supervisors is statistically significant and positively associated with the risk taken by banks in France, Germany and the UK: a 1% increase in the power of supervisors enhances the risk (VOL_ROE) by 4.211%. This means that the power of supervisors may be associated with corruption and the factors that hamper banks (Pasiouras et al., 2009) and that the private interest of supervisory authorities dominates on the social welfare and the common interest (Shleifer and Vishny, 1989). Banking supervision may also be associated with a high level of non-performing bank loans (Barth et al. 2002). Supervisions can be harmful to the development of banks (Barth et al. 2003) and can negatively influence all aspects of banking performance (Pasiouras et al. 2006).

These three countries are distinguished by the monitoring of their banks by independent authorities. In Germany, BaFin (Federal Financial Supervisory Authority) is the supervisory authority of the banking industry. *"…The aim of banking supervision to ensure that the banking system is efficient and stable. In Germany, the task of banking supervision is shared by the Bundesbank and BaFin Banking supervision does not directly intervene in transactions conducted by banks, but sets the regulatory framework. The Banking Act (Gesetz über das Kreditwesen) is the legal basis for this"*[50].

Moreover, in UK, it was the FSA (Financial Services Authority) that ensured the supervision of banks. Its dissolution in 2012 was a response of the British government to the financial crisis. The Financial Policy Committee (FPC) and the Prudential Regulation Authority (PRA) are the result of the dissolution. "*The financial crisis demonstrated the need for a new approach to financial regulation and major changes to the Bank came into force in April 2013. The Financial Services Act 2012 established an independent Financial Policy Committee (FPC), a new prudential regulator as a subsidiary of the Bank, and created new responsibilities for the supervision of financial market infrastructure providers. The Financial Policy Committee (FPC) is charged with taking action to remove or reduce systemic risks with a view to protecting and enhancing the resilience of the UK financial system. The Committee has a secondary objective to support the economic policy of the Government. The new Prudential Regulation Authority (PRA) is responsible for the supervision of banks, building societies and credit unions, insurers and major investment firms. In total the PRA will regulate around 1,700 financial firms. The PRA's role is defined in terms of two statutory objectives to promote the safety and soundness of these firms and – specifically for insurers – to contribute to the securing of an appropriate degree of protection for policyholders"*[51].

Thought, in France, the Prudential Resolution and Control Authority (ACPR) is responsible for banking supervision. The ACPR is an independent administrative authority. It is responsible for the supervision of banks and insurance agencies. Its main mission is to ensure the preservation of financial stability and the protection of bank customers, policyholders and beneficiaries of insurance contracts. Its organization and operation are designed to ensure the implementation of all the necessary skills to carry out its missions, ensuring responsiveness, effectiveness and consistency of decision-making[52].

Although these three European countries have independent supervision authorities, the question of the degree of their independence is raised because the regulatory agencies are not independent of the influences of short-term politics, and private financial institutions. The regulatory agencies that probably have the most information and best mixture of human capital skills but they are not independent of private financial institutions: Banks help choose the leadership of supervision authorities; many senior worked for private financial institutions before coming to these authorities; many authorities officials move to jobs in private financial institutions; and, supervision authorities officials are, by necessity, in constant contact with the private institutions that they supervise. Hence, these close connections with private financial institutions mean that the supervision authorities are not independent (Levine, 2011).

Turning to capital adequacy, the TE_TA and the CAPR variables are statistically significant and positively associated to bank risk-taking. This implies that the capital adequacy according to the principles of the Basel Committee encourages banks in European countries to take more risk to reward the lost revenue due to non-use of the part of the capital adequate. Owners might compensate for the loss of

[50] http://www.bundesbank.de/Redaktion/EN/Standardartikel/Core_business_areas/Banking_supervision/banking_supervision.html

[51] http://www.bankofengland.co.uk/about/Pages/default.aspx

[52] http://www.acp.banque-france.fr/lacp/quest-ce-que-lacp.html

utility from more stringent capital requirements by selecting a riskier investment portfolio, which intensifying conflicts between owners and managers over bank risk-taking (Gale 2010).

The bank size (BS) is also statistically significant and positively associated to the volatility of the return on average capital. This implies that the increase in bank capital enhances the shareholders' profitability and increases the volatility of the return on capital. However, the bank size is negatively correlated to the risk of insolvency (RISK_INSOLV). The aim of capital increase is to strengthen the bank equities, to enhance bank-borrowing capacity, thus fortification of capital improves the ability of bank to support the weight of debt. According to our results, the increase in capital reduces the risk of insolvency. This is explained by the ability of largest banks to support the weight of their debt and their effectiveness to control strategies of excessive risk taking by managers.

The findings show that different risk taking variables have different results on persistence of risk. The coefficients of VOL_ROAA and RISK_INSOLV with one period lag are both negative at 1% significance, their related coefficients are significantly negative at 0.257 and 1.120, exhibiting that variables such as VOL_ROA and VOL_ROE do not show persistence of risk, while VOL_ROAE do has persistence of risk at 10% significance. Other control variables also perform differently. For example, the coefficients of bank nonperforming loans to total gross loan (NPL), net loans to total assets (NLTA) and bank capital to assets ratio (CAR) are significantly negative on risk taking.

The Sargan and the serial-correlation tests proposed by Blundell and Bond (2000) do not reject the null hypothesis of correct specification, which means that we have valid instruments (p-value > 5%) and no serial-correlation of residuals (p-value > 5%).

Table 5. Global index and capital adequacy: France, Germany and UK

	VOL_ROA	VOL_ROE	VOL_ROAE	VOL_ROAA	RISK_INSOLV
Lag	0.032	-2.331	0.308	-0.239	0.086
	(0.400)	(-1.370)	(0.700)	(-0.640)	(1.110)
GI_RS	-0.022	2.164	92.590	0.482	-0.004
	(-0.720)	(0.560)	(0.980)	(1.360)	(-0.680)
TE_TA	-0.001	0.266	-3.587	0.129**	-0.001
	(-0.460)	(0.360)	(-0.260)	(2.970)	(-0.350)
CAPR	0.001	-0.001	11.970*	0.019	0.001
	(0.680)	(-0.010)	(2.090)	(0.450)	(0.430)
BS	-0.028*	0.868	-1.770	0.488	-0.006*
	(-2.200)	(0.300)	(-0.720)	(0.760)	(-2.300)
CAR	-0.002	-0.161	-9.308	-0.122	-0.001
	(-1.100)	(-0.480)	(-0.610)	(-0.930)	(-1.340)
NLTA	-0.001	0.014	-1.408***	-0.002	-0.001
	(-1.450)	(0.360)	(-4.390)	(-1.230)	(-1.490)
LLGL	-0.002	-0.657	-9.950	0.077	-0.001
	(-0.570)	(-1.050)	(-1.710)	(0.600)	(-0.450)
NPL	0.001	0.156	3.772	-0.213	0.000
	(0.540)	(0.260)	(0.200)	(-1.630)	(0.400)
_cons	0.319	-11.830	8.300	-4.443	0.069
	(1.740)	(-0.340)	(0.510)	(-0.780)	(1.780)
N	76	76	87	83	76

, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.*

Referring to Table 5, we find that the global index of regulations and supervisions (GI_RS), which is composed of restriction on banking activities, deposit insurance, the power of official supervisors and independent of authorities of control, is not statistically significant. This indicates that Germany, UK and France are already regulated countries and the impact of the recent financial crisis on their economies is less important than for other European countries like Greece or Spain. Thus a small increase in the overall index of regulations and supervisions does not necessarily generate a significant impact on bank risk-taking by banks of the first group, while for other European countries such as Italy, Spain and Greece, which suffer today a political, economic and

social crisis, the improvement of their regulatory and supervisory framework could has a significant effect.

Moreover, the ratios of capital adequacy (TE_TA and CAPR) are statistically significant and positively correlated to risk-taking (VOL_ROAA and VOL_ROAE), which means that the capital adequacy required by the Basel Committee encourages risk taking by banks in the three countries to reward the shortfall due to adequate capital untapped. Our results are consistent with the view that capital adequacy encourages risk taking by owners (Koehn and Santomero, 1980; Buser et al 1981. Laeven and Levine, 2009).

However, the control variables, such as the bank size (BS) and the ratio of net loans to total assets (NLTA) are statistically significant and negatively correlated to bank risk taking. Thus we conclude that the effect of banking regulation and supervision on risk taking depends on the specific indicators of banks and the assets quality (Demirguc-Kunt et al, 2008. Laeven and Levine, 2009; Lee and Hsieh, 2013).

4.2 Results for the second group: Italy, Spain and Greece

Table 6. Regulations, supervisions and capital adequacy: Italy, Spain and Greece

	VOL_ROA	VOL_ROE	VOL_ROAA	VOL_ROAE	RISK_INSOLV
LAG	0.129	-1.321	0.207*	0.231	0.067
	(0.710)	(-1.390)	(2.060)	(1.720)	(0.480)
SRP	0.012***	0.707*	1.452***	26.520***	0.001**
	(3.710)	(1.990)	(5.650)	(4.900)	(2.840)
ISA	0.005	0.355	-0.624	5.526	0.001
	(0.960)	(1.070)	(-0.810)	(0.420)	(0.150)
TE_TA	-0.001	0.070	0.103	1.683	-0.001
	(-0.700)	(1.310)	(1.910)	(1.810)	(-0.910)
CAPR	-0.001*	-0.025	-0.041*	-0.350	-0.001**
	(-2.210)	(-1.800)	(-2.220)	(-0.820)	(-2.610)
BS	-0.010*	-1.896	-0.081	-12.000	-0.001
	(-2.510)	(-1.580)	(-0.110)	(-1.890)	(-1.180)
CAR	0.003***	0.096**	0.295***	4.873	0.001***
	(8.100)	(2.860)	(6.650)	(1.730)	(6.030)
NLTA	-0.001*	-0.001**	-0.035***	-0.540**	-0.001
	(-2.310)	(-3.030)	(-3.400)	(-3.080)	(-1.130)
LLGL	0.001	-0.010	0.004	0.839	-0.001
	(0.580)	(-0.380)	(0.060)	(0.760)	(-0.590)
NPL	-0.001	-0.044	-0.173***	-3.598**	-0.001
	(-1.850)	(-1.530)	(-6.980)	(-3.130)	(-0.830)
_cons	0.090*	15.510	1.642	11.800*	0.005
	(2.390)	(1.580)	(0.270)	(2.280)	(1.160)
N	50	49	49	50	50
AR (2)	-0.741	1.518	-1.006	-0.620	0.740
P-value AR (2)	(0.458)	(0.128)	(0.314)	(0.534)	(0.643)
Sargan Test	2.296	2.185	2.754	3.079	2.056
P-value Sargan	(0.998)	(0.990)	(0.997)	(0.995)	(0.876)

, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.*

Referring to the results presented in Table 6, we can note that the supervisors power (SRP) is statistically significant and positively correlated to all the variables of risk taking by banks in Italy, Spain and Greece, which means that the empowerment of supervisors encourages risk taking and disadvantages financial stability. This result is the same for the two groups of countries, despite the fact that banks in Italy, Spain and Greece are controlled by central banks, while for the banks in France, Germany and UK, the monitoring and the control are assumed by independent authorities. Furthermore, the independence of the supervisory authorities (ISA) is not statistically significant. It seems logical since the control of banks in these countries is entrusted to central banks and not to independent supervisory

authorities. However, the capital adequacy ratio (CAPR) is statistically significant and negatively associated to risk taking. Therefore, we conclude that the capital adequacy contributes to maintain stability in some banks during the recent crisis.

This result is different from the first group countries. This confirms that the reactions of European countries to the capital adequacy proposed by the Basel Committee are different because the European countries are heterogeneous and their reactions to the recent financial crisis are also different. Thus, the influence factors of each country have an impact on the adaptation and the implementation of regulation and supervision. The null hypothesis of the Sargan test is not rejected, which means that the instruments are valid, also the null hypothesis of the test of serial-correlation is accepted, it implies the absence of autocorrelation of residuals and confirms the validity of the instruments.

Table 7. Global index and capital adequacy: Italy, Spain and Greece

	VOL_ROA	VOL_ROE	VOL_ROAA	VOL_ROAE	RISK_INSOLV
Lag	0.097	-0.046	-0.231	0.655	-1.187
	(0.500)	(-0.060)	(-0.790)	(0.470)	(-1.630)
GI_RS	0.004	0.111	0.856*	10.750	0.001*
	(1.360)	(1.790)	(2.080)	(1.510)	(2.460)
TE_TA	-0.001**	-0.006	-0.039	-2.462	-0.001**
	(-3.180)	(-0.260)	(-0.77)	(-0.61)	(-2.660)
CAPR	-0.001	0.008	-0.039*	0.286	-0.001*
	(-1.920)	(0.900)	(-2.040)	(0.470)	(-2.430)
BS	-0.008	0.186	-1.675	-11.370*	-0.001*
	(-1.180)	(0.410)	(-1.610)	(-2.220)	(-2.200)
CAR	0.003***	0.019	0.291***	5.521	0.001***
	(4.170)	(0.510)	(3.570)	(1.020)	(3.850)
NLTA	-0.001	-0.003	-0.031	-0.120	-0.001
	(-1.210)	(-1.710)	(-1.940)	(-0.460)	(-1.190)
LLGL	-0.001	0.001	0.101	-1.189	-0.001
	(-0.320)	(0.030)	(1.020)	(-0.350)	(-0.230)
NPL	-0.001	-0.016	-0.110	-1.013	-0.001
	(-0.060)	(-0.840)	(-1.890)	(-0.360)	(-1.110)
_cons	0.072	-1.677	13.280	6.410	0.013*
	(1.240)	(-0.460)	(1.550)	(1.350)	(2.030)
N	50	49	49	50	50
AR (2)	-0.457	-0.522	-1.069	-0.172	-1.562
P-value AR (2)	(0.647)	(0.601)	(0.284)	(0.863)	(0.118)
Sargan Test	5.364	2.055	3.748	4.827	1.691
P-value Sargan	(0.966)	(0.999)	(0.993)	(0.978)	(0.999)

, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.*

The global index of regulations and supervisions (GI_RS) is statistically significant and positively associated to bank risk taking. In fact, an increase of a unit in GI_RS increases VOL_ROA by 0.856 and RISK_INSOLV by 0.001, which shows that a highly regulated environment encourages risk taking by banks in Italy, Spain and Greece (see Table 7).

However, the ratios of capital adequacy (TE_TA and CAPR) are negatively correlated with risk taking (VOL_ROA and RISK_INSOLV), thus the capital adequacy declines risk taking, mainly the risk of insolvency (Demirguc-Kunt and Kane, 2002; Agusman et al 2008; Lee and Hsieh, 2013). The Sagan test and serial-correlation test do not reject the null hypothesis of correct specification, which means that instruments are valid and there is no second order correlation of residuals.

The specificity of the banks in this group is their supervision by the central banks. The Italian central bank is itself the regulator of the banking industry, it belongs to the Ministry of Economy and Finance and other public authorities, so that in our sample of six European countries, Italy is the country that the supervisory authority is the least dependent

"*The Bank of Italy's functional and governance arrangements are based on a variety of different legal*

sources: Community law, which regulates the activity of the European System of Central Banks (ESCB), the provisions of banking and financial law concerning its supervisory powers, other provisions governing its relations with the Ministry for the Economy and Finance and other authorities, and its Statute".

Regarding Spain, the central bank controls also the Spanish banking industry. "*The Banco de España is the national central bank and supervisor of the Spanish banking system. Its activity is regulated by the Law of Autonomy of the Banco de España"*.

Greek banks are also supervised by the central bank, which belongs to the Greek parliament. *"The Department for the Supervision of Credit and Financial Institutions of the Bank of Greece is responsible for the prudential supervision of credit and financial institutions, with a view to ensuring the smooth operation and stability of the Greek financial system. In the performance of its tasks, the Bank enjoys institutional, personal and operational independence, and is accountable to the Greek Parliament"*.

The tests of specification proposed by Blundell and Bond (2000) confirm that the null hypothesis of the Sargan test is accepted, which implies that the instruments are valid (p-value> 5 %) and the null hypothesis of serial-correlation test is accepted (p-value> 5%), this means the absence of second order correlation of residuals.

4.3 Robustness test: the entire sample

Table 8. Risk-taking: Global index and capital adequacy for the entire sample

	VOL_ROA	VOL_ROE	VOL_ROAA	VOL_ROAE	RISK_INSOLV
LAG	0.392***	-0.612***	-0.213	0.064	0.444***
	(19.770)	(-3.500)	(-1.320)	(0.750)	(25.980)
TE_TA	-0.002***	-0.081	0.011	-8.469	-0.001***
	(-10.440)	(-1.910)	(0.370)	(-2.100)	(-9.460)
CAPR	0.001	-0.024	-0.064	3.927	0.001
	(0.480)	(-0.650)	(-1.930)	(1.320)	(1.090)
GI_RS	-0.014**	-1.094***	0.607	17.420	-0.002*
	(-3.060)	(-4.490)	(1.480)	(0.780)	(-2.510)
BS	-0.014**	-0.194	-0.606	17.810	-0.001*
	(-3.060)	(-0.960)	(-1.550)	(1.150)	(-2.030)
CAR	0.001	0.005	0.245***	2.195	0.001
	(1.470)	(0.130)	(5.460)	(0.940)	(1.010)
LLGL	-0.001	-0.131	-0.103	-6.747**	-0.001**
	(-1.430)	(-1.510)	(-1.320)	(-2.660)	(-3.160)
NLTA	-0.001*	-0.003	-0.011**	-0.908***	- 0.001
	(-2.290)	(-1.380)	(-2.740)	(-6.820)	(-1.010)
NPL	0.004***	0.425***	0.104	9.430***	0.001***
	(5.300)	(4.250)	(1.210)	(3.350)	(4.160)
_cons	0.149***	4.036*	4.157	-14.400	0.018*
	(3.380)	(2.000)	(1.180)	(-1.330)	(2.280)
N	173	172	179	184	173
AR (2)	-1.554	-1.455	0.237	-1.480	-1.293
P-value AR (2)	(0.120)	(0.145)	(0.812)	(0.138)	(0.195)
Sargan Test	14.383	13.962	10.311	23.795	12.984
P-value Sargan	(0.347)	(0.376)	(0.668)	(0.033)	(0.449)

, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.*

5 Conclusion

We assemble data on regulation, supervision and risk taking by banks of the selected European countries, and we apply the GMM technique for dynamic panels using bank-level data over the period 2005 to 2011 to investigate the impacts of regulations and supervisions on risk taking. Our findings show three main conclusions. First, restriction on bank activities decreases risk taking, thus it enhances banking stability. However, supervisors' power and capital adequacy encourage risk taking by banks in France, Germany and UK. Second, we find that with more powerful supervisors, banks tend to take greater risks,

and strengthening regulation and supervision weakens the banking stability. However, the capital requirements decrease the risk taking by banks in Italy, Greece and Spain. Third, strengthening regulation and supervision, and compliance with Basel principles raise financial stability in Europe, which show the role of regulation and supervision in limiting excessive bank risk-taking. It is important to consider the specific features of countries' economies and the influence factors, when studying the effects of regulation and supervision on bank risk-taking ((Ben Bouheni, 2013b). This difference in results between European countries shows that the application of regulation and supervision depends also on the monitoring mode and the rhythm of application of regulation.

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Appendix 1. Summary of variables, descriptions, and data source

Classification	VARIABLES	DESCRIPTION	SOURCE
Dependent variables RISK_TAKING	VOL_ROE	Standard deviation of return on equities is calculated using the overlapping ROE data averaged every two years.	Calculated by author (data from Bankscope, 2012)
	VOL_ROA	Standard deviation of return on assets is calculated using the overlapping ROA data averaged every two years.	Calculated by author (data from Bankscope, 2012)
	VOL_ROAE	Standard deviation of return on average equities is calculated using the overlapping ROAE data averaged every two years.	Calculated by author (data from Bankscope, 2012)
	VOL_ROAA	Standard deviation of return on average assets is calculated using the overlapping ROAA data averaged every two years.	Calculated by author (data from Bankscope, 2012)
	RISK_INSOLV	Risk of insolvency (1/z-score) = (1/(ROA + CAR/ δ ROA))	Calculated by author (data from Bankscope, 2012)
Bank regulations	RESTRICT	Restriction on banking activities. The summation values for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities (the extent to which banks engage in underwriting, brokering and dealing in securities, and all aspects of the mutual fund industry), (2) insurance activities (the extent to which banks engage in insurance underwriting and selling), (3) real estate activities (the extent to which banks engage in real estate investment, development and management), and (4) bank ownership of voting shares in nonfinancial firms (the extent to which nonfinancial firms may own and control banks). These activities can be unrestricted, permitted, restricted, or prohibited and receive values of 1, 2, 3, or 4, respectively. We create an overall index by calculating the natural logarithm of summation values of the four categories.	Bank regulation and supervision database, World Bank; Barth et al., 2001, 2004, 2006, 2008.
	DEPO_INSR	Deposit insurance is calculated by answering the following 11 questions: (1) The explicit deposit insurance protection system is funded by: the government, the banks, or both? (2) Do deposit insurance fees charged to banks vary based on some assessment of risk? (3) Does the deposit insurance scheme also cover foreign currency deposits? (4) Are interbank deposits covered? (5) Are nonresidents treated less favorably than residents with respect to deposit insurance scheme coverage (either in terms of coverage for which they are entitled or the actual protection provided)? (6) Who manages the insurance fund? (7) Does the deposit insurance authority make the decision to intervene a bank? (8) Does the deposit insurance authority by itself have the legal power to cancel or revoke deposit insurance for any participating bank? (9) Can the deposit insurance agency/fund take legal action for violations against laws, regulations, and bylaws (of the deposit insurance agency) against bank directors or other bank officials? (10) Has the deposit insurance agency/fund ever taken legal action for violations against laws, regulations, and bylaws (of the deposit insurance agency) against bank directors or other bank officials? (11) Is participation in the deposit insurance system compulsory for all banks? Our method sums the individual zero/one answers, then we use the natural logarithm of the summation values to get an index.	Bank regulation and supervision database, World Bank; Barth et al., 2001, 2004, 2006, 2008.
	CAP_ADQ	Capital adequacy is measured by two ratios: total equity/total assets (TE_TA) and total Capital Ratio (CAPR).	IMF (2000) Data from Bankscope, 2012

Bank supervisions	SRP	Supervisors' power: this variable is the natural logarithm of summation values which are determined by adding 1 if the answer is yes and 0 otherwise, for each of the following 6 questions : (1) Does European central bank (ECB) supervises banks? (2) What body/agency supervises banks? (a) The central bank, (b) A single bank supervisory agency, (c) Multiple Bank supervisory agency. (3) Is there a single financial supervisory agency for all of the main financial institutions (insurance companies, contractual savings institutions, savings banks)? If yes, what is its name? (4) Is there a single financial supervisory agency for all of the activities in which commercial banks are allowed to do business? (5) Does your country adopt Basel II ? (6) Is your country planning on adopting Basel III ?	Bank regulation and supervision database, World Bank; Barth et al., 2001, 2004, 2006, 2008.
	ISA	Independence of supervisory authority: this variable is the natural logarithm of summation values which are determined by adding 1 if the answer is yes and 0 otherwise, for each of the following 4 questions : (1) To whom are the supervisory bodies responsible or accountable?: (a) the Prime Minister, (b) the Finance Minister or other cabinet level official, (c) a legislative body, such as Parliament or Congress, (d) other. (2) How is the head of the supervisory agency (and other directors) appointed?: (a) the decision of the head of government (e.g. President, Prime Minister), (b) the decision of the Finance Minister or other cabinet level authority, (c) a simple majority of a legislative body (Parliament or Congress), (d) a supermajority (e.g, 60%, 75%) of a legislative body, (e) other). (3) Does the head of the supervisory agency (and other directors) have a fixed term? (4) Can the head of the supervisory agency can be removed by: (a) the decision of the head of government (e.g. President, Prime Minister), (b) the decision of the Finance Minister or other cabinet level authority, (c) a simple majority of a legislative body (Parliament or Congress), (d) a supermajority (e.g, 60%, 75%) of a legislative body, (e) other).	Bank regulation and supervision database, World Bank; Barth et al., 2001, 2004, 2006, 2008.
	GI_RS	Global index of regulations and supervisions = Log (Σ RESTRICT * Σ DEPO_INSR * Σ SRP * Σ ISA) = RESTRICIT + DEPO_INSR+ SRP+ ISA	
Bank specific indicators	CAR	Bank capital to assets ratio	Bankscope (2012)
	NPL	Bank nonperforming loans to total gross loan (%)	World Bank (2013)
	NLTA	Net loans/total assets	Bankscope (2012)
	LLGL	Loan loss reserve/Gross loans %.	Bankscope (2012)
	BS	Bank size measured by the log of total assets.	Bankscope (2012)