UNIVERSITÀ CATTOLICA del Sacro Cuore

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Abstract

This paper aims to empirically test the interaction between systemic risk and corporate governance factors in the European banking framework on a balance panel data of 96 listed banks from 19 countries during the period 2011-2020. The purpose is to understand the role of a corporate governance's specific issue for the systemic risk, throughtout a period that saw Europe been signed by financial turmoil's long tail and the *'whatever it takes*' recovery. Among the available possible governance features we focus on the ownership structure, as the literature shows that it affects the performance of the firm, both on profitability and risk. We choose the European context since its eterogeneity and the presence of a high level of institutional ownership. To measure systemic risk, we will adopt the CoVaR approach (Adrian and Brunnermeier, 2016). Our results show that ownership concentration decreases systemic risk over the period analized, meanwhile institutional investors' high presence increases it.

Keywords: Corporate Governance, Ownerhsip Structure, Institutional Investors, Systemic Risk
JEL: G10, G21, G32,

1. Introduction

This paper aims to analyze the interaction between systemic risk and Corporate Governance factors in the European banking framework.

The 2008 global financial crisis has led, both in the US and in the EU, to a reexamination of corporate governance practices at banks, with some policy makers questioning the extent to which managerial entrenchment and the failure of the boards to monitor executives may have led to excessive risk-taking and financial instability proxied by the systemic risk (Reinhart and Rogoff, 2009; Kirkpatrick, 2009; Haldane, 2012).

These allegations are likely to be reasonable given that corporate governance can be broadly considered as the set of mechanisms for addressing agency problems and controlling risk within the firm. Banks and financial institutions are highly levered entities, many with access to explicit deposit insurance protection and most with implicit too big to fail guarantees, at least during period of financial crisis (Bellavite Pellegrini et al., 2018). Together, these features have created several important problems: first, they have induced excessive leverage and risk-taking tendencies; second, the presence of implicit or explicit government guarantees – often unpriced and at best mispriced – has blunted the instrument of debt monitoring that would otherwise impose market discipline on risk taking by these firms. Third, the size of these institutions has shielded them from the disciplinary forces of otherwise vibrant market for takeovers and shareholder activism. Finally, the ever-increasing complexity has weakened the power of governance from existing shareholders and non-executive board members.

Although there is growing evidence that points out the weaknesses in equity governance of these firms in the months leading up to the financial crisis, the extreme leverage undertaken by these firms and the failure of their internal risk management practices suggest failure of regulation as well. From a theoretical perspective, however, it is not at all clear that the implementation of good governance practices, such as having an independent board, should lead to less risk-taking. Corporate governance that aligns managerial incentives with shareholder interests can potentially result in more risk-taking, as shareholders face payoffs that are restricted on the downside by limited liability (John and Senbet, 1998; John et al., 2008; Acharya et al., 2011; Anginer et al., 2018).

Even though, the banking crisis in the Euro area has sparked considerable discussion and reform, one issue that has been overlooked in the academic and practictioners debate is the peculiar ownership and governance structures of Euro-area financial intermediaries (Véron, 2017). This paper will, therefore, explore whether the ownership structure – as a specific feature of corporate governance - of European banks and other financial institutions may have a positive role in smoothing their contribution to the financial systemic risk.

In the economic literature systemic risk represents “the risk that an economic shock such as market or institutional failure triggers (through a panic or otherwise) either the failure of a chain of markets or institutions or a chain of significant losses to financial institutions, resulting in increases in the cost of capital or decreases in its availability,

often evidenced by substantial financial-market price volatility" (BIS, 2014). To measure systemic risk, we will adopt the ΔCoVar as developed by Adrian and Brunnermeier (2016).

The case of European banks is interesting given that this area is characterized by a strong heterogeneity in governance and ownership structure, which can vary according to various factors, including country's culture and shareholders' features. Ownership structure is closely related to both banks' risk-taking (Jensen and Meckling, 1976; Laeven and Levine, 2009) and systemic risk (Saghi et al., 2018). According to the literature, if the ownership structure is dispersed, banks' risk-taking can raise. This risk incentive can result in a "herding effect", that can evolve into greater exposure to systemic risk by banking institutions. Conversely, if we have a more concentrated ownership structure there is less risk-taking incentive. Therefore, banks which allow equity participation from a diversified shareholders base take on more risks than banks that are composed of shareholders with a significant shareholding (Jensen and Meckling, 1976).

Furthermore, the ownership structure of European banks is characterized by high institutional ownership (Fernández and Arrondo, 2005). This issue has direct consequences on strengthening the control mechanism due to the *monitoring* effect by institutional shareholders. Institutional investors strongly influence a company's internal innovation and support risk-taking behavior (Hoskisson et al., 2002).

In line with previous studies (La Porta et al., 1999; Laeven and Levine, 2008) we will analyze the shareholdings held by bank shareholders, to understand whether it is above a certain threshold and therefore there is a concentration ownership.

The sample is made up of listed banks from countries in the European region. In order to have significant data and to have a clear view of the evolution of systemic risk in the banking sector over the years, we will consider the period covering the global financial crisis till the explosion of COVID-19 pandemic. We acknowledge that the period considered is rich of events that are worthy to be analyzed considering their specifities. The austerity programs that characterized European countries as a reaction to the debt crisis or the change of approach provided by the 'whatever it takes' policies, open room for future research more focused on these events.

The rest of the paper is structured as follows. Part 2 will present the literature review and the conceptual background on the relationship between ownership structure and systemic risk. Part 3 will show the data of our sample and the methodology of our study, while Part 4 will analyze the results. Conclusions will summarize our work.

2. Literature Review and Conceptual Background

The ownership structure is an important determinant of corporate governance and it affects the performance of the company (Shleifer and Vishny, 1997). The ownership structure helps improve information in stock prices; it enhances the corporate governance and increases the quality of information on the market.

Different economic systems are caractherized by different ownership structures, distinguished by size of the shareholding held and by type of investor. In this paper we distinguish for: i) Controlling shareholders, who hold the absolute or qualified majority of the company's shareholdings with full voting rights; ii) Relevant shareholders, who exceed a threshold set according to the different institutional contexts (for example > 2%); iii) Institutional investors, who have different size of shareholdings (significant and not), operating in the capital of the company (i.e. pension funds, open-ended investment funds, Private Equity funds and Hedge Funds); iv) Retail investors, who make up the free float of listed companies with various forms of investment.

Since ownership structures may affect bank performance, both in terms of profitability and risk, a recent stream of research on bank risk-taking typically incorporates information on each bank's ownership structure (Diez-Esteban et al., 2021; Battaglia and Gallo, 2016; Saghi et al., 2018). Also referring to that topic, the pre and post-crisis literature shows mixed results without offering a conclusive view (Gropp and Kohler, 2010; Beltratti and Stulz, 2012; Ellul and Yerramilli, 2012; Erkens et al., 2012). This heterogeneity of findings suggests that results may vary with the ownership structure under investigation (i.e. insider ownership, institutional ownership, bank ownership, ownership by top executives and outside directors, etc.).

As outlined by the IMF (2014), in general, institutional ownership is related to less risk-taking, while insider ownership is associated with more risk. However, the IMF study (2014) states that the presence of institutional investors and of large insider ownership correlates with more risk in 2008. The underlying idea is that banks with higher percentage of insider or institutional investors hold a higher fraction of shareholdings, reducing their risk exposure, since they have a lot to lose.

In contrast to these findings, Ellul and Yerramilli (2012) show that banks with higher institutional ownership take less risk as measured by their Risk Management Index (RMI). However, in the presence of deposit insurance, they document the effect reverses and a positive correlation between tail risk and institutional ownership emerges. Erkens et al. (2012) report that financial institutions with more independent boards and higher institutional ownership experience worse stock returns during the crisis period.

In this paper we explore the idea that beyond affecting the individual risk of banks, ownership structure (i.e., ownership concentration and the category of shareholders) may be responsible on the correlation of banks' risk-taking behavior at the aggregate level, leading to more systemic fragility.

According to the risk-management perspective, financial intermediaries' governance features have been observed to be responsible for the high correlation between past stock returns and the emergence of a financial crisis (Diez-Esteban et al., 2014; Fahlenbrach et al., 2012). Furthermore, such governance characteristics in a given bank may have externalities on other fnancial institutions and, hence, affect the overall banking systemic risk (Acharya and Volpin, 2010). Additionally, in a recent study, Anginer et al. (2018) found that shareholder-friendly corporate governance is associated with higher stand-alone and systemic risk in the banking sector.

More recently, financial scholars have focused their attention on ownership structure and systemic risk in financial institutions. Diez-Esteban et al. (2021) suggest that a higher ownership concentration promotes banks' systemic risk to a certain threshold. Initially, as more powerful owners of large banks can exploit greater bargaining power with regulators and governments in the event of fnancial distress, we would expect concentrated ownership to be associated with higher systemic and tail risks than banks with dispersed ownership. However, after a critical threshold, very large shareholders can also impose better monitoring on managers' action and, in more general terms, obtain a better insight into the complex and opaque banking activities, which can lead to better control over the tail and systemic risk. Moreover, if the concentration is too high, it is more likely that large shareholders will seek to reduce risk levels given that they will now bear a very large fraction of the potential costs associated with systemic risk.

Battaglia and Gallo (2017) examine the effects of ownership on traditional measures of bank risk and proxies of bank tail and systemic risk. Based on a sample of 40 European banks over the period 2006–2010, they find that the boards' characteristics affect banks' systemic risk, except for board independence and that this relation depends on capital regulations, banking systems' ownership structures and bank activity restrictions.

Finally, Saghi et al. (2018) empirically test whether ownership concentration contributes to explain the cross-variation in systemic risk contribution for a sample of European banks over the 2004-2016 period and how this effect may vary depending on the largest controlling shareholder category. The results show that higher ownership concentration is associated with greater banks' systemic risk contribution. Deeper analysis indicates that banks' systemic risk contribution is even stronger for banks where institutional investors and states are the largest controlling owners.

The literature review highlights that the effects of financial institutions' ownership structure on risk-taking and systemich risk lead to mixed results.

On the one hand, in line with the agency theory, banks with controlling owners tend to be riskier than banks with large participation since those shareholders have the power and incentives to induce managers of banks to increase risk-taking (Laeven and Levine, 2009).

When a bank has concentrated equity ownership, the tendency of managers to engage in less risky activities can be hindered by powerful shareholders. This results in a positive relationship between ownership concentration and risk. Indeed, powerful shareholders by their nature have bargaining power vis-à-vis the authorities in the event of financial difficulties; this determines a greater systemic risk for banks with concentrated ownership compared to those with dispersed ownership.

On the other hand, and contrary to the agency theory, there would appear to be a negative relationship between concentrated ownership and bank default risk (Song and Li, 2012). In particular, relevant shareholders may have a better understanding of complex and opaque banking activities, which can lead to better control of systemic risk.

Controlling shareholders of large banks may leverage greater bargaining power with regulators and governments in the event of financial distress and instability, therefore concentrated ownership may be associated with higher systemic risks than banks with dispersed property.

Regarding ownership concentration, the following first hypothesis can be postulated: *Ownership concentration decreseases systemic risk, and then ownership concentration shows a negative relationship with banks' systemic risk over the period analyzed.*

Institutional investors are a key group of market participants who have sufficient capacity and incentives to engage in managaers' monitoring (Shleifer & Vishny, 1997). They are distinguished according to the role they play in: i) active institutional investors, who usually only have an investment in the companies involved, and therefore have a more independent position; ii) passive institutional investors, who buy securities and do not actively seek to profit from short-term price fluctuations.

Active investors are likely to be more prone to risk, in fact, they encourage managers to undertake riskier investment projects to maximize their short-term investment (Almazan et al. 2005).

De George et al. (2019) find that higher levels of institutional ownership are positively associated with the future risk movement of banks. These results are more relevant during market downturns, as institutional owners experience adverse common funding-to-liquidity shocks in these periods. The consequence is a possible difficulty in raising capital when they need it most.

Institutional investors may have greater incentives to engage in risky strategies (Saghi et al., 2018). These risk incentives taken on an individual level can directly translate into higher exposure to systemic risk of banking institutions.

With regard to ownership by institutional investors, the following hypothesis can be postulated: *Ownership by institutional investors increases systemic risk of banks, then there is a positive relationship between an high presence of institutional investors' and the systemic risk.*

Considering both assumptions on institutional investors' concentration and ownership structure, we conclude that for low levels of bank ownership, institutional investors will play an active role, encouraging managers to increase their returns by pursuing riskier investments. However, when the level of ownership of banks becomes high enough, institutional investors will have greater incentives to protect their position and, therefore, will be able to engage in activities that reduce the risk-taking of a firm (Díez-Esteban et al. 2014).

3. Sample Description

Our sample consists of a balanced panel of 96 listed banks from 19 European countries for the period 2011-2020. Notably, the primary list of banks consisted of 121 institutions with complete financial information, but of which

only 96 also provided complete governance information we needed. We considered the idea to use an unbalanced panel data, but due to the lack of information for the identified 25 banks for the most part of the period (six years over ten) we decided to eliminate these banks reaching the definitive sample of 96 banks. The following table n.1 shows the distribution of the banks across contries.

Table 1: Number of banks and % over the period 2011-2020

Country	**Number of Banks**	**%**
Austria	5	5.21%
Belgium	1	1,04%
Cyprus	1	1.04%
Denmark	12	12.5%
Finland	1	1.04%
France	15	15.63%
Germany	1	1.04%
Greece	3	3.13%
Island	2	3.13%
Italy	10	10.42%
Liechtenstein	1	1.04%
Malta	1	1.04%
Norway	16	16.67%
NetherlandsPortugal	1	1.04%
Portugal	1	1.04%
United Kingdom	7	7.29%
Spain	4	4.17%
Sweden	2	2.08%
Switzerland	12	12.5%
Total	**96**	**100%**

Source: Author's own analysis. Data obtained by Orbis.

As summarized in Table 1, the countries with more banks analyzed are: Norway with 16 banks, that represents 16.67% of the total; France next with 15 banks represents 15.63%; Denmark and Switzerland with 12 banks are 12.50% of the total banks. In the case of Portugal, Finland, Liechtenstein, Malta, the Netherlands, Germany, Belgium and Cyprus, only one bank was eligible to be part of the sample.

The sample consists of banks of various typologies, since European banking system is characterized by great heterogeneity. For example, we take into analysis, savings banks such as the Norwegians ones, Swiss cantonal banks, cooperative banks such as the French ones, British public companies and medium-sized banks that operate only in a single country were analysed.

3.1 Definition of the variables

The following paragraph explains the variables used in the model.

First, the dependent variable reflecting banks' systemic risk was defined. Secondly, the independent variables of interest have been identified, which in our specific case concern the ownership structure. Finally, the set of control variables and "Other variables" introduced in the regression to support the model was identified. Table 2 provides a description for each of the variables analyzed:

Table 2: Variables' definition

Variables	**Description**
Dependent Variable	
$\Delta CoVar$	The Delta CoVaR of firm i is defined as the difference between the VaR of the financial system conditional on this particular firm being in financial distress (a situation in which the loss exceeds the VaR) and the VaR of the financial system conditional on firm *i* being in its median state. .
Independent Variable	
Ownership Concentration (dCONC_lag)	It is a dummy variable equals to 1 if the % held by the first three shareholders is greater than 51%, 0 otherwise. The variable has been lagged of one year.
Institutional Investors (INST_lag)	Weight in % of the quota held by banks and insurance companies with respect to the total shareholders. The variable has been lagged of one year.
Control Variables	
Banks' size (LnTA_lag)	Calculated as the logarithm of total assets at the end of the year, it controls for the fact that larger banks will have a higher

	association with systemic risk. The variable has been lagged of one year.
Beta_lag	It is the correlation between the annual value-weighted market return, excluding the company of interest, and the company's return. The inclusion of beta effectively controls the correlation in returns across the entire distribution of returns. The variable has been lagged of one year.
Bank's performance (ROA_lag)	Net income divided by total assets expressed as a percentage. The variable has been lagged of one year.
Deposits/Total Assets (DepTA_lag)	The ratio of total deposits to total assets. The variable has been lagged of one year.
Income not from interest (NONINT_lag)	The bank's (standardised) revenues not from interests. The variable has been lagged of one year.
Equity/Total Assets (EqTA_lag)	The equity ratio measures the amount of leverage used by a company. It uses asset investments and the amount of equity to determine how well a company manages its debts and finances its capital requirements.
Other Variables	
VaR_lag	The value of the VaR lagged by one year in the period considered. VaR is a statistic that quantifies the extent of possible financial losses for a company, portfolio or position over a specific period of time.
$\Delta CoVar$_lag	The value of the CoVaR delta lagged by one year in the period considered.

Source: Author's own analysis. Data obtained by Orbis.

3.2 Dependent Variable

As anticipated in the previous section, systemic risk is difficult to define, but it deserves to be monitored and measured because it represents how much a bank or a financial institution can contribute to the distribution of system losses. In the previous literature widely used measures of systemic risk include the following: the SES (*Systemic Expected Shortfall*) and MES (*Marginal Expected Shortfall*) by Acharya et al. (2017); the SRISK (*Systemic Risk Measure*) by Acharya et al. (2012); the AR (*Absorption Ratio*) by Kritzman et al. (2011).

In this paper, the systemic risk was identified throught the ΔCoVaR (*Delta-Conditional Value at Risk*). This measure, which is based on the CoVaR (*Conditional Value at Risk)* tool used by Adrian and Brunnermeier (2016), is defined as the change in the Value-at-Risk of the financial system conditional on an institution being in trouble relative to its median state. The steps necessary to build this measure are shown in the Appendix with the descriptive statistics of the variables to build ΔCoVaR shown on Table 3 (see the Appendix).

3.3 Independent Variables: Ownership structure

To measure ownership concentration, we collected shareholder information for each sampled bank and for each year from 2011 to 2020 (source: Orbis). In line with previous studies (La Porta et al., 1999; Laeven and Levine, 2008), a control threshold was set to assume whether the share held by the top three shareholders is significant and therefore to have a proxy of ownership concentration. Our analysis differs from past research insofar the threshold was higher and equal to 51%.

Starting from the data, the main three shareholders for each bank were identified, i.e. those who held the largest share. In particular, only the direct stake held in the bank was considered and not the total stake, as this represents the total stake in the bank regardless of the type of connection.

Furthermore, free floating shares, i.e. the shares not held for control purposes and the share held by the bank itself, were excluded from the calculation of the quota of the first three shareholders. These caveats concerned, the sum of the shares of the three shareholders was identified as the basis for calculating the variable.

From an operational point of view, therefore, a dummy variable of ownership concentration has been identified, which equals to 1 if the sum of the shares held by the first three shareholders is greater than 51%, 0 otherwise. The final variable taken into consideration is the ownership concentration variable lagged by one year from the period considered.

The empirical analysis, in addition to investigating the ownership concentration, aims to consider the type of shareholders for each European bank in the sample.

Database Orbis groups shareholders into the following categories: Other shareholders in aggregate; Insurance; Private shareholders; Banks; Employees, managers, directors; Public entities; Foundations; Mutual, pension,

nominal, trust funds; hedge funds; Property itself; Individuals or families; Private equity firms; Society; Financial companies; Listed companies; Venture capital.

Along this way, a second variable was identified which identifies the percentage weight of shareholders such as banks and insurance companies who participate in the ownership of financial institutions with respect to the total number of shareholders. Therefore, it was useful to identify, on the one hand, the sum of the direct quota held by banks and insurance companies and, on the other hand, the sum of the direct quota held by all shareholders without distinction. Finally, the results were compared by determining the percentage of incidence of banks and insurance companies on the total shareholders. Also, the variable relating to institutional ownership lagged of one year was taken into consideration.

According to the literature the typology of the controlling shareholder is divided into 5 kinds: banks, institutional investors, including insurance companies, mutual and pension funds, and financial companies; industrial companies; individuals or family investors; states or public authorities. Subsequently, starting from this distinction, we study which category the shareholder belongs to.

3.4 Control Variables

Control variables allow to monitor the analysis for various bank-level factors that can affect the level of systemic risk.

In line with previous literature on risk-taking by banks (Laeven and Levine, 2009; Pathan, 2009), we focus on the size of the bank (in terms of the natural log of total assets), the performance (proxied by the ROA), the asset structure (expressed by the ratio of deposits to total assets), the non-interest income (the bank's standardized revenue from non-traditional activities), the beta (as the correlation with the value-weighted market's annual return) and the amount of leverage used (which is represented as the Capital/Total Assets ratio).

3.5 Model

To test the effect of the ownership structure on systemic risk, a model is proposed that includes the variables described in the previous sections. In particular, the model was estimated with the support of independent variables, divided into variables relating to the ownership structure, control and other variables, and the dependent variable taken as a reference and measurement of systemic risk.

The model identifies is as follows:

$$\Delta CoVaR_{it} = \beta_0 + \beta_1 INST_{it-1} + \beta_2 dCONC_{it-1} + \beta_3 LnTA_{it-1} + \beta_4 Beta_{it-1} + \beta_5 ROA_{it-1} + \beta_6 NONINT_{it-1} + \beta_7 Dep_{TA\,it-1} + \beta_8 Eq_{TA\,it-1} + \beta_9 \Delta CoVaR_{it-1} + \beta_{10} VaR_{it-1} + \sum_{t=2011}^{2020} Year_i^t + \varepsilon_{it} \quad (1)$$

whereas the dependent variable is the contribution to the systemic risk measured by the ΔCoVaR of the bank while dCONC and INST are the ownership structure variables. Control variables follow, based on corporate and financial data of the banks: LnTA represents the logarithmic function of the bank's total assets; the Beta, calculated over the period 2011-2020, defines the systematic risk (market and non-diversifiable); the ROA which identifies the profitability of the bank; the NONINT or the non-interest portion of income; DepTA which expresses the ratio between total debt and assets; EqTA which expresses the ratio between total capital and assets.

Following Adrian and Brunnermeier (2016) and Lopez Espinosa et al. (2012), variables such as the lagged values of VaR and ΔCoVaR were included in the model. Operationally, the series of values was calculated for each bank considering the first year as zero (in our case 2011) and scaling the results obtained from the VaR and ΔCoVaR variables by one year in the years 2011-2020. Also the control variables presented were all considered one year-lagged, following the procedure described. Finally, time dummies are represented in the model to control for fixed-effects of time.

3.6 Descriptive Statistics

Table 4 presents the descriptive statistics for all the variables used in the empirical analysis. The dependent variable ΔCoVaR ranges from -0.608 to 2.068 with a mean of 0.395. Furthermore, as can be seen, the ownership concentration of the banks in the sample, expressed by the dummy variable dCONC, being binary, varies between 0 and 1 with an average of 0.445.

The INST variable (expressed as a percentage) which refers to the percentage weight of the stake held by institutional investors with respect to the total shareholders also fluctuates between 0 and 100%, with an average of 20.91%. This variable investigates the share held by regulated institutions, such as banks and insurance companies, excluding the percentage held by the other shareholders who participate in the bank's capital. The analysis showed that some banks did not record shares from banks and insurance companies over the entire period considered.

In any case, the prevalence of institutional ownership in European banks is confirmed, as affirmed by Franks and Mayer (1997) and Fernández and Arrondo (2005), since only 15 banks out of 96 (15.63%) have a shareholding that it does not figure the participation of banks and insurance companies in all the years of the period.

Analyzing the statistics of the control variables reveals heterogeneity among the banks in the sample, for example, in terms of size (measured by the logarithm of total assets), profitability (ROA), non-interest income and VaR.

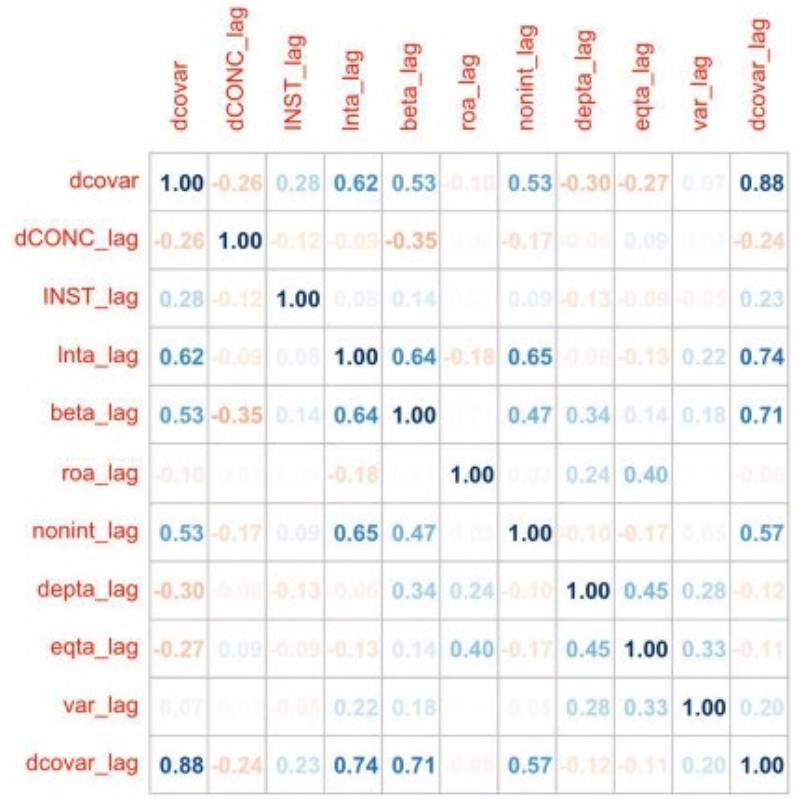
Table 4: Descriptive statistics of Models' variables

Variables	N	Min	Average	Max	Median	Std	Skew	Kurtosis
Systemic Risk Variable								
ΔCoVaR	958	-0,608	0,395	2,068	0,287	0,460	0,674	-0,226
Ownership Structure Variable								
dCONC_lag	958	0	0,445	1	0	0,497	0,222	-1,953
INST_lag	958	0	20,910	100	9,780	26,997	1,554	1,765
Control Variable	958	-2,101	2,868	7,791	2,612	2,395	0,342	-0,735
LnTA_lag	958	0	0,742	1,466	0,658	0,406	-0,154	-0,826
Beta_lag	958	-7,959	0,572	9,973	0,530	1,022	1,751	27,495
ROA_lag	958	-18,672	2,235	42,537	0,153	5,600	2,709	9,512
NONINT_lag	958	0,000	0,465	0,917	0,508	0,233	-0,468	-0,530
DepTA_lag	958	-0,019	0,080	0,204	0,076	0,045	0,091	-0,352
EqTA_lag								
Other Variable								
VaR_lag	958	-0,705	2,771	20,733	2,447	2,323	3,649	21,054
ΔCoVaR_lag	958	-0,608	0,357	2,068	0,230	0,455	0,836	-0,026

Source: Author's own calculation; data by Refinitiv Datastream and Orbis.

Moreover, Figure 1 presents the correlation matrix between the variables that we use for our analysis. It shows a positive correlation for the measure of institutional ownership (0.28) and a negative correlation for the variable measuring ownership concentration (-0.26) with respect to systemic risk.

Figure 1: *Correlation matrix*



Source: Author's own calculation.

It is worth noting that several of the control variables are strongly correlated with each other. In particular, size is positively correlated with systemic risk (0.62) and to non-interest income (0.65), indicating that larger banks may be more involved in non-traditional banking activities; this result is in line with what was shown by the research of Addo et al. (2020). Also, like Iqbal et al. (2015), the two variables that measure the capital and income structure of banks (deposits/assets and non-interest income) are negatively correlated to each other (-0.10). Finally, ROA, deposits/assets, capital/assets are negatively correlated with respect to the dependent variable of the model.

4. Results

This section shows the results that emerged from the regression models. Table 5 summarizes the ΔCoVaR values by year and by country.

Table 5: ΔCoVaR distribution for year and country

Country	ΔCoVaR	Year	ΔCoVaR
1. Austria	0,419	2011	0,417
2. Belgium	0,934	2012	0,442
3. Cyprus	0,148	2013	0,413
4. Denmark	0,251	2014	0,415
5. Finland	0,646	2015	0,394
6. France	0,432	2016	0,374
7. Germany	1,152	2017	0,367
8. Greece	0,359	2018	0,359
9. Island	0,194	2019	0,381
10. Italy	0,671	2020	0,383
11. Liechtenstein	-0,035		
12. Malta	0,098		
13. Norway	0,221		
14. Netherlands	1,323		
15. Portugal	0,680		
16. United Kingdom	0,656		
17. Spain	1,200		
18. Sweden	0,714		
19. Switzerland	-0,106		

Source: Author's own calculation.

Table 6 shows the regressions carried out on three models:

Model 1 considers all the control variables and, as explicative variable, the variable dCONC, which explains the ownership concentration;

Model 2 considers all the control variables and the institutional ownership;

Model 3 considers all control variables and both explicative variables.

Table 6: Regression on ΔCoVaR, *, **, ***, represent significativity at 10%, 5% and 1%.

	Model 1	Model 2	Model 3
INST_lag		0,00086***	0,00085***
		(0,00014)	(0,00017)
dCONC_lag	-0,03490**		-0,03374*
	(0,00842)		(0,01034)
dcovar_lag	0,91151***	0,89742***	0,89823***
	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)
var_lag	-0,00260	-0,00179	-0,00217
	(0,38287)	(0,54509)	(0,46447)
lnta_lag	0,00995 .	0,00923 .	0,01121*
	(0,06299)	(0,08051)	(0,03518)
beta_lag	0,01318	0,03266	0,00480
	(0,67240)	(0,26283)	(0,87715)
roa_lag	0,00463	0,00319	0,00348
	(0,48919)	(0,63261)	(0,60178)
nonint_lag	0,00133	0,00172	0,00149
	(0,36969)	(0,24508)	(0,31439)
depta_lag	0,00331	0,01341	0,01215
	(0,93922)	(0,75682)	(0,77839)
eqta_lag	0,15460	0,12766	0,15113
	(0,47725)	(0,55534)	(0,48416)
Fixed Effects	Yes	Yes	Yes
R2 Adj.	0,84920	0,85041	0,85130
Obs.	958	958	958

Source: Author's own calculation.

As can be seen, in Model 1, the corporate variable dCONC is statistically significant at 5% and has a negative coefficient of -0.03490. The economic interpretation of this result is that the increase of the ownership concentration decreases the systemic risk over the period analyzed.

In Model 2 the corporate variable INST is positive and statistically significant for a level of 1%; the reported coefficient is equal to 0.00086. In this case, a positive relationship between institutional ownership and systemic risk shows that during the period we studied, the presence of institutional investors increases banks' systemic risk.

Again in this model the value of the lagged ΔCoVaR contributes positively and is statistically significant at 1% with a coefficient equal to 0.89742. The size of the banks has a positive effect on the risk, in fact the variable has a coefficient equal to 0.00923 and is not statistically significant.

The hypotheses on the ownership structure of the banks, anticipated in Section 2, were tested since the two corporate variables relating to ownership concentration (variable dCONC) and ownership by institutional investors (variable INST) were included in the model. In line with what was stated by Song and Li (2012), it was assumed that the ownership concentration of banks decreases systemic risk, as showed by negative relationship. On the contrary, we find that the presence of institutional ownerhsip increases systemic risk, as identified by a positive relationship. This latter result is also confirmed by De George et al. (2019).

The following results may be pointed out from the Model 3:

1. For the dCONC variable, relating to the ownership concentration, it can be seen that the coefficient is negative (-0.03374) and statistically significant for a significance level of 10%.

2. The INST variable, relating to institutional ownership, reports a positive coefficient (0.00085) and the variable is statistically significant with a significance level of 1%.

Concentrated ownership has been suggested as an effective corporate governance mechanism and can be shown to increase banks' valuation (Caprio et al., 2007). Furthermore, evidence suggests that higher levels of institutional ownership are significantly associated with higher future systemic risk.

Starting from the regression with the basic models described in Table 6, we proceeded with a further analysis. In the first place, an evaluation of the sample at a regional level was carried out; it should be underlined that the sample is made up of banks from 19 countries in the Europe region. This allows us to divide the sample into European banks, which are based in a country of the European Union, and non-European banks, which are based in countries that are not members of the European Union, but are formally linked by commercial relations with it. In this subdivision, non-European banks are those based in Switzerland, Iceland, Norway and Liechtenstein; the United Kingdom, although it came out with Brexit on 31 January 2020, was considered part of the group of European countries, therefore the seat of European banks, since for almost all of the years of the period considered it was part of the Union.

This subdivision has brought out results, reported in Table 7, in line with the standard model. Indeed, for the corporate independent variables the positive relationship for INST and the negative one for dCONC are maintained.

Table 7: Regression on ΔCoVaR by geographical area, *, **, ***, represent significativity at 10%, 5% and 1%.

	Model 1		Model 2		Model 3	
	EU Banks	*Non-EU Banks*	*EU Banks*	*Non-EU Banks*	*EU Banks*	*Non-EU Banks*
INST_lag			0,00037	0,00151***	0,00036	0,00142**
			(0,14800)	(0,00067)	(0,15847)	(0,00138)
dCONC_lag	-0,03943*	-0,02588*			-0,03897*	-0,02106 .
	(0,02688)	(0,04369)			(0,02862)	(0,09722)
dcovar_lag	0,88454***	0,90259***	0,87535***	0,86025***	0,87999***	0,86660
	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)
var_lag	-0,00682	0,00075	-0,00627	0,00249	-0,00615	0,00082
	(0,19014)	(0,85623)	(0,23163)	(0,52718)	(0,23917)	(0,83965)
lnta_lag	0,01681*	-0,00101	0,01758*	-0,00009	0,01722*	0,00173
	(0,04691)	(0,84097)	(0,03822)	(0,98479)	(0,04179)	(0,73063)
beta_lag	-0,00998	0,07267	0,02282	0,12500	-0,01140	0,08656
	(0,79261)	(0,37101)	(0,51045)	(0,10563)	(0,76373)	(0,27976)
roa_lag	0,00870	-0,00073	0,00763	0,00134	0,00794	0,00255
	(0,33190)	(0,93354)	(0,39673)	(0,87610)	(0,37619)	(0,76750)
nonint_lag	0,00126	-0,00017	0,00146	-0,0008	0,00138	-0,00122
	(0,50613)	(0,93882)	(0,44328)	(0,73295)	(0,46608)	(0,58590)
depta_lag	0,04488	-0,01008	0,06066	-0,03160	0,04563	-0,00597
	(0,40860)	(0,88632)	(0,26140)	(0,64204)	(0,40043)	(0,93143)
eqta_lag	-0,03176	0,29107	0,03817	0,25300	-0,01358	0,35684
	(0,92209)	(0,29531)	(0,90647)	(0,34538)	(0,96664)	(0,193377)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2 Adj.	0,83917	0,84968	0,83845	0,85355	0,83942	0,85444
Obs	650	308	650	308	650	308

Source: Author's own calculation.

Secondly, banks based in so-called PIGS[1] countries were distinguished from other banks. This analysis was possible because we consider the period 2011-2020, which was characterized by systemic crises that further worsened the public finances of countries already in difficulty.

Table 8 shows the results of the regression. It can be noted that also in this case the statistical significance is maintained for the corporate variables dCONC and INST and for the control variables of the size of the bank (lnTA) and the lagged ΔCoVaR.

Furthermore, for the variables dCONC and INST, on which the assumptions of the model are based, a negative relationship and a posiive relationship are maintained, respectively.

[1] During the European debt crisis of 2009-2014, this derogatory acronym has been used to designate the economies of the Southern European countries of Portugal, Italy, Greece, and Spain.

Table 8: Regression on ΔCoVaR by PIGS countries *, **, ***, represent significativity at 10%, 5% and 1%.

	Model 1		Model 2		Model 3	
	PIGS	*Other Banks*	*PIGS*	*Other Banks*	*PIGS*	*Other Banks*
INST_lag			0,00065	0,00069**	0,00088 .	0,00066**
			(0,18890)	(0,00419)	(0,07226)	(0,00652)
dCONC_lag	-0,10500**	-0,03261*			-0,11576**	-0,03022*
	(0,006289)	(0,01604)			(0,00280)	(0,02529)
dcovar_lag	0,87974***	0,91207***	0,87255***	0,90420***	0,86324***	0,90704***
	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)	(< 2.2e-16)
var_lag	-0,01057	-0,00223	-0,01077	-0,00158	-0,00622	-0,00215
	(0,31779)	(0,48965)	(0,32530)	(0,62307)	(0,56351)	(0,50408)
lnta_lag	-0,00075	0,008932 .	0,02531	0,00751	-0,00263	0,00982 .
	(0,97727)	(0,08726)	(0,31720)	(0,14250)	(0,92045)	(0,05957)
beta_lag	-0,08701	0,02245	-0,04455	0,04350	-0,09195	0,01469
	(0,25482)	(0,52622)	(0,55800)	(0,18828)	(0,22598)	(0,67805)
roa_lag	0,01442	0,00141	0,01367	0,00067	0,01684	-0,00015
	(0,34619)	(0,84598)	(0,38090)	(0,92662)	(0,27012)	(0,98332)
nonint_lag	0,00335	0,00150	0,00031	0,00167	0,00386	0,00161
	(0,58039)	(0,31038)	(0,95970)	(0,25812)	(0,52204)	(0,27368)
depta_lag	-0,00793	-0,00704	0,03423	0,00066	-0,02260	0,00529
	(0,94834)	(0,87587)	(0,78130)	(0,98841)	(0,85271)	(0,90665)
eqta_lag	-0,07158	0,22264	0,02116	0,16903	-0,21406	0,23660
	(0,90491)	(0,32679)	(0,97230)	(0,45186)	(0,72140)	(0,29548)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2 Adj.	0,79394	0,85913	0,78643	0,85958	0,79681	0,86032
Obs	180	778	180	778	180	778

Source: Author's own calculation.

5. Conclusions

The purpose of this study is to evaluate the impact of the ownership structure of banks on the contribution to systemic risk. Starting from the ownership structure, we focus on the ownership concentration of the banks and on the type of shareholders who participate in their capital.

To test how these two elements affect systemic risk, a database of 96 banks from 19 European countries was built for the period 2011-2020. Subsequently, the CoVaR approach by Adrian and Brunnermeier (2016) is used to estimate the systemic risk, with which the contribution of each bank to the overall risk is measured. The estimate is accompanied by the implementation of supporting variables for the calculation of the ΔCoVaR, i.e. corporate variables and market variables (Lopez-Espinosa et al., 2012; Bellavite Pellegrini et al., 2018). Finally, the two corporate and governance variables are identified, thanks to which the contribution to systemic risk is analysed.

The results show, at first, that ownership concentration decreases systemic risk. Secondly, there is a positive relationship between the ownership by institutional investors and the systemic risk of banks, meaning that the presence and concentration of institutional investors among the ownership leads to an increasing in systemic risk. Furthermore, in line with Van Oordt and Zhou (2019), Vallascas and Keasey (2012) and Laeven et al. (2014),

there is a positive relationship between the size of banks and systemic risk. In this sense, our results seem to support the 'Too big to fail' theory, according to which large banks increase systemic risk. However, this result should be controlled for time since, according to the literature, the positive relationship holds true during financial turmoil's periods while acts in the opposite direction, meaning that the size acts as a shield against systemic risk, during quieter periods (Bellavite Pellegrini et al. 2018).

These considerations are valid for all three models analyzed in the standard representation and also when the sample is divided into European, non-European and banks based in PIGS countries, other banks. This paper contributes to the literature on systemic risk which, in relation to the ownership structure, is evolving.

The historical period is driven by external forces, such as crises and market instability, so it is important to understand to what extent these events contribute to the exposure of financial institutions to systemic risk. We also acknowledge that further research should consider that regulation plays a central role in risk control and monitoring and how it can account the influence of the ownership structure (Jensen and Meckling, 1976; Laeven and Levine, 2009).

In the highlighs of these evidences, together with the peculiarities characterizing the period of analysis, it would be appropriate to investigate such relations across time during the different crises that have taken place.

According to these reasons, further investigation of the relationship between systemic risk and ownership structures on a sample of financial institutions based in overseas countries, which were not analyzed in this research due to different regulations, is left open to future research.

Appendix

For the purposes of the empirical analysis, in order to evaluate the marginal contribution of a given bank to the overall systemic risk, it is necessary to identify the CoVaR, such as the VaR (Value at Risk) of the financial system, conditioned by a specific event - $C(X_i)$ - relating to the *i* institution, so that the financial institutions are in a state of crisis.

To obtain the CoVaR, an event C is conditional which is equally probable for all the financial institutions. Usually C is the loss of institution *i* that is equal to or greater than its level of VaR_q^i which, by definition, occurs with probability (1 - q)%. It is important to note that this implies that the probability of the conditioning event is independent of the riskiness of the business model of *i*. If we were to condition on a particular level of return (instead of a quantile), then more conservative (i.e. less risky) institutions might have a higher CoVaR simply because the conditioning event would be a more extreme event for less risky institutions

$CoVar_q^{system}\big|C(X^i)$, is defined by the q-th quantile of the conditional probability distribution as follows (Bellavite Pellegrini et al., 2018):

$$Prob\ (X^{system}|C(X^i)_{\leq}\ CoVar_q^{system}\big|C(X^i)_{=q\%} \quad (1)$$

CoVaR is estimated using quantile regression (Adrian and Brunnermeier, 2016). We then consider the expected value of a financial sector loss quantile regression on the losses of a particular institution *i* for the q%-quantile:

$$\hat{X}_q^{system\,|\,X^i} = \hat{\alpha}_q^i + \hat{\beta}_q^i X^i \quad (2)$$

Where (2) denotes the expected value for the q%-quantile of the financial system conditional on realizing a return Xi of institution *i*.

Assuming that VaR_q^i equals to the q%-quantile:

$$Prob\left(X^i \leq VaR_q^i\right) = q\% \quad (3)$$

Then the following equation can be stated:

$$CoVar_q^{system\,|\,X^i} = \hat{X}_q^{system\,|\,X^i} \quad (4)$$

In essence, through quantile regression it is possible to determine the expected value of the financial system's losses based on the losses of institution *i*, and this value constitutes the VaR of the financial system conditional on Xi.

This holds trues because $Var_q^{system}\big|(X^i)$ is the quantile conditioned.

Then Xi=VaR_q^i defines the measure of $CoVar_q^i$

$$CoVaR_q^i = Var_q^{system\ |\ X^i = VaR_q^i} = \hat{\alpha}_q^i + \hat{\beta}_q^i VaR_q^i \quad (5)$$

Subsequently, the ΔCoVaR will be defined as the difference between the CoVaR of the financial system conditional on the event in which the considered bank or financial institution is under stress (i.e. at the q. percentile), and the CoVaR of the system conditional on a median situation of the bank itself (i.e. at the 50% percentile).

$$\Delta CoVaR_q^i = CoVaR_q^i - CoVaR_{50}^i = \beta_q^i (VaR_q^i - VaR_{50}^i) \quad (6)$$

The ΔCoVaR captures the change in the CoVaR when the influencing event moves from the median return of institution *i* to the adverse VaR_q^i. Thus, the ΔCoVaR measures the "tail dependence" between two random return variables.

Furthermore, it is noted that, for random variables jointly normally distributed, the ΔCoVaR is related to the correlation coefficient, while the CoVaR corresponds to a conditional variance. The conditioning alone reduces variance, while conditioning on adverse events increases the expected return losses.

According to Adrian and Brunnermeier (2016) for the estimation of ΔCoVaR, a series of state variables are identified to capture the temporal variation in the conditional moments of asset returns. Specifically, for the determination of the financial variables we refer to the studies conducted by Lopez-Espinosa et al. (2012) and Bellavite Pellegrini et al. (2018):

i) Weekly price of the stock market volatility index; ii) Liquidity spread calculated as the difference between the Bank of England base rate and the UK 3-month T-bill; iii) Change in the French 3-month T-bill rate; iv) Change in the slope of the yield curve represented by French 5-year interest rates minus 3-month government bond interest rates; v) Change in the credit spread, represented by the difference between Moody's corporate bonds (BAA rating) and 10-year German government bonds; vi) Weekly stock returns of the European stock market index.

Furthermore, in line with previous studies, the following corporate variables were used, collected for all the banks included in the sample (source: Datastream): i) Market capitalization (market value) as the share price multiplied by the number of ordinary shares outstanding; ii) Security's price (price); iii) The degree of leverage (leverage): calculated as the ratio between total debt and total equity (D/E); iv) Total debt held: it is the sum of long-term and short-term debts; v) Total liabilities: calculated as the sum of current liabilities and long-term liabilities.

Table 3 shows the descriptive statistics for the corporate variables of European banks of our sample, calculated in the period 2011-2020.

Table 3: Descriptive statistics corporate variables for the ΔCoVaR

Variables	**N**	**Min**	**Avg**	**Max**	**Median**	**Std**
Mkt Cap. (mil.)	49.116	3	8.754	178.56	757	20.006
Price	49.116	0	137	7.006	15	596
Leverage	3.230	-71.057	548	13.95	409	1.683
Tot. Debt (mil.)	3.230	0	62.92	710.332	6.035	113.775
Liabilities (mil)	3.230	112.15	245.23	2.560	17.299	482.644

Source: Author's own calculation. Data by Refinitiv Datastream.

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