LUISS

Master's Thesis in Corporate Finance

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Ownership Structure and Banking Resilience: A Comparative Study of Public and Private Banks During the 2007-2008 Financial Crisis

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INDEX

Chapter 2 – Sample Criteria Selection and Financial Indicators

Chapter 3 – Empirical Analyses

INTRODUCTION

The global financial crisis of 2007-2008 marked one of the most critical moments in the recent history of the economic system, revealing deep structural vulnerabilities within the banking sector, calling into question the soundness of the regulatory and governance models in place at the time. Its roots lie in complex dynamics such as the uncontrolled expansion of subprime mortgages, the spread of securitization, excessive leverage and the ambiguous role pursued by rating agencies. However, in addition to causing a collapse in the markets, the crisis raised crucial questions about the behaviour of banks, both public and private, in all phases: before, during and after the collapse. These circumstances fueled a broad debate on their ability to react, their structural stability and their contribution to supporting the real economy. This thesis aims to investigate, through a theoretical and empirical approach, the differences between public and private banks in terms of economic performance and financial solidity in a context of the 2007-2008 systemic crisis. The paper opens with a review of the main events that characterized this financial turmoil, analyzing the macroeconomic dynamics and institutional responses, focusing on the structural characteristics of private and public banks. This includes also a brief overview of the historical evolution of the bank privatization process, useful to contextualize the structural divergences observed between public and private institutions. Aspects such as governance, institutional mission, access to credit, especially for SMEs, and the stabilizing role of public banks in periods of recession will be explored. The central part of the

work is dedicated to a comparative empirical analysis conducted on a sample of 100 banks, equally distributed between public and private institutions, belonging to over 25 countries. In addition to the direct comparison between public and private banks, the analysis considers two additional fundamental dimensions: on the one hand, the degree of economic development of the country of belonging (Developed economies vs. Emerging ones); on the other, the geographical distribution in three macro-areas (Europe, Asia and Rest of the World). The aim is to capture more precisely how the ownership structure of banks interacts with the economic and regional context, influencing also their ability to respond to systemic shocks. Through the use of OLS regression models and the use of key performance and solidity indicators such as ROA (Return on Assets), ROCE (Return on Capital Employed) and the Debt/Equity ratio (Financial Leverage), the behaviours of different types of banks will be analyzed in the period between 2006 and 2009. The aim is not only to compare the performance of public and private banking models, but also to have a view on how the level of development and geographical location could affects the behaviours and resilience of financial institutions. Particular attention will also be paid to the temporal dimension of the crisis, examining how public and private banks adapted in the different phases, from the pre-crisis expansion to the normalization of the post-crisis period. In this context, the following chapters will guide the reader through a structured analysis that combines theoretical insights and empirical evidence. By exploring the interactions between ownership model, geographical location and level of economic development of countries, the study aims to offer a comprehensive view

of banking dynamics during one of the most turbulent periods in the recent financial history. This perspective is crucial not only to interpret the past, but also to guide future strategies aimed at strengthening the resilience and effectiveness of the global banking system. Ultimately, understanding these dynamics is essential to design policy interventions that are not only reactive but also preventive, ensuring greater stability in the face of future financial shocks.

Chapter 1 - Theoretical Framework and Literature Review

1.1 The 2008 Crisis and Its Impact on the Banking Sector

[1]The 2007-2009 financial crisis resulted in the largest realization of bank risk since the Great Depression. The performance of banking shares during this period was unprecedented, between May 2007 and March 2009, more than 3 trillion euros were erased from the market capitalisation of banks in Europe and the United States. [2]The subprime mortgage financial crisis began in the United States in 2006. Specifically, the crisis origin date back to three years earlier, in 2003, when the granting of high-risk mortgages started to increase relevantly. Clients who would not have obtained this amount of credit under normal conditions, as they were unable to provide sufficient guarantees, were able to secure the desired loans. It is important to assess here, that the growth of subprime mortgages was mainly driven due to the real estate market trends and the development of securitization processes.

1.1.1 The Housing Bubble and Monetary Policy Reactions

From 2000 to mid-2006, the U.S. housing prices rose steadily at a high rate, creating the famous real estate bubble. This trend was fueled by the FED's accommodative monetary policy, which kept the interest rates at their historically low levels until 2004. As we know, low interest rates translate into low borrowing

[1] Altunbas, Y., Manganelli, S., & Marques-Ibanez, D. (2011). *Bank Risk During the Financial Crisis: Do Business Models Matter?* European Central Bank (ECB) Working Paper Series.
[2] CONSOB. *La crisi finanziaria del 2007-2009.*

costs for the fund receivers, that in that period, were mainly families taking out mortgages, stimulating so housing demand and further increasing home prices. An important aspect to highlight is that the real estate bubble made mortgage lending highly attractive for the financial institutions, this is because, considering the hypothesis of a borrower default, banks could still easily recover the loaned amount through the resale of the granted property.

1.1.2 The Securitization Process

In addition to the housing bubble and the low interest rates, the subprime mortgages growth was also supported by the presence of securitization operations.

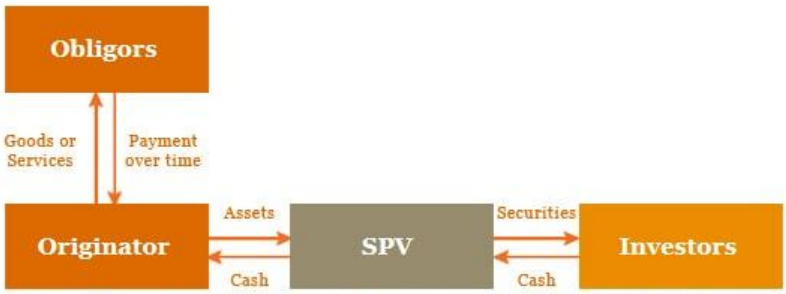

Fig.1 *- Source: PwC Luxembourg*

These processes allowed financial institutions to transfer mortgages, after transforming them into securities, to third parties (‘special purpose vehicles’). This mechanism enabled the banks to recover most of the credit immediately instead than over the long-term period. Securitization seemingly freed banks from the risk of borrower default, thus weakening their incentive to properly assess the various borrowers' creditworthiness. The special purpose vehicles, in turn, financed the purchase of securitized mortgages by issuing short-term securities to investors. In

a low-interest-rate environment, securitized securities were purchased by lots of investors, this circumstance brought to the transmission of the crisis from the U.S. economy to the European economy. Through securitization, banks quickly regained access to loaned funds, which they could then use to issue more mortgages, often to customers whose creditworthiness was assessed with not the right accuracy. Thanks to this process, financial institutions were able to massively expand their operations in relation to their own capital, increasing their financial leverage. [3]This high leverage limited the system's ability to absorb even small losses and contributed to the decline in confidence and increase in counterparty risk early in the crisis.

1.1.3 The Role of Rating Agencies

Securitization operations generated highly complex, non-standardized, and illiquid structured products. Moreover, these structured products were mainly traded over the counter, meaning outside the regulated markets. In this context, given the opacity of the products and also the difficulty in assessing their value, the ratings assigned by credit rating agencies became increasingly important as a shared reference for evaluating these securities. However, the rating agencies' assessments were subject to the limitations inherent in their valuation models. These limitations became evident following the subprime crisis when it became

[3] Claessens, S., Dell'Ariccia, G., Igan, D., & Laeven, L. (2010). *Lessons and Policy Implications from the Global Financial Crisis*. IMF Working Paper, Research Department. International Monetary Fund.

clear that these firms had used models that were not sophisticated enough or that were based on overly optimistic assumptions and scenarios. It also became apparent that rating agencies had assigned overly generous ratings partly due to conflicts of interest that incentivized them to do so, they also had been too slow in downgrading the issuers that were beginning to show initial signs of financial distress.

1.1.4 The Burst of the Real Estate Bubble

In the early 2004, the FED started raising interest rates in response to the recovery of the U.S. economy. The mortgages became increasingly more expensive, this led to rising defaults among households that were unable to meet their growing repayment obligations. The demand for the real estate declined, causing the housing bubble to burst and reducing the value of mortgages used as collateral. The financial institutions, that were the most involved in subprime lending, suffered significant losses. From July 2007 through 2008, rating agencies issued multiple downgrades of securitized debt. These securities, which had been widely distributed in the market, lost all value and became unsellable, forcing the special purpose vehicles to seek funds from the banks that had issued and guaranteed to them various liquidity lines. However, some banks were unable to secure the necessary liquidity, as no financial institution was willing to extend them the needed credit. Due to a widespread uncertainty about the distribution of structured securities across the financial system, the interbank market experienced a sharp rise in interest rates and a significant contraction in the credit availability among

financial institutions. This confidence crisis led to a liquidity crisis, the banks suffered heavy losses not only due to their exposure to special purpose vehicles but also because of their direct holdings of structured securities and exposure to funds that had invested heavily in securitized products. [4]In the first quarter of 2008, the CDS default swap premium of the major international banks was subject to a relevant increase. The average CDS' five-year maturity of U.S banks, equal to less than 200 basis points at the beginning of 2008, reach 300 basis points at half march of the same year; for the European banks instead, we passed from 60 basis points to 170 points (Fig.2 below).

Average CDS of the banking sector: Italy, Europe, and the USA from 01-06-2007

(daily data; basis points)

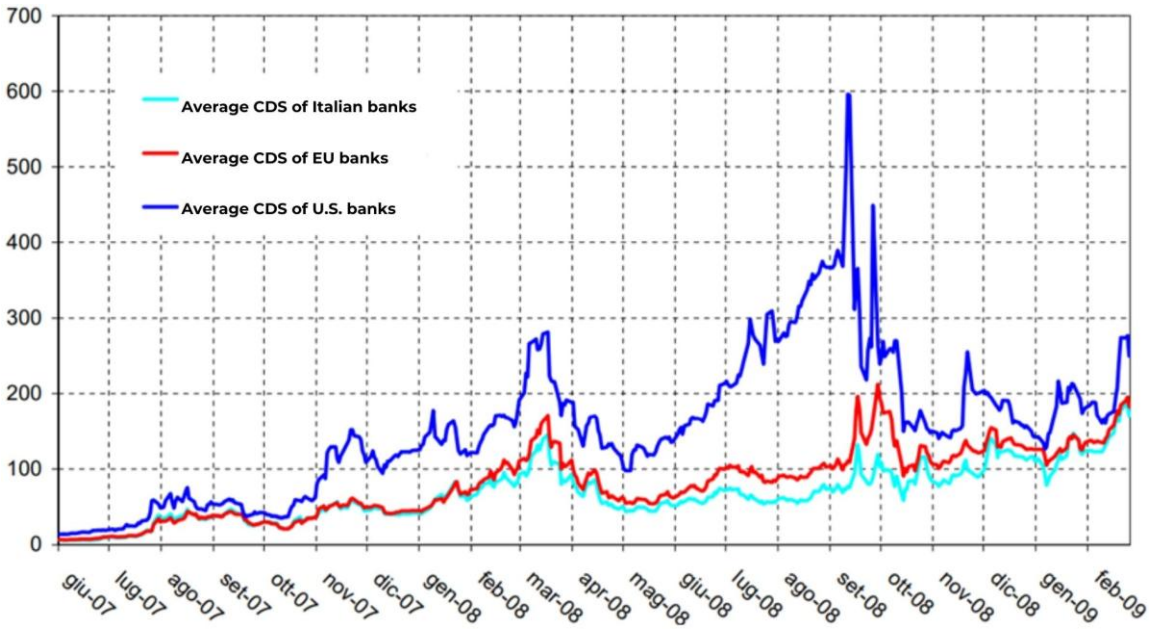

Fig. 2 *- Source: Thomson Reuters*

[4] Mieli, Stefano. *La crisi finanziaria internazionale e le banche italiane.* Banca d'Italia, 2009.

These circumstances led several major U.S. financial institutions near bankruptcy, which was only avoided thanks the intervention of the U.S. Treasury in coordination with the FED. However, there were some exceptions, the most famous example was the Lehman Brothers case, the investment bank did not receive any support from the state and filed for bankruptcy on September 15, 2008. The collapse of the Lehman Brothers bank triggered a new wave of intense instability, the U.S. authorities' decision to let a major financial institution fail, deeply shocked the investor confidence, bringing to an atmosphere of extreme tension and uncertainty in the markets. The major institution default raised widespread concerns about the solvency of other investment banks and about the exposure of all other market participants into the financial sector. The crisis became increasingly systemic, it extended from structured finance markets to stock markets, particularly affecting financial sector companies, and gradually spreading throughout the entire financial system. Due to the direct and also indirect exposure of U.S banks in some European countries, the subprime mortgage crisis also spread to Europe becoming a global crisis.

1.1.5 Responses by U.S. and European Institutions

As the crisis worsened, the U.S. government intervened with a financial rescue plan for major financial institutions, involving both nationalizations and private asset purchase programs. Between 2007 and 2009, the TARP program initially set at $700 billion, reached instead $7.7 trillion, injecting liquidity into the banking system in an environment with near-zero interest rates. Overall, the European

governments provided more than 3 trillion in aid to national banking systems. These bailouts significantly increased the public debt in the affected countries, creating the base for the subsequent sovereign debt crisis. [5]It is important to assess that institutional and macroeconomic differences between Europe and the U.S have caused some diversity in the design of support plans. In terms of monetary policy, in the euro area the priority has been to repair the functioning of the money market. For Europe, regulation is fundamental, it should set the right incentives for market participants, balancing profit-seeking and risk-taking.

1.2 Banking stability and risks during the 2007-2009 financial crisis

During the Global Crises the banking sector was hit by a strong shock caused by multiple risk factors, including a massive exposure to subprime mortgages, the liquidity crisis in the interbank market, a high level of leverage and deficiencies in the various risk assessment models. These elements highlighted the structural weak points of the financial system in that period and brought to the failure of some of the world's largest banking institutions, including Lehman Brothers, marking a turning point in the crisis. In the next paragraphs, based on official documents and different research papers, we will analyse in detail the major risks that characterized this critical period.

[5] Tumpel-Gugerell, G. (2009). *The European response to the financial crisis.* Speech at the Bank of New York Mellon Headquarters, New York, 16 October 2009. European Central Bank.

1.2.1 Credit Risk and Insolvencies

[6]Credit risk represents the risk that the obligor will not be able to meet its obligations regarding interest payments and capital repayment. This type of risk is a component of all loan activities, and it influences the investment choices of banks, investors and financial intermediaries regarding bonds instruments. It is important to assess, that the higher is the credit risk the higher will be the interest rate required from the buyer as a compensation for the high exposure on that investment. [7]The reduction in bank lending and the deterioration of asset quality are two aspects strictly correlated that got a relevant impact on banking stability. During the 2007-2009 crisis, the increasing difficulty of banks into credits recovery had caused a lowering of the asset quality owned by financial institutions, this brought to a higher insolvency risk due to a reduced capability of banks in generating returns. As a consequence, the banks adopted politics of credit reduction, limiting the provision of new loans and the credit access to families and enterprises. This had a systematic effect, leading to a further weakening of trust in the banking system. So, we can affirm, that in this context the credit risk got a crucial role: the high level of exposure to non-performing loans and the difficulty into evaluating correctly the risk, accelerated the failure of financial institutions and the spreading of the crisis. This event enhanced the importance of a good quality credit risk management system, not only to ensure the safety of single banks, but also for the entire economic system prosperity.

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[6] Glossario Finanziario Borsa Italiana. *Credit risk*.
[7] Brei, M., & Schclarek, A. (2014). *A theoretical model of bank lending: Does ownership matter in times of crisis?*

1.2.2 Liquidity Risk and Bank Runs

[8]We define liquidity risk as the risk that the bank could not face its own payment obligations due to both the inability of getting funds on the market (funding liquidity risk) and the ability to liquidate its own assets (market liquidity risk). An adequate liquidity risk management system has a fundamental role for the stability of the financial sector, and it got the same importance also during the 2007-2008 financial turmoil. Due to the trust crisis in the financial institutions there was a huge bank run, this brought to massive withdrawals from the clients, exacerbating the liquidity shortage in banks, which found it difficult to meet the depositors' requests. Simultaneously, the interbank market has been frozen, with banks finding themselves reluctant to lend money to each other, due to fears of a mutual default. This further increased liquidity risk, as banks could not easily obtain the funds needed for their daily operations. [9]In this context the public bank's role was fundamental, these institutions played a key role into providing liquidity to the system, contrasting the credit reduction imposed by the private banks to protect themselves from major insolvency risk.

1.2.3 Market Risk and Asset Value Losses

[10]Every investor must face market risk, that is the risk associated to unexpected events that impact the assets value. It could be represented also as the possibility to obtain a lower return than the expected one. Market risk derives from prices and

[8] Intesa Sanpaolo (2024). Nota integrativa consolidata. *Informazioni sui rischi e sulle relative politiche di copertura.*
[9] Brei, M., & Schclarek, A. (2013). *Public bank lending in times of crisis*.
[10] Pictet, Guida alla finanza (2020). *Rischio di mercato: cos'è e quali sono i fattori che lo determinano.*

interest rates fluctuations in the financial markets, that can negatively influence the banks' asset value. During the crisis, market volatility had a devastating impact on the financial institutions' balance sheets which held a lot of MBS (Mortgage-Backed Securities) and CDO (Collateralized Debt Obligations) that had suffered a downgrade in their ratings. This brought to significant losses in terms of asset values, undermining banks stability. [11]The crisis put in evidence the excessive exposition of financial institutions to complex and opaque financial instruments. To contrast that, market risk must be addressed correctly, especially promoting a more rigorous, strict and transparent regulation in the financial markets.

1.2.4 Dependence on Wholesale Funding

Wholesale Funding refers to the fund's raisings by banks and other financial institutions through high value transactions, usually the issuance of bonds or repurchase agreements. Unlike retail deposits, which come from individual savers, wholesale funding involves institutional investors and is often more volatile and less stable. Lots of banks, especially in Europe and the U.S, relied on this type of funding, this model nevertheless convenient during time of stability it proved to be vulnerable during financial crises. [12]The banks with the higher dependency and concentration on wholesale funding suffered more from the crisis than those with more diversified funding models. These financial institutions, unable to quickly

[11] Fernandes, C., Farinha, J., Martins, F. V., & Mateus, C. (2016). Journal of International Economic Law. *Determinants of European banks' bailouts following the 2007–2008 financial crisis.*
[12] Iannotta, G., Nocera, G., & Sironi, A. (2007). Journal of Banking & Finance. *Ownership structure, risk and performance in the European banking industry.*

access liquidity in interbank markets, have seen their liquidity risk increase dramatically, leading to difficulties in meeting their financial commitments. The over-reliance on wholesale funding has, therefore, brought to light the vulnerability of many banking institutions, underlining the importance of diversifying funding sources.

1.2.5 Banking Systemic Risk and High Leverage

[13]Currently it doesn't exist a common accepted definition of systemic risk. One perspective could be to describe it as the risk to experiment a systemic event, a situation in which a number of financial intermediaries or markets of a relevant systemic importance are negatively impacted. The event triggers could be represented by an exogenous, which comes from outside the financial system. Alternatively, the event could emerge endogenously within the financial system or within the economy at large. Considering the 2007-2008 crisis, we can consider the systemic risk as the possibility that the failure of a single actor could determine a domino effect, ending up afflicting the entire economic system. This could be the case of the Lehman Brothers failure; we must also say that the systemic risk deriving from this event was also amplified due to the high financial leverage of a lot of financial institutions. Banks with higher leverage exposure and those with significant international transactions were more sensitive to market shocks. In addition, the banking system, characterized by a strong interconnectedness

[13] European Central Bank. (2009). The concept of systemic risk. *Financial Stability Review*

between financial institutions, led to the rapid spread of the Lehman Brothers failure across the system, amplifying the magnitude of the crisis.

1.2.5 Ownership Risk and Regulation

Ownership structure of banks plays a crucial role into determining their performance and risks. [14]Banks with a high concentration of private ownership tend to adopt more aggressive behaviours in terms of financial leverage, augmenting their exposure to market shocks. From the cited paper, it is expressed an important observation, there is a direct relationship between risk and ownership concentration: the bank risk is reduced when we got either moderate or low level of concentration and when the managers interests prevail, instead the risk is higher when the ownership is highly concentrated, and the shareholder interests prevail. Moreover, this direct relationship is reinforced by the country in which the bank is regulated, this is because governance, regulation and more specifically, the legal protection of shareholders influence relevantly the financial risk of a bank. This scenario highlights the importance of having a solid governance structure and bank regulation that could mitigate the risks associated to the excessive ownership concentration and foster a balanced risk management.

[14] Magalhaes, R., Gutiérrez Urtiaga, M., & Tribó, J. A. (2010). *Banks' ownership structure, risk and performance*.

1.3 Comparing Public and Private Banks

During the last decades, privatization processes have transformed deeply the bank sector, redesigning the State and privates' roles in credit management and financial services. This change brought to a continuous debate on the differences between, public and private entities, two models that respond to different logics and objectives. On the next pages, we will focus on private and public banks, the latter had traditionally a strong relationship with national economic policy, instead the private sector is majorly guided by market dynamics. This distinction has significant consequences not only in terms of governance and mission, but also with respect to their role in the economy, access to credit for enterprises and citizens, and the regulatory and supervisory framework. Analysing these differences is essential to understand the evolution of the banking system and its impact on economic stability and development. To better understand how these two banking models have taken shape and diverged over time, it is crucial to look back at the historical evolution of the privatization process.

1.3.1 The History of Privatization

[15]Privatization involves the transfer of either possession or control, or both, of state assets, organisations and operations to private investors. It can be whole or partial and can be followed by complete withdrawal of state interest in the privatized activities or can lead to some degree of regulation of those activities.

[15] Loeffler, E., Sobczak, D., & Hine-Hughes, F. (2012). *Liberalisation and privatization in the EU – Services of general interest and the roles of the public sector*. European Union: Multi-Science Publishing.

This trend in Europe, started during the early 1980s with the first privatizations. Figure 3 shows that in the EU-15 privatization began in the 1980s (in the UK), and, after a slow start, increased rapidly in the 1990s. The bursting of the dotcom bubble caused a relevant fall in privatizations from 1998 to 2002, but there was a fast recovery after, with 2005 providing a record year in privatization history.

Privatization proceeds: Trend from 1977 to 2007 *(US$ million)*

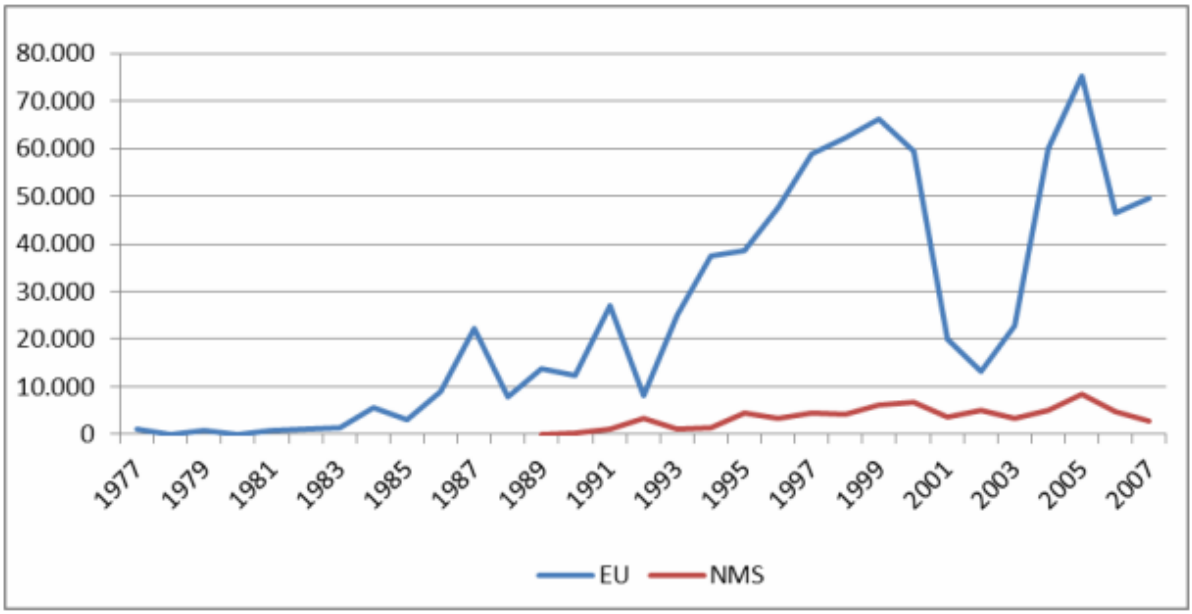


Fig. 3 *- Source: Privatization Barometer Databank; own calculations in Privatization and the European Social Model, 2009, Executive summary and final activity report')*

The privatization initially happened in most of the competitive sectors, such as manufacturing and banking, but with the '90s this trend diffused also in a series of other sectors, mainly because there was less danger of privatization that leads to job losses through market capture by international suppliers. In the 1990-2000 period the proceeds from privatization in the UE-15 represented the 45% of the global total liberalisation returns.

EU 15 Privatization returns from the 1977-2004 period

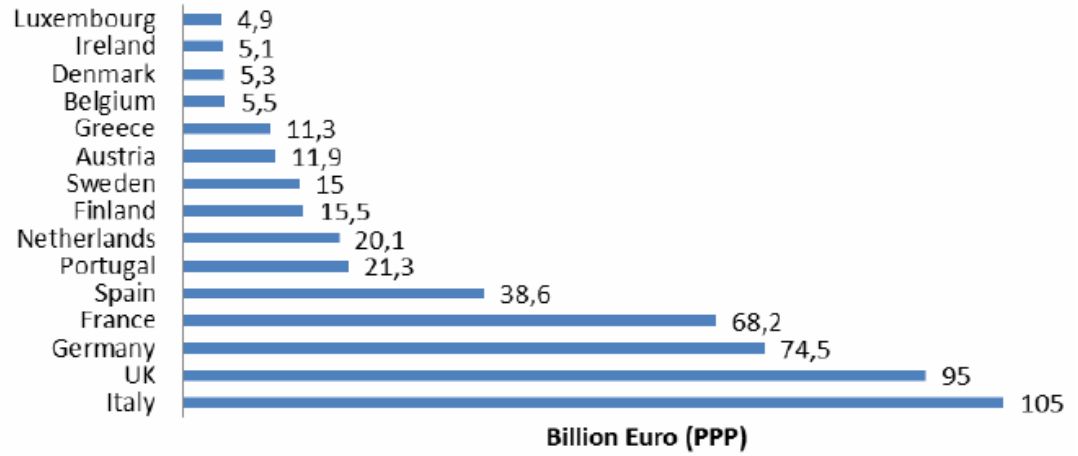


Fig. 4 *- Source: V.P. Morano, 2005, 'The Future of Privatization in Europe' in Privatization and the European Social Model (PRESOM), Background and history of liberalisation and privatization in the EU*

The figure above shows that in the 1977-2004 period the UE-15 proceeds coming from privatizations reached 497 billion euro. We could observe also how the nations that contributed majorly to these returns were Italy, UK, Germany and France, amounting alone to 68,9% of the total privatization proceeds. The liberalization period got a relevant impact on the European macroeconomic structure, determining a deep transformation of governance models and the management of strategic companies. This transition from State ownership to the private one has bring to an increase of efficiency and competitiveness in lots of different sectors, thanks to the introduction of new economic actors in the European business environment. Nevertheless, it brought also uncertainty about the social and financial consequences of privatization, for what it concerns employment levels and the State's role in regulating these processes. Overall, privatization represented a critical step in the European economies' modernization, bringing to an economic model more oriented towards competitiveness.

1.3.2 Public and Private Banks: Governance and Mission

One of the most impacted sectors of privatization was banking, the shift from public to private ownership redefined not only financial markets and credit distribution but also the governance. This introduces, at first, the necessity to analyze which are the main differences between public and private banks and especially their role in the modern economic system. [16]It is important to assess that banks assume a key role in the economic system performing the function of collecting savings and conveying the flow of savings to production activities. In particular, this is true for countries characterized by bank-centric financial systems and by and by a high recourse to bank debt, rather than to the capital market, as a form of financing necessary for the performance of a given economic activity. A key difference between public and private banks it's in their governance and the interests that are called to pursue. Public banks, being under the State's control, often tend to pursue broader social and political objectives, going beyond the profit maximization. These financial institutions can be used as public politics policy instruments: offering credit at convenient conditions, sustaining employment levels or supporting major strategic sectors for political reasons, even at the cost of operational efficiency. Due to this context, the governance in this type of banks could be frequently influenced by political appointments, rather than on merits and results obtained. This dynamic often could bring to a weaker link between the managers incentives and the long-term performance of the public banks, inducing

[16] Autorità Garante della Concorrenza e del Mercato. *La corporate governance di banche e compagnie di assicurazioni (IC 36) – Indagini conoscitive*.

to a general lower level of managerial responsibilities. Moreover, public banks are less exposed to the pressured derived from competitiveness, mainly thanks to the fact that, at least in part, they could count on State's support in case of difficult times. This could incentivise governance inefficiencies and delay the implementation of appropriate structural adjustments, especially when compared to private institutions. Private banks, instead, typically are guided majorly by market logics and shareholders' interests, consequently, they are characterized by a stricter governance and a major focus on profitability, risk management and operational efficiency. It is important to assess here that the market, trough competitiveness and investors behaviours, stimulate these innovation and flexibility. Therefore, private banks tend to be more dynamic, aware of costs and more performance oriented in the long term. So, to sum up, while public banks provide stability and countercyclical support in times of crisis, it is important to assess that they have also shown structural rigidity and lower yields than their private counterparts.

1.3.3 Public and Private Banks' Role in Financial Crises

Public and private banks are essential for the global economy, they facilitate credit access and support the economic growth of countries. Nevertheless, during a financial crisis the banks' behaviour differs. [17]It is important to assess how different empirical studies enhance how public banks tend to maintain or even

[17] Brei, M. & Schclarek, A. (2013). *"Public Bank Lending in Times of Crisis"*, Journal of Financial Stability.

increase their loans levels in period of crises, playing a stabilizing role for the financial system and contributing to economic recovery. In contrast to that, private banks, more focused on profit maximization and the management of the current market risk, tend to reduce loans with the objective of preserving their liquidity reserves. This difference comes mainly for the different strategic objectives of these banks and because, in these period of crises, public banks are more facilitated into accessing to the State's resources dedicated for recapitalization. Similar results had been obtained by *Bertay*[18] which demonstrate how the public banks possess a key role in mitigating the negative effects of financial crises, unlike private banks that trough credit tightening tend to worsen these difficult times. Considering public and private bank's role on the economy, there is still a relevant debate in the Economic Literature. *La Porta*[19] study, conducted on 92 countries, enhance a negative relationship between public ownership in banks and financial development and economic growth. These results would therefore favour the privatization of banks. The work of *Andrianova et al. (2009)*[20], however, it questions these conclusions as it shows evidence that, once institutional quality is considered, the results of *La Porta et al. (2002)* will be not relevant. In conclusion, for *Andrianova,* state banks can promote economic growth if they are managed by transparent institutions and, more specifically, if there is the presence of opportunistic private banks and poor institutional quality, the absence of public

[18] Bertay, A.C., Demirgüc¸ -Kunt, A., Huizinga, H., 2012. *"Bank ownership and credit over the business cycle: Is lending by state banks less procyclical?"*. European Banking Center Discussion Paper.
[19] LaPorta, R., Lopez-De-Silanes, F., Shleifer, A., 2002. "*Government ownership of banks"*. Journal of Finance
[20]Andrianova, S., Demetriades, P., Shortland, A., 2009. *"Is government ownership of banks really harmful to growth?"* Discussion Papers in Economics No. 09/11, University of Leicester.

banks may lead to financial disintermediation. *Dinc*[21] study against *Andrianova*, analysing 43 countries, found that the loans given by the state-owned banks are positively related to electoral cycles, suggesting so a political influence over the credit decisions. This study brought the researcher to support privatization as well as *La Porta*'s view. In conclusion, the real influence of public and private banks still remains object of debate. The studies cited in this paragraph, highlight contrasting results, reflecting how this argument is strongly dependent on institutional, political, and market variables. However, one element appears undeniable: public banks compared to private ones get more easily access to the State's support and the different recapitalization programs during period of crisis. This advantage allows them to play a stabilizing role in the financial system, ensuring continuity in credit provision and mitigating negative economic effects. On the other hand, the possibility that this stabilizing function could come and be influenced due to political dynamics raise questions on the efficiency and effectiveness of public management. Therefore, the debate on the necessity of a further privatization or instead a reinforcement of the public bank's role remains open, and additional future studies will be essential to comprehend at best these effects on future financial crises.

[21] Dinc., I.S., 2005. *Politicians and banks: political influences on government-owned banks in emerging markets*. Journal of Financial Economics 77, 453–479.

1.3.4 Access to Credit and Support for SMEs

[22]As it is widely known, SMEs represent an essential role within the European productive system, especially for employment levels. Nevertheless, despite their importance, because of their small size, they face significant difficulties in accessing credit, mainly due to the lack of guarantees that banks usually require to grant loans. During the 2008 crisis and the consequent credit tightening, SMEs, that are strongly dependent from the banks' support, faced a lot of struggles. Also, in this situation the banks play a key role, with a substantial difference in the behaviour between public and private institutions. Considering state-owned banks, *Mediocredito Centrale* in Italy, could be a great example of how public banks play a countercyclical role in supporting SMEs. MCC bank, trough the management of the "Guarantee Fund for SMEs", facilitates the credit access offering coverage of up to 80% of the loans requested, reducing the risk for the lending banks. This mechanism, in the Italian business environment, is essential because allows to SMEs with few guarantees to access loans that otherwise would have been refused by the traditional banking system. However, it is also worth mentioning that some private banks have implemented targeted initiatives to support SMEs. [23]To remain in the Italian banking environment, *Intesa Sanpaolo* launched in 2021 the *"Motore Italia"* program, a €50 billion plan aimed at strengthening the growth and competitiveness of small and medium-sized enterprises after the Covid pandemic.

[22] Bonsi, S., & Bruzzo, A. (2015). *Il finanziamento delle PMI nei principali paesi dell'UE durante la grande recessione*.
[23] Intesa Sanpaolo, Comunicato Stampa. (2021, March 5). "*Intesa Sanpaolo presenta Motore Italia"*.

On the other hand, nevertheless some exceptions such as *Intesa Sanpaolo*, it is fair to say that private banks tend to follow a business logic that is more market oriented, with a major focus on profitability and risk management rather than supporting SMEs. Despite this, it is important to assess that private banks are fundamental for the efficiency of the credit market, nevertheless at the same time state-owned bank's role is also crucial to grant support to SMEs, especially during financial crises.

1.3.5 Regulation and Supervision

[24]The 2007-2008 crises had devastating repercussions on the global financial system. This scenario has brought to a profound reflection on the financial system regulation, enhancing the holes in the control systems and the norms present at that time, that, instead of contrasting the crisis, in lots of cases aggravated it. Analyzing this crisis, the State intervention, had demonstrated how, in the moments of major instability, the financial institutions destiny is strictly related to the government politics and the regulators capability to prevent and manage the systemic risks. Considering these events, the governments and the vigilance authority had responded with a reinforcement of regulation, introducing new rules to reduce systemic risk, increasing transparency and strengthening banks' solidity. It is in this context that Basilea III collocates, representing the set of rules developed by the Basel Committee on Banking Supervision, aimed at making the banking sector

[24] Filotto, U., Mattarocci, G., & Mottura, P. M. (2013). "*The Bank, Between Public and Private"*.

more resilient and capable of facing future shocks. [25]A healthy banking system is essential for the economic stability and financial security of citizens. Basel III was introduced gradually to allow institutions to adapt to the new standards and, with its final adoption by the Council of the European Union on 30 May 2024, is now fully in force in the EU. The major objective of this reform is to grant that banks will have adequate levels of capital and liquidity necessary to face future financial shocks without compromising the economic system stability. One of the most important amendments done was the strengthening of capital requirements, in particular, the CET1 passed from 4% to 7% of the RWA and there was also the adding of various capital buffers to absorb the eventual losses during future period of crises. Besides the capital, Basilea III focused also majorly on liquidity management. In this context, there was the introduction of two key metrics: the Liquidity Coverage ratio, that impose the banks to have liquidity reserves to at least cover 30 days of financial distress, and the Net Stable Funding ratio, that grants the financial institutions to have a stable financing structure in the long-term, reducing the short-term financing dependence. To contrast the high leverage usage, a major practice that contributed to the gravity of the 2007-2008 financial crisis, there was the introduction a minimum Leverage ratio of 3%. This metric impose that the banks detain at least the 3% of CET1 in respect to their total exposure, limiting the maximum leverage to approximately 33x. Another key element of the reform was the Output Floor, a mechanism that determines a

[25] Consiglio dell'Unione Europea. "*Basilea III: quadro normativo internazionale per le banche"*.

minimum limit of usage of the internal models for the credit risk valuation. The banks can, in fact, continue to utilize proprietary models to compute their regulatory capital required but with the constraint that the resulted value could not be lower than the 72,5% of that computed with the standardized method. This measure was introduced to avoid excessive underestimations, granting major uniformity globally for the capital requirements. Alongside these technical aspects, the European Union has introduced additional regulations to address emerging risks related to ESG factors, cybersecurity and cryptocurrencies. Banks are now obliged to integrate ESG risks into their governance and risk models, keeping attention to the impact of their activities on climate change and the social sphere. Instead, to protect the financial system from potential crypto-related instabilities, specific capital requirements have been introduced for banking investments in cryptos, in line with the European Markets in Crypto-Assets Regulation (MiCA). The reforms introduced with Basilea III offer concrete advantages for both citizens and enterprises. A more stable banking system reduces the risk of financial crises, banks failures, protecting the depositors and the economic system. In addition, stronger and more regulated banks are more inclined to lend to households and businesses, facilitating access to mortgages, loans and investments, with a positive impact on economic growth and job creation. Basel III therefore represents a fundamental step in the global banking regulation, born from the experience of the 2007-2008 crisis to build a more resilient financial system. Full adoption in the EU ensures that the European banking sector is more robust, safer and able to support economic growth without exposing the market to excessive risks. The goal is to

ensure a balance between regulation and innovation, protecting citizens and businesses without obstructing the development of the banking system.

Chapter 2 – Sample Criteria Selection and Financial Indicators

2.1 Selected sample criteria and used data sources

To conduct a rigorous empirical analysis of the impact of ownership structure on bank performance and stability during the 2007-2008 financial crisis, a balanced sample of 100 banks was selected, divided equally between public banks (50) and private banks (50), representing more than twenty-five countries spread across developed and emerging economies. This geographical composition was done with the objective to grasp the systemic dynamics of the crisis at a global level, while ensuring an adequate institutional, regulatory and macroeconomic context variety.

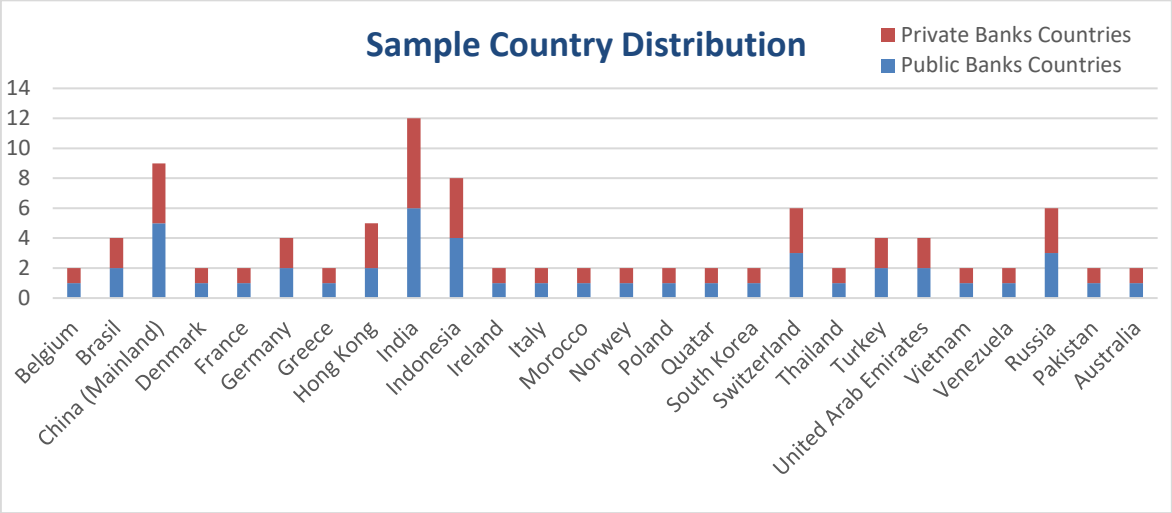


Fig. 5 - *Sample Country Distribution, chart produced with Microsoft Excel based on Refinitiv Data*

In constructing the sample, particular attention was given to maintain a comparable geographical distribution, across both public and private bank groups. Almost all the data necessary for the selection and classification of banks was obtained through the Refinitiv Workspace platform, using the integrated Screener. In

addition to the Screener tool, where needed, several financial metrics required for the calculation of the key ratios that will be used for the empirical analysis, were also retrieved directly from the annual reports of the selected banks, to ensure completeness of the financial information. The sample selection is composed by banks that were either entirely public or entirely private during the 2006 - 2009 period. However, institutions where the State or public bodies played the role of controlling shareholder, were also included, even though there wasn't a fully 100% ownership by these entities. Similarly, for the sample of private banks, only those not subject to public control were considered, even if there were minority public shareholdings that were not able to affect governance or strategic choices. The classification was made based on the historical shareholding structure available on Refinitiv and its Screener mode.

2.2 Definition of solidity and performance indicators

The 2007-2008 crisis had enhanced the structural fragilities of the global banking system, putting into discussion the tradition metrics used to evaluate the financial institutions' solidity and performance. Before and after the collapse of the financial markets, researchers and investors started to examinate with major attention a series of key indicators to measure banks risk, solidity and profitability. The analysis of these indicators it's crucial to understand at best the differences between public owned banks and private ones during this period of crisis. In this chapter, three key indicators are introduced and analysed: ROA and ROCE as profitability ratios and the D/E as a financial stability ratio. These metrics will be

used to conduct the comparative analysis between our sample of financial institutions, aiming at evaluating the existence of significant differences.

2.2.1 ROA as a measure of operational efficiency

[26]Return on Assets (ROA) is a key metric for assessing a bank's profitability and operational efficiency, measuring how effectively an institution uses its assets to generate net income. This ratio is obtained by dividing a bank's net income by its total assets. A high ROA indicates that a bank efficiently converts its assets into profits, demonstrating strong financial management and sustainable business operations. Instead, a low or negative ROA suggests weak profitability, operational inefficiencies, or even could indicate financial difficulties. The banking sector typically has lower ROA values than other sectors, as banks rely heavily on leveraged funds, such as deposits and borrowed capital, rather than their own capital. During the financial crisis, banks' ROA fell sharply due to loan losses, asset write-downs and liquidity constraints, reflecting the collapse of the subprime mortgage market. Many financial institutions suffered large losses on their loan portfolios, significantly reducing net income, while the increase in the volume of non-performing loans (NPLs) eroded the value of banking assets, further weakening balance sheets. In the years following the crisis, the ROA became a crucial indicator for assessing financial stability and identifying institutions at risk. This ratio remains a vital tool for monitoring the impact of financial crises on

[26] Borsa Italiana. *Return on Assets - Glossario finanziario*.

banking institutions, offering valuable insights into profitability trends and the effectiveness of strategic responses to economic shocks. Although ROA alone is not sufficient to fully assess a bank's financial health, it serves as a key performance indicator that, when combined with other financial metrics, provides a comprehensive view of how banks navigate economic downturns and adapt to financial instability.

2.2.2 ROCE and Its Implications for Profitability

[27]The return on capital employed (ROCE) is a financial ratio used by business owners, shareholders, and potential investors to assess the profitability of a business, it represents how efficiently a company turns capital into profit and it is a good indicator of how well the company is operating. Unlike the ROE, which focuses solely on the returns generated relative to shareholders' equity, the ROCE considers the total capital employed in the business, offering, for our study, a broader perspective on how efficiently a bank uses both its own and borrowed funding sources to generate profits. This makes the ROCE particularly valuable in contexts of heightened financial uncertainty, such as the 2007–2008 crisis, where excessive leverage and unsustainable capital structures played a central role in amplifying the systemic risk. By incorporating both equity and debt into its assessment, ROCE allows for a more realistic evaluation of a bank's operational efficiency and financial resilience. During the financial crisis, the

[27] American Express. *"Return on Capital Employed (ROCE): Meaning, Formula, and Examples".*

ROCE of many banking institutions declined significantly because of rising loan defaults and increased provisions for credit losses. The sharp contraction in economic activity and the liquidity crunch forced banks to reassess their capital strategies and restructure their balance sheets, which in turn had a direct impact on this metric. As a result, ROCE proved to be a valuable metric for assessing not only profitability but also the sustainability of banks' financial structures. For this reason, it will be included among the three core indicators considered for the empirical study conducted.

2.2.3 D/E Ratio as a Measure of Financial Strength

[28]The debt-to-equity ratio measures a company's financial leverage by comparing its total liabilities to the shareholder equity. It shows how much debt is used to finance operations compared to the owner's funds. This ratio also helps to understand the balance between debt and equity financing by highlighting the risk exposure to debt obligations, giving insights on long-term solvency. A higher D/E ratio indicates a greater reliance on borrowed funds, which can amplify returns in favourable market conditions but also increase vulnerability during periods of financial distress. Conversely, a lower D/E suggests a more conservative capital structure and potentially greater resilience in times of economic uncertainty. In the context of the 2007–2008 financial crisis, excessive leverage was one of the main contributors to the systemic collapse of several financial institutions. Many banks

[28] Allianz Trade. *"Leverage Ratios: Definition, Formula and Examples."*

had significantly expanded their balance sheets through debt-financed activities, exposing themselves to heightened risk when asset values declined, and liquidity dried up. As the credit markets froze, highly leveraged institutions were among the first to suffer severe losses or require government intervention. The 2007-2008 crisis demonstrated how high leverage levels can undermine not only the individual institutions but the broader stability of the entire financial system.

Chapter 3 – Empirical Analysis

3.1 Empirical Methodology: OLS Regression Model

In this section, the empirical methodology will be illustrated, analyzing the ownerships' impact on banks during the 2006-2009 period, distinguishing between the profitability and stability of private and public banks. The analysis is based on OLS (Ordinary Least Squares) regression models, enriched with different specific dummy variables, with the objective to isolate the crisis effects and find divergences between the public and private banks reactions. In these models the dependent variables are representing a measure of financial performance or either financial stability, such as the ROA, the ROCE, and the D/E. The intercept represents the average attended value of the dependent variable in absence of other effects. The *Public* Variable is a dummy that assume value (1) if the bank is public and value (0) if it's private, *Crisis* and *PostCrisis* are temporal dummy variables that respectively identify the years of crisis (2007-2008) and the post-crisis (2009). The interaction between *Public, Public_Crisis* and *Public_PostCrisis,* will allow to capture the differential effects on public banks compared to private banks, during and after the crisis period. The regression error represents the component not explained by the model. It is also important to assess that the 2006 year was used as a base for the construction of the temporal dummy variables, so these variables will be interpretated in relationship to the 2006 period, that was considered as a benchmark pre-crisis. This approach allows for the isolation of the effects of the financial crisis and the subsequent period, relative to a stable phase

of the banking market, represented by the year 2006. The empirical analysis followed two different estimation strategy. In first place, it was conduced a multiyear regression, including in the sample the entire regression period (2006-2009). This approach allows to assess the overall effect of ownership structure and the financial crisis on the variables of interest throughout the period under consideration. Next, separate regressions were run for each year. This second methodology permits us to capture any specific dynamics that may have occurred in individual years, providing a more detailed view of trends in bank performance and stability over the year-by-year period. A crucial aspect of the analysis relates to the logarithmic transformation of the Debt/Equity (D/E) ratio adopted for the analysis of banking stability. The D/E is commonly used as an indicator of leverage, but it has a highly skewed distribution, characterized by the presence of big outliers. To mitigate these issues, the logD/E was used, reducing the impact of these extreme observations, stabilizing the variance and facilitating the interpretation of the coefficients. This methodological choice is supported by the financial literature, particularly the studies of *Winn* (2012)[29], which highlight the benefits of this approach in analyses of financial variables characterized by high skewness. An additional methodological highlight is the adoption of robust standard errors of the HC1 (Heteroskedasticity-Consistent Standard Errors) type. In financial analyses, dependent variables such as ROA, ROCE and D/E can be affected by heteroskedasticity (i.e., non-constant variance of errors between

[29] Win Vector LLC, 2012. *Modeling Trick: The Signed Pseudo Logarithm*.

observations). The use of robust standard errors allows for reliable estimates of the coefficients and correct assessments of their statistical significance, even in the presence of heteroskedasticity. HC1 is particularly useful for small sample sizes such as the one used in this analysis, which consists of precisely 100 banks. This choice makes it possible to strengthen the robustness of the estimates, improving the precision of statistical inferences in the context of this empirical study. The study integrates also geographic control variables through a two-way approach. On the one hand, the main model includes dummy variables for regional macro areas (Asia, Europe, Rest of the World), with the aim of capturing geographic heterogeneity in banking performance and stability. On the other hand, a complementary model was built with the role to analyze the level of economic development, distinguishing between emerging and developed countries, to assess whether and how this context affects the effects of ownership structure during the financial crisis. To strengthen this approach, interactions were introduced between the variables of interest and geographic dimensions, both in terms of macro area and emerging status to test whether the impact of public ownership varies by region or level of development of the country of origin. Finally, to complement the regression models, a variance analysis (delta) of performance and stability metrics was conducted between 2006 and 2009. This strategy makes it possible to isolate the dynamics of change between the beginning and the end of the period analyzed, offering a reading of the main net effects of the crisis and the post-crisis period on the behaviour of public and private banks, both geographically and in terms of economic development.

3.2 Regression Results: Banks Performance and Stability

This section presents the results obtained from the regression analyses designed to explore the relationship between the ownership structure of banks, distinguishing between public and private institutions, and their performance before, during, and after the 2007-2008 financial crisis. The objective is to understand whether, and to what extent, the public or private nature of a bank influenced performance in terms of asset profitability and return on capital employed. This analysis will focus on these two main measures of bank performance: return on assets (ROA) and return on capital employed (ROCE). These two ratios will be accompanied also by the analysis of the Debt-to-Equity (D/E), used in its logarithmic form as an indicator of the financial stability of banks. This measure will allow the study to evaluate also the intensity of indebtedness and the capital strength of the sample banks before, during and after the crisis period. The following subsections discuss the results for ROA, ROCE and D/E. Each subsection is divided into additional sections devoted to the presentation of regression coefficient tables and an analysis of standard deviation as a measure of performance volatility.

3.2.1 ROA of Public and Private Banks

Return on Assets (ROA) analysis is one of the key tools for assessing the profitability of banks by measuring the ability of assets to generate income. For this research, in line with the methodological approach adopted by Refinitiv, ROA was calculated as Return on Average Total Assets, that is, using the average assets

between year *t* and year t_{-1}. This methodology has significant advantages over the traditional calculation, which is based solely on total assets at year-end. In particular, the ROA reported in financial statements is a snapshot of the last day of the year, but over the course of the year the capital structure of banks can vary significantly, especially in a highly unstable environment such as that of the 2007-2008 financial crisis. Considering only the year-end figure therefore runs the risk of overestimating or underestimating the true use of assets throughout the year. Adopting the average between beginning- and end-of-year assets makes it possible to mitigate the inter-year volatility, returning a more stable and consistent measure of profitability that can capture the average operating conditions rather than the momentary ones. This approach is particularly useful during crises periods, where we could see dramatic changes of the year-end balance sheet values. From an econometric point of view, the use of asset averaging has the merit of reducing the residual variance in OLS regressions, improving the quality of the estimates. This translates into greater reliability of the results and better explanatory power of the model, a key aspect when analysing banking data during periods of high financial stress.

3.2.2 ROA Regression Coefficients

The following table shows the estimated coefficients for ROA, obtained through the multiyear regression model and separate regressions for each year, including interactions with the three different geographic macroareas (Asia, Europe, Rest of the World). The coefficients make it possible to analyze the effect of the public or

private nature of banks, crisis, geographic areas, and their interactions on return on assets.

Table 1: OLS Annual Regressions – ROA

Variable	2006		2007		2008		2009	
	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Constant	0.014***	+6.41	0.015***	+8.64	0.012***	+4.71	0.009***	+5.51
Public	-0.001	-0.34	-0.000	-0.09	-0.007	-1.55	-0.002	-0.67
Region_Asia	0.001	+0.31	0.000	+0.17	-0.000	-0.14	0.004**	+2.53
Region_Europe	0.002	+0.57	-0.000	-0.17	-0.002	-0.45	-0.005***	-2.83
Region_Rest	0.012***	+3.16	0.015***	+4.12	0.014***	+4.32	0.010***	+3.14

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

Table 1: OLS Multiyear Regression – ROA

Variable	Coefficient	z-statistic
Constant	0.014***	(+6.37)
Public	-0.001	(-0.34)
Crisis	-0.001	(-1.03)
PostCrisis_2009	-0.007***	(-3.21)
Public_Crisis	-0.002	(-0.71)
Public_PostCrisis_2009	-0.001	(-0.40)
Region_Asia	0.001	(+0.61)
Region_Europe	-0.001	(-0.34)
Region_Rest	0.014***	(+3.20)
Public_Asia_Crisis	-0.001	(-0.25)
Public_Europe_Crisis	0.000	(+0.04)
Public_Rest_Crisis	-0.001	(-0.22)
Public_Asia_PostCrisis	0.006*	(+1.85)
Public_Europe_PostCrisis	-0.001	(-0.27)
Public_Rest_PostCrisis	-0.006	(-1.10)

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

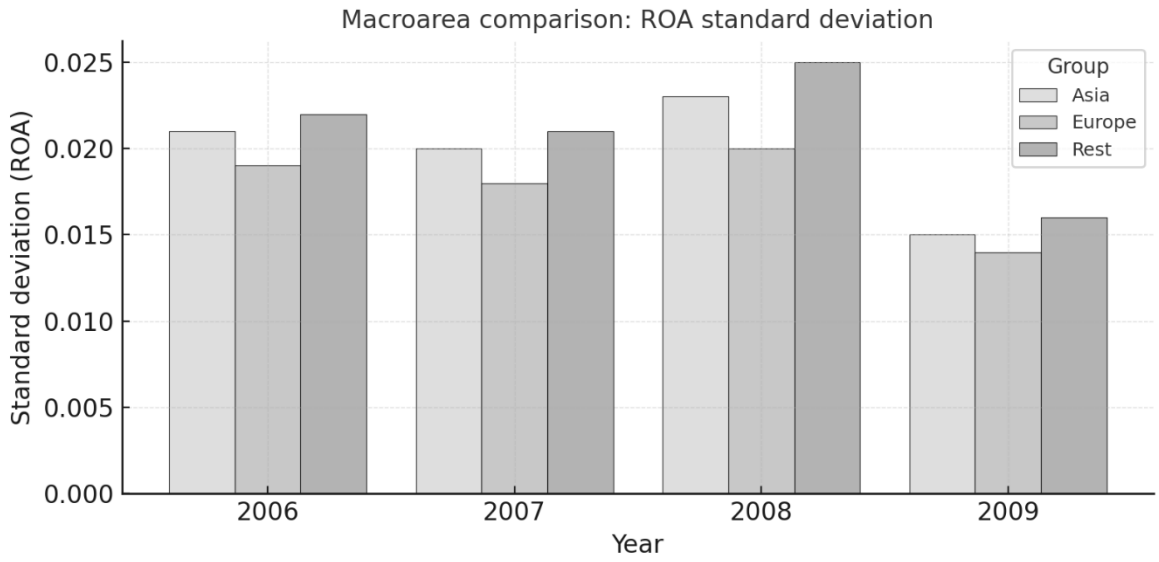
The analysis of coefficients estimated through the OLS regression model for Return on Assets (ROA) shows significant results for the interpretation of bank profitability during 2006-2009. The multiyear regression, which jointly considers all years of the sample, shows a significant intercept ($p < 0.01$), with an estimated value of about 0.014. This indicates that, on average, private banks belonging to the reference category (Asia) presented a ROA of 1.4 percent in the absence of effects related to the crisis, public nature or geographic location. Among the variables of interest, we note the negative significance of the *PostCrisis_2009 dummy* (*coef. -0.007, $p < 0.01$*), suggesting that, in the post-crisis period (2009), all banks experienced a reduction in ROA of about 0.7 percentage points compared to the pre-crisis period. This effect is further reinforced by the Delta analysis conducted on ROA between 2006 and 2009. Delta ROA, in fact, confirms this decline (*coef. -0.007, $p < 0.01$*) for the sample, emphasizing the lasting impact on bank profitability, even one year after the crisis. However, the most relevant and distinctive aspect of this comparative analysis emerges from the *Public_Asia_PostCrisis* interaction, which is positive and marginally significant (*coef. +0.006, $p < 0.1$*). This finding indicates that Asian public banks experienced a higher ROA recovery than private banks in the immediate post-financial crisis period. In other words, public banks in Asia performed better than the private counterparts in 2009, showing greater resilience. This result is a clear indication of the resilience of the public model in Asia, differentiating it from the rest of the world, where the ownership structure did not show significant effects on profitability. One could speculate that in Asia, government support policies, or a

different configuration of the banking system, favoured public banks in coping with the effects of the crisis and restoring profitability. In contrast, the *Public*, *Public_Crisis* and *Public_PostCrisis_2009* variables, which capture the effect of ownership structure globally, are not significant. This reinforces the idea that the performance differential between public and private banks is geographically localized, emerging significantly only in the Asian region in the post-crisis period. Regarding the macroareas, the *Region_Rest* variable is significant (*coef. +0.014*, $p < 0.01$), indicating that banks located outside Asia and Europe ("Rest of the world") presented, on average, higher ROA than European banks, regardless of ownership structure. Separate regressions for each year confirm this evidence: Asian public banks stand out positively in the post-crisis period, while no significant differences emerge between public and private in the other geographic contexts or periods. The R^2 of the regressions, while small (0.106 in the multiyear and between 0.051 and 0.185 in the individual years), is consistent with the nature of cross-sectional banking data, where the concrete performance is influenced by a lot of different exogenous factors. In summary, this comparative analysis shows that while the financial crisis has had a generalized negative impact on bank profitability assets, Asian public banks have shown greater resilience, suggesting a geographic differentiation in the effectiveness of the public model.

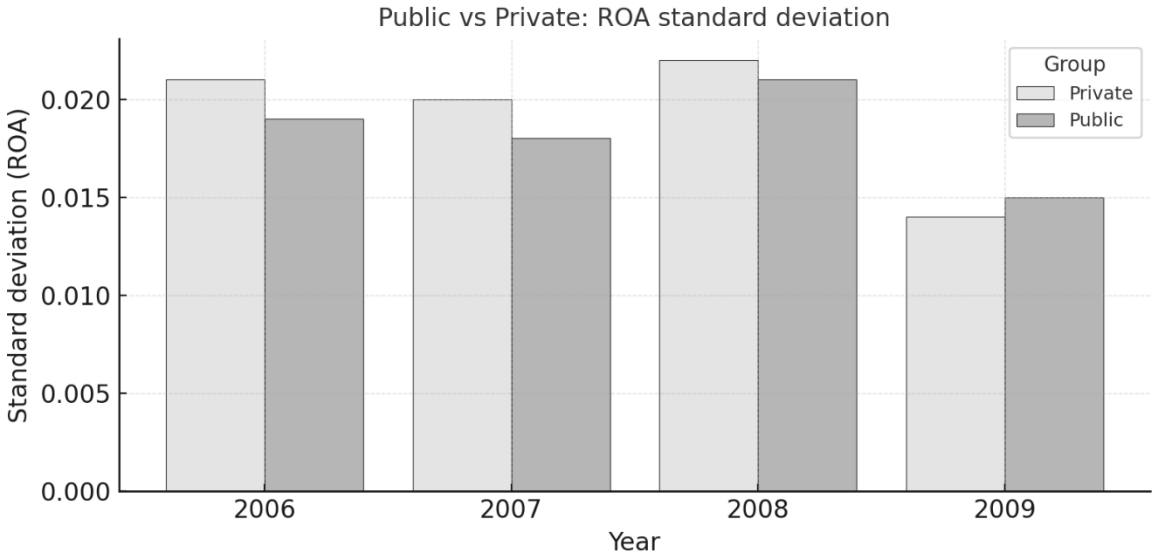
3.2.3 ROA Standard Deviation

To complete the analysis of bank profitability, the evolution of the standard deviation of ROA over the period 2006–2009 was examined, with the aim of

assessing the stability of returns in the context of the financial crisis. The peak observed in 2008 highlights a sharp increase in volatility, corresponding to the most acute phase of the financial turmoil, followed by a contraction in 2009 that suggests the start of a normalization process.



The analysis by geographical macro-area, illustrated in the figure above, shows that all regions recorded an increase in volatility in 2008, although with different intensities. The “Rest” group, which includes countries outside Asia and Europe, remains the area with the highest level of instability throughout the period analyzed, suggesting greater exposure to systemic shocks. On the contrary, European and Asian banks show a greater capacity to contain volatility, especially in the post-crisis phase.



It is important to assess that, from 2006 to 2008, private banks showed slightly higher levels of volatility than their public counterparts. In 2009, despite the stabilization process, there was a reversal in this trend and public banks instead experienced greater volatility in ROA. The increase in volatility in public ROA could be attributed to several factors, including policies to support the economy, which especially in the year of exit from the crisis could have led to more aggressive management of loans. Furthermore, in the post-crisis period, there was a progressive easing of extraordinary measures, such as government interventions and liquidity policies, which had previously helped stabilize the sector. The difficulty in finding a balance between economic and social objectives, combined with a reduced availability of state support, could have increased the uncertainty related to their performance. Thus, the increase in volatility in public bank ROA in 2009 may reflect the complexity of navigating a post-crisis transition period,

where normalization challenges have become intertwined with pressures to support the economy.

3.2.4 ROCE of Public and Private banks

Return on Capital Employed (ROCE) is a key indicator for assessing a bank's ability to generate profit from capital employed, reflecting efficiency in managing capital. In this study, ROCE was calculated using the average of capital employed between year t and year t_{-1}, rather than relying solely on the year-end value. This methodological choice is consistent with the approach taken for ROA and aims to improve the robustness of the performance indicators used in the regression analysis. The use of the average between beginning and ending capital for the year makes it possible to mitigate distortions caused by extraordinary fluctuations that may occur in the capital structure especially during the end of the year. This is particularly relevant in the context of the 2007-2008 financial crisis, when recapitalization interventions, asset write-downs, or other balance sheet adjustments generated significant discrepancies in year-end values. The simple measure of ROCE may therefore not accurately represent a bank's actual operating efficiency throughout the year. From an econometric perspective, adopting an average capital base helps also to reduce noise and residual variance in OLS regression estimates, like what is observed for ROA. However, since ROCE incorporates not only profitability but also capital dynamics, the stabilizing effect obtained with the averaging approach is even more relevant, especially in the presence of volatile capital levels due to financial distress periods. For these

reasons, the use of the average of capital employed in the ROCE computation was used, to strengthen the robustness of the regression results.

3.2.5 ROCE Regression Coefficients

The following table shows the estimated Return on Capital Employed (ROCE) coefficients, obtained through the multi-year regression model and separate regressions for each year, including interactions with the geographical macro-areas (Asia, Europe, Rest). The coefficients allow to analyse the effect of the public or private nature of banks, the crisis, geographical areas and their interactions on the efficiency in the use of capital employed.

Table 2: OLS Annual Regressions – ROCE

Variable	2006		2007		2008		2009	
	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Constant	0.157***	+9.89	0.160***	+13.81	0.085	+1.56	0.074***	+6.03
Public	-0.036	-1.26	-0.015	-0.57	0.028	+0.35	0.011	+0.34
Region_Asia	0.028	+1.62	0.025	+1.42	0.057**	+2.32	0.079***	+4.14
Region_Europe	0.067***	+2.69	0.023	+1.17	-0.066	-0.74	-0.078***	-3.03
Region_Rest	0.061***	+3.87	0.112***	+4.75	0.094***	+3.69	0.074***	+3.23

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

Table 2: OLS Multiyear Regression – ROCE

Variable	Coefficient	z-statistic
Constant	0.159***	(+9.67)
Public	-0.036	(-1.22)
Crisis	-0.052	(-1.39)
PostCrisis_2009	-0.112***	(-3.93)
Public_Crisis	0.035	(+1.10)
Public_PostCrisis_2009	0.035	(+1.22)
Region_Asia	0.055***	(+2.71)
Region_Europe	0.015	(+0.37)
Region_Rest	0.088***	(+4.16)
Public_Asia_Crisis	0.006	(+0.22)
Public_Europe_Crisis	-0.017	(-0.32)
Public_Rest_Crisis	0.046	(+1.25)
Public_Asia_PostCrisis	0.064*	(+1.75)
Public_Europe_PostCrisis	-0.053	(-0.95)
Public_Rest_PostCrisis	0.023	(+0.52)

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

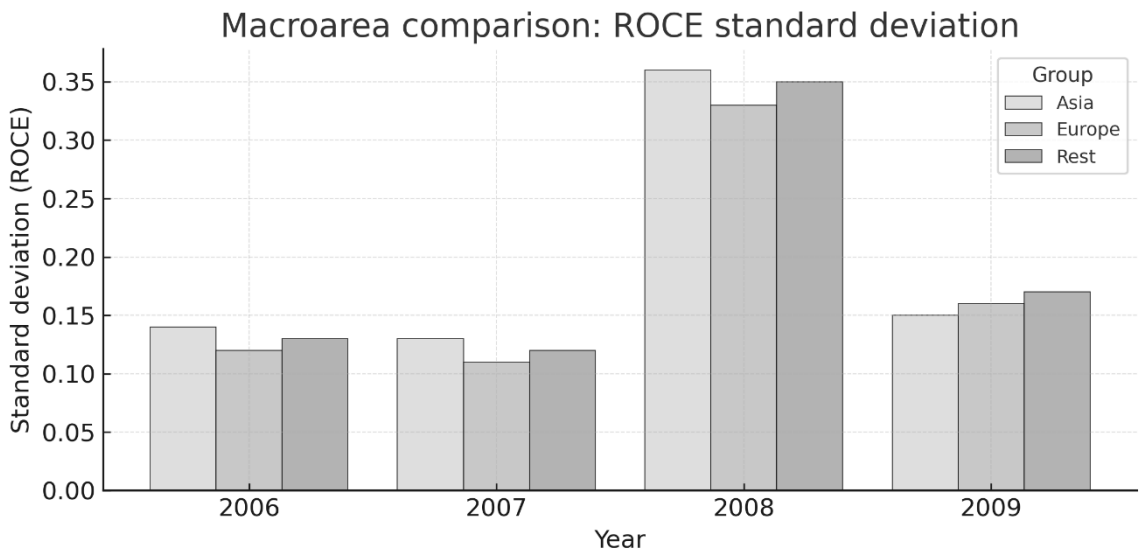
The analysis of the coefficients estimated using the OLS regression model for ROCE shows significant results for the interpretation of the stability and efficiency of the capital employed by banks 2006-2009 period. The multiyear regression shows a significant intercept ($p < 0.01$), with an estimated value of 0.159. This indicates that, on average, European private banks, that are representing the reference category in the regression, presented a ROCE of 15.9% in the absence of effects related to the crisis, public nature or geographical location. As also observed for the ROA, the *PostCrisis_2009* dummy assumes a negative and highly significant coefficient *(-coef. -0.112, $p < 0.01$)*, signaling a reduction in the ROCE

of about 11.2 percentage points in 2009 compared to the pre-crisis period. This underlines a particularly severe impact of the crisis on the efficiency of capital employed. The Delta analysis confirms this dynamic: the ROCE Delta between 2006 and 2009 shows a significant reduction (*coef. -0.112, $p < 0.01$*), reinforcing the evidence of a deterioration in the stability of the capital invested during the analysed period. The *Public* variable and its interactions with the crisis (*Public_Crisis, Public_PostCrisis_2009*) are not significant in the multiyear regression, suggesting that the ownership structure did not affect the banks' ROCE with statistical significance over the period considered. However, there are interesting signs at a geographical level. The variables *Region_Asia* (*coef. +0.055, $p < 0.01$*) and *Region_Rest* (*coef. +0.088, $p < 0.01$*) are both positive and significant, indicating that banks located in Asia and in the "Rest of the world" have on average had a higher ROCE than European banks. This geographical effect is more pronounced than that observed for the ROA, suggesting that capital efficiency has been more affected by location. The result of the *Public_Asia_PostCrisis* interaction, which is positive and marginally significant (*coef. +0.064, $p < 0.1$*), is particularly relevant. This suggests that Asian public banks, including in terms of ROCE, have seen better performance than private counterparts in the post-crisis period. Similarly to the ROA, this result indicates greater resilience of Asian public banks also in terms of efficiency of invested capital use. The separate regressions for each year confirm this evidence: the variables *Region_Asia* and *Region_Rest* are often significant and positive, indicating a systematic tendency of banks in these areas to have higher ROCE

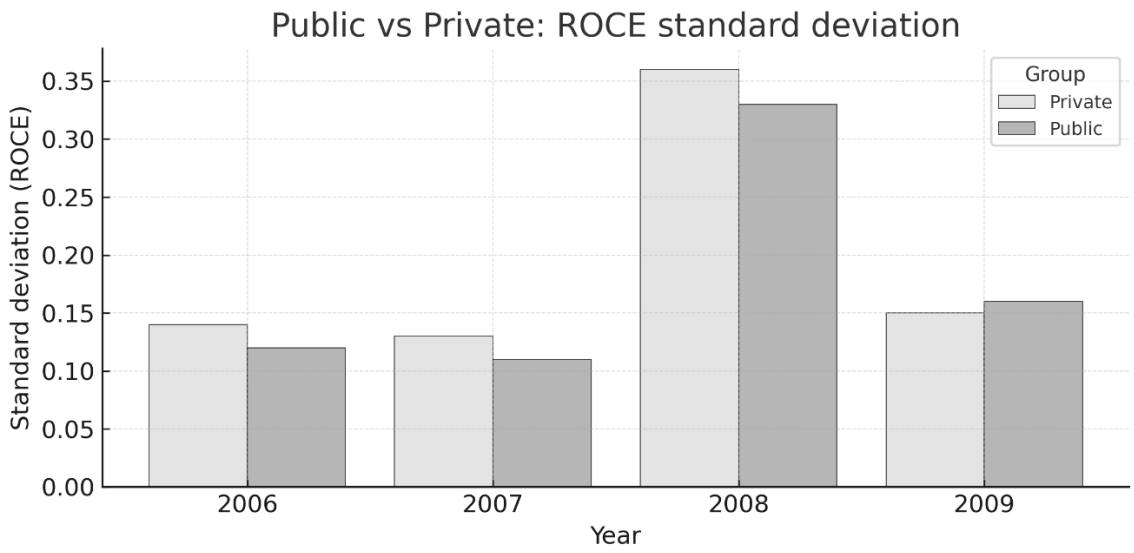
levels than in Europe. However, even in annual regressions, there are no systematic differences between public and private banks, except for Asian public banks in the post-crisis period. The R2 of the regressions is contained (0.052 in the multiyear and between 0.032 and 0.189 in the individual years), but appropriate to the nature of the cross-section financial data. In summary, the results suggest that the financial crisis has had a negative impact on the stability and efficiency of capital employed in private and public banks. However, Asian public banks are once again distinguished by their post-crisis resilience, reinforcing the idea of a stronger framework associated with the public model in Asia.

3.2.6 ROCE Standard Deviation

To complete the analysis of bank capital efficiency, the evolution of the standard deviation of ROCE over the period 2006-2009 was examined, to assess the volatility and instabilities in the banking system before, during and after the global financial crisis. As with ROA, ROCE also experienced a sharp increase in volatility in 2008, when banks were under severe pressure to manage their capital efficiency during the height of the financial crisis. In 2009, the standard deviation started to decline, indicating a gradual process of normalization and stabilization, although performance levels had not yet returned to pre-crisis levels. This pattern of volatility and subsequent reduction aligns with the trends observed for ROA, reinforcing the broader implications of the financial crisis on both profitability and efficiency in the banking sector.



The analysis of ROCE standard deviation by geographic macro-area, shown in the figure above, reveals that all regions experienced an increase in volatility in 2008, although with different degrees. The “Asia” group presents the highest levels of standard deviation throughout the 2006-2008 period, suggesting a generic greater susceptibility to systemic shocks. In contrast, European and the “Rest” banks showed a slight greater resilience, with relatively lower levels of volatility. However, in 2009, despite the initial trend, Asian banks showed the most significant recovery in terms of volatility, confirming the results from the regression analysis.



It is important to assess that ownership structure played a limited role in influencing the stability of capital efficiency in the period observed. The *Public* variable did not show statistically significant results, highlighting that ownership type was not a main determinant of the capital invested return volatility during this period.

3.2.7 Log(D/E) Coefficients

The following tables shows the resulting coefficients associated to the logarithm of the debt/equity ratio (log D/E), obtained through the multi-year regression model and separate regressions for each year, including interactions with the geographical macro-areas (Asia, Europe, Rest). The coefficients make it possible to analyse the effect of the public or private nature of banks, the crisis, geographical areas and their interactions on the capital structure and the level of indebtedness of the various banks object of the empirical study.

Table 3: OLS Multiyear Regression – log(D/E)

Variable	Coefficient	z-statistic
Constant	0.816***	(+10.39)
Public	-0.110	(-0.74)
Crisis	-0.027	(-0.42)
PostCrisis_2009	-0.158**	(-2.19)
Public_Crisis	0.064	(+1.03)
Public_PostCrisis_2009	0.203***	(+2.62)
Region_Asia	0.023	(+0.30)
Region_Europe	0.723***	(+6.11)
Region_Rest	0.070	(+0.63)
Public_Asia_Crisis	-0.003	(-0.02)
Public_Europe_Crisis	0.191	(+1.04)
Public_Rest_Crisis	-0.124	(-0.75)
Public_Asia_PostCrisis	0.059	(+0.42)
Public_Europe_PostCrisis	0.073	(+0.42)
Public_Rest_PostCrisis	0.072	(+0.39)

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

Table 3: OLS Annual Regressions – log(D/E)

Variable	2006		2007		2008		2009	
	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Constant	0.815***	+10.24	0.827***	+10.91	0.757***	+11.86	0.692***	+11.59
Public	-0.110	-0.74	-0.107	-0.67	0.090	+0.63	0.160	+1.17
Region_Asia	-0.036	-0.42	0.023	+0.25	-0.005	-0.06	0.024	+0.29
Region_Europe	0.806***	+6.54	0.776***	+5.64	0.746***	+6.52	0.678***	+6.23
Region_Rest	0.045	+0.37	0.028	+0.26	0.016	+0.14	-0.010	-0.09

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

The analysis of the coefficients estimated using the OLS regression model for log(D/E) highlights particularly relevant results, confirming that the ownership

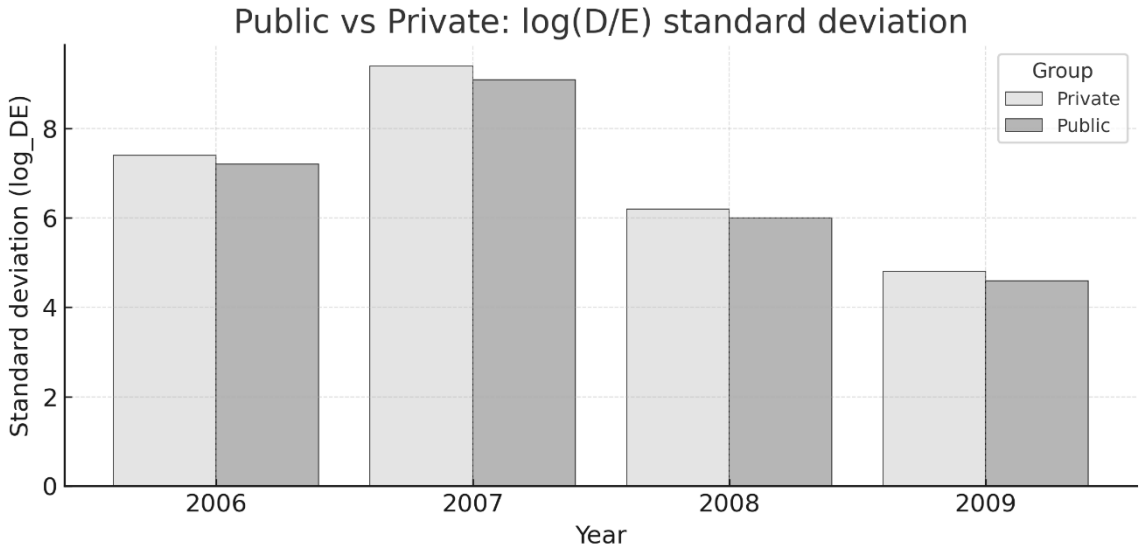
structure of banks has had a significant impact on leverage strategies during the 2006-2009 period. In the multiyear regression, there is a significant increase of the leverage in the post-crisis period (*PostCrisis_2009*), with a coefficient of -0.158 ($p < 0.05$), indicating an overall reduction of the D/E after the crisis, consistent with the deleveraging policies implemented by many banks in response to the financial turmoil. However, what distinguishes public from private banks is the differential behaviour shown by the variable *Public_PostCrisis_2009*, which assumes a positive and highly significant coefficient ($+0.203$, $p < 0.01$). This suggests that, holding other factors constant, public banks showed higher levels of leverage than private banks in the post-crisis period, contrary to the general trend of deleveraging observed in the banking sector. This behaviour can be interpreted as a trademark of the counter-cyclical function of public banks. Supported by government policies and a mission oriented to support the real economy, public banks may have continued to finance the economy even in the most critical moments, increasing their leverage to support credit activity when instead the private banks adopted deleveraging strategies. This interpretation, as stated in previous chapters, is widely supported by the banking literature, which identifies public banks as instruments of macroeconomic stabilisation, able to mitigate recessions through a greater involvement in lending. From a geographical point of view, the variable *Region_Europe* shows a positive and highly significant ratio ($+0.723$, $p < 0.01$), suggesting that the European banks (compared to Asian ones, reference category) have higher levels of leverage. This result is also confirmed by the individual years regressions. The interactions between *Public* and macro areas

(such as *Public_Europe_Crisis* or *Public_Asia_PostCrisis*) are not significant for log(D/E), which indicates that the leverage differential between public and private in the post-crisis period is on a global scale, without large geographical variations, unlike the ROA observed. The year-by-year regressions confirm these trends: while overall leverage is decreasing in 2009, the higher leverage of public banks compared to private banks remains unchanged, although it does not always reach statistical significance in individual years. Finally, the Delta analysis reinforces these results: the Delta log(D/E) between 2006 and 2009 shows a significant increase in public versus private banks (*+0.270*, $p < 0.01$), highlighting how the leverage differential has widened over time, especially in the post-crisis period. This further reinforces the assumption that public banks have adopted more expansionary capital strategies than the private institutions during the period observed. In summary, the log(D/E) results represent the distinctive and central element of this comparative analysis. While profitability metrics do not show systematic differences between public and private, the capital structure highlights a clear divergence in strategy: public banks have increased leverage or at least reduced leverage less than private banks and, as we previously affirmed, this could be attributed to their supporting role on the real economy during periods of financial distresses.

3.2.8 Log(D/E) Standard Deviation

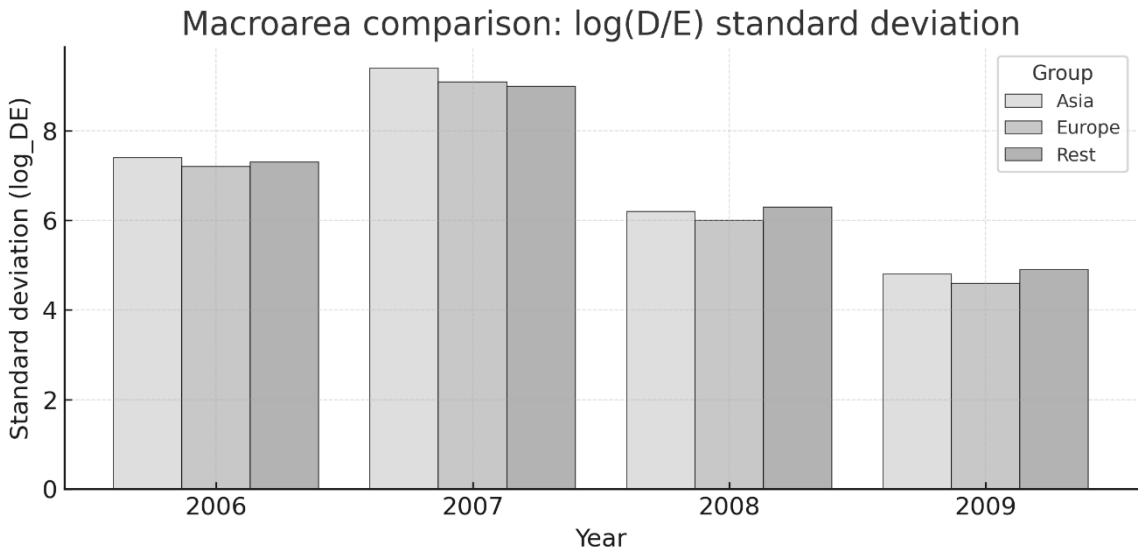
To complete the analysis on banking leverage, we present a graph showing the trend of the standard deviation of log(D/E) over the period 2006-2009, to analyze

the volatility of the capital structure. The results highlight a peak of volatility in 2008, followed by a reduction of the standard deviation in 2009, indicating a partial stabilization of the banking sector's leverage strategies. This trend also reflects what was observed for ROA and ROCE, suggesting that the crisis affected both the average levels and the variability of leverage, with a gradual return to more balanced conditions in the year following the crisis.



The analysis of the standard deviation of log(D/E) by ownership type, shown in the graph above, suggests that the volatility of private banks was generally higher than that of public banks during the pre-crisis period (2006-2007). However, in 2008, the peak year of the crisis, both types of banks experienced a significant decrease in volatility. In 2009, volatility decreased as well for both categories, but private banks showed still a higher volatility in the financial leverage. When we analyze the standard deviation of log(D/E) by geographic macro-area, an

interesting shift in the distribution of volatility across regions emerges over the period 2006-2009.



In 2006, the pre-crisis year, and in 2007, Asian banks showed the highest volatility compared to European banks and the "Rest" group. However, in 2008, during the peak year of the crisis, it was the "Rest" group (which includes countries outside Asia and Europe) that recorded the highest volatility, followed by a generalized reduction in 2009. Despite the decline in volatility for all macro-areas in 2009, the "Rest" group maintained the highest volatility also in the post-crisis period. This reversal of the trend between the period analyzed could be due to the different impact that the crisis had on geographic areas. The “Rest” group, which includes countries with less developed banking markets or highly dependent on global economies, may have been more impacted by the crisis, with larger fluctuations in debt levels and greater uncertainty in capital management. This may explain why

banks in the “Rest” group experienced higher volatility than Asian and European banks in 2008 and 2009.

3.3 Emerging vs. Developed: Empirical Analysis

After analysing the differences between public and private banks according to geographical macro-areas, this section focuses on the role of the economic environment of the countries in which the banks operate, distinguishing between emerging and developed countries. The objective is to understand whether and to what extent the ownership structure of banks interacts with the country’s level of development to influence banking performance and stability, especially in a period of a global financial crisis. The analysis is based on an OLS model similar to the previous one, enriched with the dummy variable *Emerging*. The *Emerging* dummy assumes the value (1) if the bank is in an emerging country and (0) otherwise, allowing the model to isolate the effect of operating in an emerging economy rather than in a developed one.

3.3.1 ROA Regression Coefficients

The multi-year regression on Return on Assets (ROA) shows a significant intercept (*coef. +0.012, $p < 0.01$*), which represents the average expected value of the ROA for a private bank in a developed country in the pre-crisis period.

Table 4: OLS Annual Regressions – ROA

Variable	2006		2007		2008		2009	
	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Constant	0.014***	+3.54	0.013***	+3.76	0.006	+1.08	0.004**	+2.07
Public	-0.001	-0.37	-0.001	-0.14	-0.007	-1.62	-0.002	-0.73
Emerging	0.005	+1.14	0.008*	+1.88	0.012**	+2.23	0.010***	+3.81

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

Table 4: OLS Multiyear Regression – ROA

Variable	Coefficient	z-statistic
Constant	0.012***	(+2.82)
Public	0.002	(+0.29)
Crisis	-0.003	(-0.48)
PostCrisis_2009	-0.010**	(-2.21)
Public_Crisis	-0.006	(-0.55)
Public_PostCrisis_2009	-0.001	(-0.10)
Emerging	0.008	(+1.46)
Emerging_Crisis	0.002	(+0.33)
Emerging_PostCrisis_2009	0.005	(+0.73)
Emerging_Public	-0.006	(-0.62)
Public_Emerging_Crisis	0.005	(+0.44)
Public_Emerging_PostCrisis	0.001	(+0.05)

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

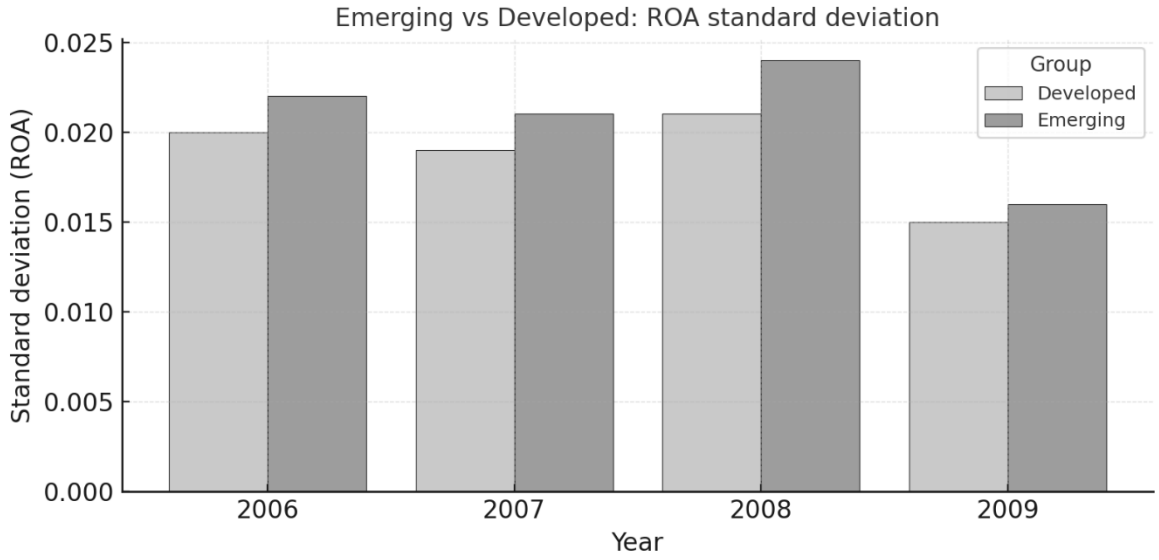
The variable *PostCrisis_2009* assumes a negative and significant coefficient (*coef. -0.010, $p < 0.05$*), confirming the reduction in the assets' profitability during the post-crisis period. The most important aspect concerns the variable *Emerging*,

which is positive and statistically significant in several specifications (coef. + 0.008 in the multiyear; up to +0.012 in 2008 and +0.010 in 2009). This suggests that, under equivalent circumstances, emerging-market banks have tended to outperform their developed-country counterparts in terms of ROA. In particular, the 2008 and 2009 results indicate that emerging market banks have shown greater ability to generate income from assets at precisely the most critical moment of the crisis. One possible explanation for this result is that many emerging countries had less direct exposure to the toxic subprime bonds, which were at the heart of the 2007-2008 financial crisis. Their banks, being less integrated in international financial markets, have suffered a more moderate impact from the systemic transmission generated in the global banking system, and this has potentially fostered a greater operational stability. However, the interactions between ownership structure and emerging context are not significant: neither the *Emerging_Public* variable nor its interactions with the crisis phases (*Public_Emerging_Crisis* and *Public_Emerging_PostCrisis*) provide evidence of a differential behaviour between public and private in emerging markets. This suggests that, as far as ROA is concerned, ownership structure has not significantly affected performance dynamics in emerging countries. The results of the annual regressions confirm this dynamic: the coefficients associated with the Emerging variable are positive and significant in the two-year period 2008-2009, reinforcing the idea of a greater resilience of emerging banks during the crisis. The Delta analysis between 2006 and 2009 also confirms an improvement in ROA for

emerging banks compared to those of developed countries (*coef. +0.005*), although with marginal significance.

3.3.2 ROA Standard Deviation

To complete the analysis of bank profitability with a comparative focus between emerging and developed countries, we present a graph showing the standard deviation of ROA over the period 2006-2009. This measure allows us to examine how the volatility of banking profitability has changed over time, highlighting periods of greater instability and recovery phases.



In 2008, during the peak year of the crisis, we observe the largest differential in standard deviation of ROA between emerging and developed countries, with emerging banks experiencing significantly higher volatility. This indicates that, despite global difficulties, banks in emerging countries were more exposed to

fluctuations in the return on their assets. The larger differential observed in 2008, in line with what was observed in the regression analysis, implies that banks in emerging countries had maintained a higher average profitability levels of their assets than banks in developed countries, proportional to the greater variability in their returns observed in the graph. In other words, the crisis had a stronger impact in terms of volatility on the profitability of banks in emerging countries than those in developed countries. This suggests that emerging banks had to navigate an environment of greater uncertainty. However, in 2009, the standard deviation of ROA for both categories of banks decreased, highlighting how the stabilization processes worked out for the two different groups of banks.

3.3.3 ROCE Regression Coefficients

The results for Return on Capital Employed (ROCE) largely mirror those observed for ROA, with a greater intensity.

Table 5: OLS Annual Regressions – ROCE

Variable	2006		2007		2008		2009	
	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Constant	0.212***	+5.41	0.165***	+6.02	0.007	+0.05	0.003	+0.10
Public	-0.036	-1.27	-0.016	-0.62	0.025	+0.33	0.008	+0.25
Emerging	-0.008	-0.24	0.060**	+2.28	0.151	+1.32	0.140***	+3.88

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

Table 5: OLS Multiyear Regression – ROCE

Variable	Coefficient	z-statistic
Constant	0.159***	(+9.67)
Public	-0.036	(-1.22)
Crisis	-0.052	(-1.39)
PostCrisis_2009	-0.112***	(-3.93)
Public_Crisis	0.035	(+1.10)
Public_PostCrisis_2009	0.035	(+1.22)
Region_Asia	0.055***	(+2.71)
Region_Europe	0.015	(+0.37)
Region_Rest	0.088***	(+4.16)
Public_Asia_Crisis	0.006	(+0.22)
Public_Europe_Crisis	-0.017	(-0.32)
Public_Rest_Crisis	0.046	(+1.25)
Public_Asia_PostCrisis	0.064*	(+1.75)
Public_Europe_PostCrisis	-0.053	(-0.95)
Public_Rest_PostCrisis	0.023	(+0.52)

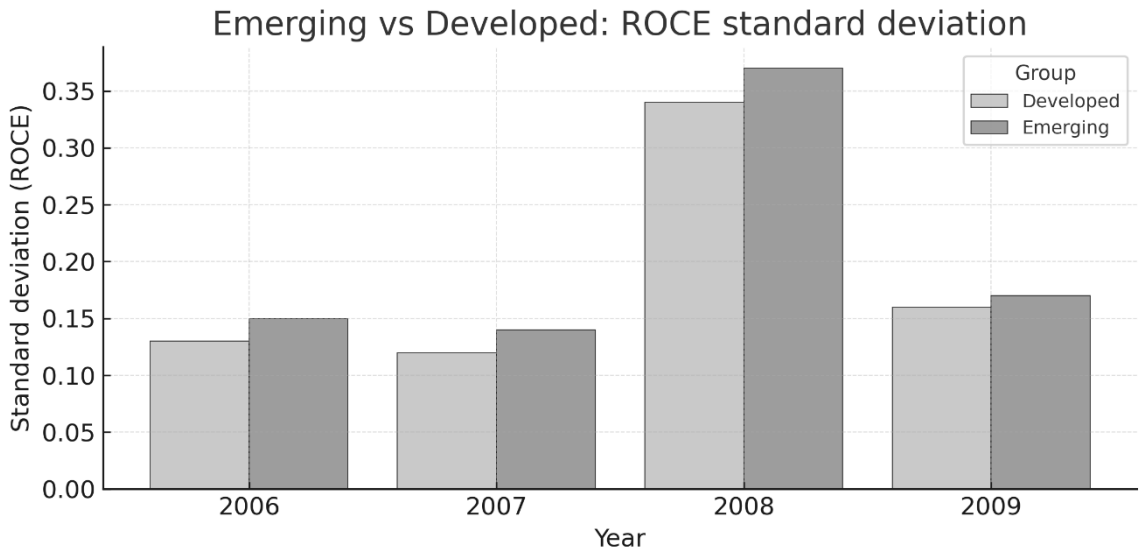
**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

In the multiyear regression, the *PostCrisis_2009* variable assumes a negative and highly significant coefficient (*coef. -0.228, p < 0.01*), highlighting a heavy impact of the crisis on capital efficiency. However, unlike the regression analysis on the macroareas, the variable *Emerging_PostCrisis_2009* is significant (*coef. +0.175, p < 0.05*), suggesting that banks located in emerging countries have better contained the loss of efficiency in the capital employed in 2009. The most relevant result is that also in terms of ROCE, emerging banks show superior performance: the coefficient of the *Emerging* variable reaches values up to +0.140 in 2009 (*p < 0.01*). The Delta analysis between 2006 and 2009 confirms a significant positive

differential (*+0.175, $p < 0.01$*), indicating that capital efficiency has remained more stable in emerging markets than in advanced ones. The interactions between *Public* and *Emerging* are not significant, suggesting that the competitive advantage in emerging countries has not been influenced by the ownership structure. Overall, the evidence suggests that the emerging market environment has been a key determinant of resilience during the crisis with respect to capital efficiency.

3.3.4 ROCE Standard Deviation

To complete the analysis on the efficiency of the capital employed, a graph of the standard deviation of ROCE of the period 2006-2009 is presented, which allows us to capture the variability of performances in emerging and developed countries.



The data show that in 2008, the standard deviation of ROCE peaked for both categories of banks, with emerging market banks showing significantly higher

volatility than developed market banks. In 2009, both categories saw a reduction in volatility, signaling the consequent post-crisis stabilization. In summary, the patterns of volatility of invested capital (ROCE) are consistent with those of ROA, indicating that emerging market banks, despite experiencing higher instability, showed a similar recovery in terms of post-crisis stabilization.

3.3.5 Log(D/E) Regression Coefficients

Regarding the capital structure, taking into consideration the ROA and ROCE regression results, there is a clear and contrary evidence.

Table 6: OLS Multiyear Regression – log(D/E)

Variable	Coefficient	z-statistic
Constant	1.548***	(+6.44)
Public	0.192	(+0.56)
Crisis	-0.020	(-0.07)
PostCrisis_2009	-0.131	(-0.45)
Public_Crisis	0.215	(+0.51)
Public_PostCrisis_2009	0.242	(+0.54)
Emerging	-0.676**	(-2.57)
Emerging_Crisis	-0.011	(-0.04)
Emerging_PostCrisis_2009	-0.041	(-0.13)
Emerging_Public	-0.425	(-1.15)
Public_Emerging_Crisis	-0.167	(-0.37)
Public_Emerging_PostCrisis	0.043	(+0.09)

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

Table 6: OLS Annual Regressions – log(D/E)

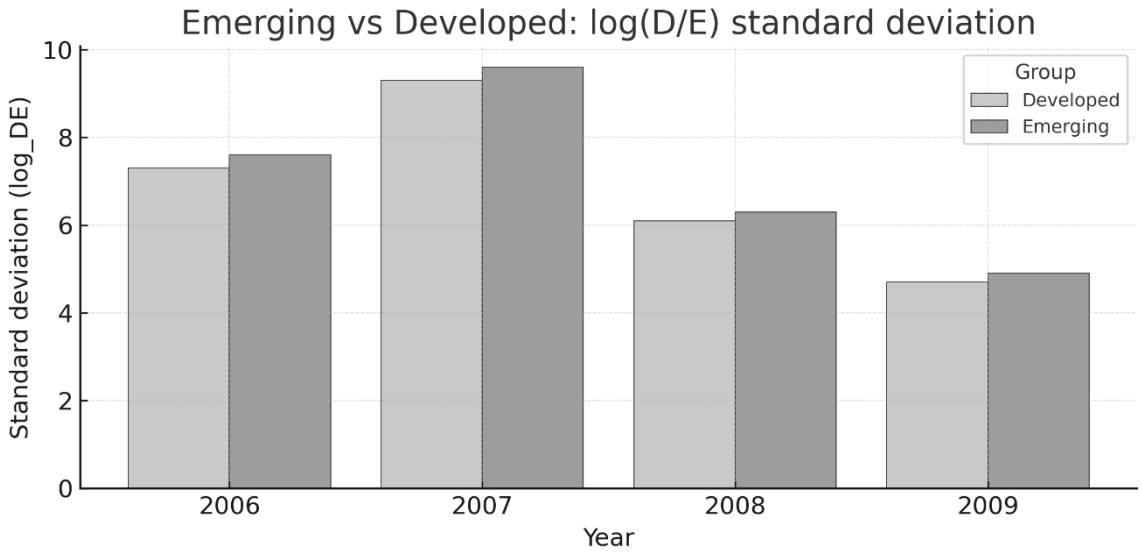
Variable	2006		2007		2008		2009	
	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Constant	1.686***	+8.97	1.800***	+9.28	1.641***	+10.59	1.541***	+10.69
Public	-0.092	-0.64	-0.087	-0.60	0.109	+0.82	0.178	+1.45
Emerging	-0.885***	-4.75	-1.026***	-5.19	-0.929***	-5.47	-0.905***	-5.75

**** for p-values < 0.01, ** for p-values < 0.05, * for p-values < 0.1*

The *Emerging* variable assumes a strongly negative coefficient (*coef. -0.676, p < 0.01* in the multiyear), indicating that banks in emerging countries have maintained significantly lower levels of leverage than banks in developed countries. This result is confirmed also in individual years, with even more accentuated values (e.g. -1.026 in 2007, -0.905 in 2009). This evidence suggests that banks in emerging countries have adopted more prudent strategies in terms of financial leverage, potentially due to less access to international debt markets or greater risk aversion. The interactions with *Public* are not significant, but the *Public_PostCrisis_2009* variable maintains a positive coefficient (*+0.242*), suggesting once again that public banks, globally, have reacted to the crisis with more expansionary capital strategies. The Delta analysis confirms this dynamic: the Delta log(D/E) for the *Emerging* variable is negative (*-0.041*), while for *Public* it is positive (*+0.242*), reinforcing the evidence of a strategic differential between public and private, and between developed and emerging countries.

3.3.6 Log(D/E) Standard Deviation

To complete the analysis of banks stability and capital structure, the following graph shows the trend of the standard deviation of log(D/E) between 2006 and 2009, with particular attention to the differences between emerging and developed countries.



The data show that the volatility of bank leverage (measured in terms of the logarithm of the D/E ratio) peaked in 2007. This increase reflects systemic uncertainty and the divergent strategies adopted by banks in response to the exogenous shock. Subsequently, in 2008-2009, a reduction in the standard deviation is observed, indicating a partial stabilization of leverage policies in the international banking system. In the comparison between countries, it is noted that emerging countries recorded higher levels of leverage volatility than developed countries in the entire period analyzed. This does not contradict the

fact that, on average, emerging banks maintained lower leverage, as shown by the regressions. Rather, it highlights greater heterogeneity in the responses among emerging banks during the crisis: some reacted with strong deleveraging, while others, increased their leverage to support credit. The rapid decline in standard deviation in 2009 suggests that stabilization strategies, mainly pursued trough capital structure restructuring, were relatively effective for the banks in the sample. In summary, the higher volatility observed in 2007 does not translate into higher leverage overall but reflects the diversity of strategies adopted by emerging and developed banks in a time of global stress, consistent with the quantitative evidence provided by the regressions.

Chapter 4 – Conclusion, Comparative Discussions and Policy Insights

4.1 Summary of Key Empirical Findings

Summarizing the main empirical results obtained, this paragraph will start by analyzing the ROA, which is the first of the three fundamental metrics examined in the empirical study. The analyses on returns on assets have highlighted some significant differences between public and private banks, as well as between different geographical regions and emerging markets compared to developed ones. As for ROA, the Region_Rest variable is significant (coef. +0.014, $p < 0.01$), indicating that banks located outside Asia and Europe (i.e. in the "Rest of the world") have recorded, on average, a higher ROA, regardless of the ownership structure. This result, however, is accompanied by higher volatility, which translates into a higher risk associated with these areas. In fact, the higher average profitability observed in banks in the Rest group can be interpreted as the result of higher risk: the higher the uncertainty and economic variability, the higher the return possibilities. Nevertheless, the results suggests that banks in these regions, despite being exposed to greater risk, were able to benefit from higher returns during the analysis period. The geographical analysis showed that all regions experienced an increase in volatility in 2008, although with different intensities. The Rest group, which includes countries outside Asia and Europe, was confirmed as the area with the highest level of instability throughout the period analyzed, suggesting a greater exposure to systemic shocks. In contrast, European and Asian banks showed a greater ability to contain volatility, especially in the post-crisis

phase, which reflects a more stable management of the ROA metric. Another relevant aspect concerns the Emerging variable, which is positive and statistically significant in different specifications (coef. +0.008 in the multiyear model; up to +0.012 in 2008 and +0.010 in 2009). This suggests that, all else being equal, emerging market banks tend to outperform their developed counterparts in terms of ROA. In particular, the results for 2008 and 2009 indicate that emerging market banks have shown a greater ability to generate income from their assets precisely at the most critical moment of the crisis and even after. Indeed, in 2008, the peak year of the crisis, the largest standard deviation spread in ROA between emerging and developed countries is observed, with emerging country banks experiencing significantly higher volatility. The larger spread observed in 2008 implies that banks in emerging markets have maintained higher average levels of return on their assets than banks in developed countries, proportionately to a greater variability in their returns. In other words, the crisis has had a stronger impact in terms of volatility on the profitability of banks in emerging markets than those in developed countries. This suggests that emerging market banks have found themselves navigating an environment of greater uncertainty, but with significant resilience that has allowed them to manage the difficulties efficiently. In summary, the empirical analysis revealed that public banks, despite being more volatile, showed greater resilience in some geographical areas, such as Asia, where they recorded a higher ROA recovery than the private banks. At the same time, private banks demonstrated a greater ability to adapt to market conditions, with a faster stabilization of their post-crisis performance. Regional differences and the

distinction between emerging and developed markets further influenced the results, with emerging market banks that, despite suffering a greater impact in terms of volatility, managed to maintain relatively higher levels of profitability, showing remarkable resilience in an uncertain economic context. Continuing with the empirical analysis, we now focus on ROCE, which measures the efficiency of invested capital. Again, the results obtained for the performance of public and private banks, as well as those regarding the different macro-areas and emerging markets, highlight some consistencies with what was observed for ROA, but also distinctive aspects. At a geographical level, interesting signals emerge, the variables Region_Asia (coef. +0.055, $p < 0.01$) and Region_Rest (coef. +0.088, $p < 0.01$) are both positive and significant, indicating that banks located in Asia and the "Rest of the world" had, on average, a higher ROCE than European banks. This geographical effect is more pronounced than what is observed for ROA, suggesting that capital efficiency was more influenced by location. The result of the interaction Public_Asia_PostCrisis, which is positive and marginally significant (coef. +0.064, $p < 0.1$), is particularly relevant. It suggests that Asian public banks, also in terms of ROCE, have performed better than their private counterparts in the post-crisis period. As in the case of ROA, this result highlights a greater resilience of Asian public banks, also in terms of efficiency in the use of invested capital. For emerging markets, the variable Emerging_PostCrisis_2009 is significant (coef. +0.175, $p < 0.05$), suggesting that banks in emerging countries have better contained the loss of efficiency in capital employed in 2009. The most relevant result is that also in terms of ROCE, emerging banks show a superior

performance, with the coefficient of the variable Emerging reaching values up to +0.140 in 2009 ($p < 0.01$). The Delta analysis between 2006 and 2009 confirms a significant positive differential (+0.175, $p < 0.01$), indicating that capital efficiency has remained more stable in emerging markets compared to advanced markets. Finally, the analysis of the standard deviation of ROCE revealed that in 2008, the peak year of the crisis, volatility increased for both categories of banks, but with emerging market banks showing significantly higher volatility than developed market banks. In 2009, both categories experienced a reduction in volatility, signaling the subsequent post-crisis stabilization. In summary, the patterns of volatility of invested capital (ROCE) are consistent with those of ROA, indicating that emerging market banks, despite greater instability, showed a similar recovery in terms of post-crisis stabilization. This confirms that, although emerging market banks faced greater volatility, their ability to recover and stabilize in the post-crisis period was similar to that of developed country banks, highlighting a notable resilience also in the efficiency of the capital employed. In conclusion, the results obtained for ROCE reinforce some of the main patterns already observed for ROA such as: emerging market banks, despite greater initial volatility, managed to maintain a superior performance in terms of capital efficiency compared to developed country banks, highlighting a strong capacity for resilience during and after the crisis. Continuing with the analysis of the log(D/E), significant results emerge that reflect distinct behaviours between public and private banks, as well as between emerging and developed markets. A distinguishing feature between public and private banks is represented by the variable Public_PostCrisis_2009,

which assumes a positive and highly significant coefficient (+0.203, $p < 0.01$). This result suggests that all other things being equal, public banks have recorded higher levels of leverage than private banks in the post-crisis period, contrary to the general deleveraging trend observed in the banking sector. This behaviour can be interpreted as a sign of the counter-cyclical function of public banks. Supported by government policies and a mission oriented to supporting the real economy, public banks may have continued to finance the economy even during the most critical moments, increasing their leverage to support lending, while private banks instead have adopted deleveraging strategies. From a geographical point of view, the variable Region_Europe shows a positive and highly significant relationship (+0.723, $p < 0.01$), suggesting that European banks (compared to Asian banks, the reference category) have maintained higher levels of leverage. In relation to the Emerging variable, what is interesting is that the coefficient for Emerging_PostCrisis_2009 is significant (+0.175, $p < 0.05$). This result is also confirmed by the Emerging variable, which assumes positive values in the long term (+0.140 in 2009, $p < 0.01$), indicating that banks in emerging markets have maintained a lower leverage than those in developed countries, reflecting a more prudent strategy. Referring to the Delta Analysis between 2006 and 2009, it is noted a significant increase in the leverage of public banks compared to their private counterparts (+0.270, $p < 0.01$), highlighting how the leverage differential has increased in the observed period, especially in the post-crisis period. Looking at the standard deviation of log(D/E) by ownership type, it emerges that the volatility of private banks was generally higher than that of public banks in the

pre-crisis period (2006-2007). However, in 2008, the peak year of the crisis, both groups of banks experienced a reduction in volatility. In 2009, volatility decreased for both groups, but private banks continued to exhibit higher volatility than public banks, suggesting a more turbulent management of leverage by private banks, despite the deleveraging policies they adopted. When we analyze the standard deviation of log(D/E) by geographic region, an interesting shift in the distribution of volatility across regions emerges during the period 2006-2009. In 2006, the pre-crisis year, and in 2007, Asian banks showed the highest volatility compared to European banks and the Rest group. However, in 2008, the peak year of the crisis, it was the Rest group (which includes countries outside Asia and Europe) that recorded the highest volatility, followed by a generalized reduction in 2009. Despite the decline in volatility across all macro-regions in 2009, the Rest group maintained the highest volatility also in the post-crisis period. This shift in trend across periods could be due to the different impact that the crisis had on different geographic regions. The Rest group, which includes countries with less developed banking markets and less transparent regulation, may have been more affected by the crisis, with larger fluctuations in debt levels and greater uncertainty in capital management. In addition, the comparison between countries highlighted that emerging countries experienced higher levels of leverage volatility than developed countries throughout the period analyzed. However, this does not contradict the fact that, on average, emerging banks maintained lower leverage, as highlighted by the regressions. On the contrary, this result highlights a greater heterogeneity in the responses of emerging banks during the crisis: some reacted with strong

deleveraging, while others instead increased their leverage. The rapid reduction of the standard deviation in 2009 suggests that stabilization strategies, mainly pursued through capital structure restructuring, were relatively effective for the banks in the sample. In conclusion, the analysis of the standard deviation of the log(D/E) showed that, despite an overall increase in volatility during the crisis period, public banks managed to maintain a more stable leverage management than private banks, especially in the post-crisis period. Furthermore, the higher volatility observed in emerging country banks compared to developed country banks confirms a greater heterogeneity in the responses of banks during the crisis. The rapid reduction in volatility in 2009 suggests that stabilization strategies, especially those aimed at restructuring the capital structure, were relatively effective for banks over the observed period.

4.2 Comparative Discussion with Existing Literature

Incorporating the comparative discussion with existing literature presented in this section, our findings both affirm several key insights from previous studies and provide new perspectives on the relationship between ownership structure and bank performance, particularly in the context of financial crises. The analysis conducted highlights a picture consistent with the conclusions of various academic works, but also relevant differences that need to be explored further. The study by Mamatzakis[30], which explores the relationship between ownership structure and

[30] Mamatzakis, E., Zhang, X., & Wang. (2017). MPRA Paper No. 80653. *Ownership structure and bank performance: An emerging market perspective.*

bank performance in emerging markets, suggests that public banks tend to have lower performance than private banks, despite also having higher volatility. This is consistent with what was observed in our analysis, which shows that public banks, despite having higher performance volatility, tend to suffer from lower profitability, especially in emerging markets. However, in line with also what was highlighted in the empirical analysis carried out in the previous chapter, Mamatzakis notes that public banks play a crucial role during crises, stabilizing the economy through counter-cyclical policies, such as increasing the credit disposal to support the financial system. In this context, the study by Brei[31] further reinforces Mamatzakis' view by offering important insights on the role of public banks as counter-cyclical actors. Brei emphasize how, despite growing economic uncertainty during the crisis, public banks increased lending and leverage, thereby maintaining the stability of the system. Our results are consistent with these observations, demonstrating that public banks adopted expansionary policies to support credit and address the credit crunch, unlike private banks, which favoured deleveraging strategies. Another important work in this regard is that of Iannotta[32], who examines the performance of public banks in Europe. This study confirms, in accordance with our study and Mamatzakis view, that public banks, compared to private ones, tend to have lower profitability. As indicated by Iannotta, not only the ownership structure but also regulatory policies and government support played a fundamental role in preserving the stability of the European banking

[31] Brei, M., & Schclarek, A. (2014). *A theoretical model of bank lending: Does ownership matter in times of crisis?*
[32] Iannotta, G., Nocera, G., & Sironi, A. (2007). Journal of Banking & Finance. *Ownership structure, risk and performance in the European banking industry.*

system during the economic turbulence. However, despite the findings consistent with these studies, it is important to recognize that the relationship between ownership structure, bank performance and stability is not always univocal. The work of Magalhães[33] raises a crucial point regarding ownership concentration and its influence on bank performance, indicating that the positive or negative effects of ownership structure strongly depend on the regulatory and institutional context. In conclusion, while the study carried out in this thesis has had a greater focus on understanding the role of public and private banks, as well as the dynamics of leverage and capital efficiency before, during and after the crisis, it is evident that there are still many uncertainties on this argument in the academic research. Future research directions should consider not only the ownership structure, but also other exogenous factors, which we will explore in the next section, to have a deeper and more precise understanding of the dynamics that influence and could influence in the future the stability and profitability of banks.

4.3 Final Remarks and Future Research Directions

In this study, we explored the relationship between ownership structure, profitability and bank stability, with a particular focus on the differences between public and private banks, as well as between banks located in developed and emerging countries and banks belonging to different geographical macro-areas. The results obtained highlight how the dynamics that influence bank performance

[33] Magalhaes, R., Gutiérrez Urtiaga, M., & Tribó, J. A. (2010). *Banks' ownership structure, risk and performance.*

are variable, and how these depend not only on the ownership structure, but also on the geographical context and the degree of development of the country in which the banks operate. However, to obtain a more complete understanding of these factors and to improve the ability to navigate efficiently future financial crises, it is essential to extend our study by including exogenous variables such as governance, regulation and country effect. Governance is definitely an aspect that deserves attention in future research. The quality of bank governance can indeed influence banks' resilience during crises, determining banks' ability to adapt to changing economic conditions. Banks with strong governance tend to implement more robust and stability-oriented policies, while those with weaker governance may be more vulnerable to economic shocks. Integrating this aspect with different variables in future studies would allow to better analyze how the quality of governance influences risk management and banks' ability to recover during periods of instability. Regulation also plays a crucial role in bank stability. Regulatory policies, in fact, can limit risk-taking and foster a conservative capital management. In a crisis context, stricter regulation can help maintain stability, preventing banks from taking excessive risks. Future research should examine how regulatory policies and their degree of flexibility influence banks' performance in times of economic turbulence. Finally, the country effect is confirmed as a fundamental element to consider in future research. This factor includes not only regulation and governance, but also other characteristics of the economic and institutional context that can profoundly influence the performance of banks. In this regard, despite the empirical studies carried out on the various macro-areas

and on emerging and developed countries, to obtain a sharper analysis of the impact of the country effect, a study with a significantly larger sample, which allows to consider a greater number of public and private banks for each country, would be essential to obtain more robust estimates. This approach would allow to carry out more detailed regressions, analyzing all the individual banks in the sample by country of belonging rather than by macro-area. Increasing the sample size, it would be possible to obtain a more accurate vision of how the individual country of belonging influences the banking strategies and the performance of each institution, offering a more targeted and significant analysis at a national level. We conclude, therefore, by stating that, although our study has offered significant insights into the relationship between ownership structure, macro areas, country development level and banking performance and stability, it is only through the measures and considerations expressed in this last paragraph that a more complete understanding of banking dynamics can be obtained. This approach will therefore allow to develop more effective, targeted banking and economic policies, capable of facing the future challenges of the global banking system with greater resilience.

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