



# SPAIN

## FINANCIAL SECTOR ASSESSMENT PROGRAM

### TECHNICAL NOTE—DETERMINANTS OF BANK PROFITABILITY

November 2017

This Technical Note on the Determinants of Bank Profitability for Spain was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed in October 2017.

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October 31, 2017

# TECHNICAL NOTE

## THE DETERMINANTS OF BANK PROFITABILITY

Prepared By  
**Monetary and  
Capital Markets  
Department**

This Technical Note was prepared by IMF staff in the context of the Financial Sector Assessment Program in Spain. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Please also see the Financial System Stability Assessment at <http://www.imf.org/~media/Files/Publications/CR/2017/cr17321.ashx>  
Further information on the FSAP can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

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## Glossary

BdE	Bank of Spain (Banco de España)
CR5	Concentration Ratio for Top Five Banks
ECB	European Central Bank
FinTech	Financial Technology
FSB	Financial Stability Board
FSR	Financial Stability Report
GSIB	Global Systemically Important Bank
NIMs	Net Interest Margins
NPL	Nonperforming Loan
ROA	Return on Assets
ROAA	Return on Average Assets
ROE	Return on Equity
ROAE	Return on Average Equity
SI	Significant Institution

## EXECUTIVE SUMMARY<sup>1</sup>

**While system-wide profitability for Spanish banks has recovered gradually since the crisis, the return on equity remains below the cost of capital** (Bank of Spain May 2016 FSR).<sup>2</sup> Profitability remains higher for Spanish banks compared with European peers, especially supported by relatively high Net Interest Margins (NIMs), however, some Spanish banks still have higher non-performing loan (NPL) and provision to asset ratios.<sup>3</sup> The internationally oriented Spanish banks perform more strongly in NIMs compared with domestically oriented banks, mainly supported by their subsidiaries abroad (particularly in Latin America). The efficiency of Spanish banks as measured by the cost-to-income ratio remains favorable compared with peers. On excess capacity, the branch per capita level is relatively high for Spanish banks, while bank employees per capita remains low compared with European peers.

**Panel regression analysis suggests that Spanish banks' profitability is influenced by a combination of structural and cyclical factors, similar to those influencing other European banks and GSIBs.** NPL ratios influence profitability negatively, as unproductive assets on the balance sheet are costly to maintain and drive up provisions. Stronger solvency position as measured by Tier 1 capital ratio tends to be associated with better performance in both returns on assets and returns on equity. The efficiency of the banking sector as measured by the cost-to-income ratio is strongly associated with profitability, with more efficient banks (lower cost-to-income ratio) performing more favorably. Cyclical factor such as GDP growth is positively related to bank profitability, as banks benefit from improved macroeconomic environment, in part through higher demand for credit. On monetary policy, short term interest rate is found to be a positive driver for profitability, as NIMs tend to rise with higher interest rates. Finally, on the European level, excess capacity as measured by the number of branches per capita and bank employees per capita are negatively associated with profitability, as higher branch density tends to be associated with higher operating costs.

**The mission recommends further steps to reduce NPLs and legacy assets, continued cost cutting measures to enhance the profitability of Spanish banks and stronger communications between supervisors and banks on business models.** The mission recommends:

- **Reduction of problem assets.** Banks and supervisors should take further steps to reduce problem assets on bank balance sheets, and to lessen the burden of unproductive assets on banks' profitability. Going forward, the carrying costs for NPLs are likely to rise as monetary policy normalizes.

<sup>1</sup> The author of this note is TengTeng Xu (IMF), part of the Spain FSAP 2017 team led by Udaibir Das. The analysis has benefitted from discussions with the staff of the Ministry of Economy and Justice, the Spanish Treasury, the Spain FSAP team, and reviewers at the IMF. Many thanks to Felipe Nierhoff for the excellent research assistance.

<sup>2</sup> The Bank of Spain May 2016 FSR estimated the cost of capital to be 6.8 percent for Spanish banks at end-2015, while ROE stood at 5.6 percent in consolidated terms, and at 4.4 percent for domestic Spanish banking business.

<sup>3</sup> In aggregate, the NPL ratio for Spanish Significant Institutions (SIs) have come down significantly, to a level below the SSM average for SIs.

- **Examine the scope of further consolidation.** Supervisors should engage closely with banks in discussing benefits from continuing cost-cutting measures. The scope for further consolidation through mergers and a rationalization of the extensive branch network should be analyzed thoroughly.
- **Analyze bank business models.** Supervisors should analyze the benefits and potential risks associated with income diversification, particularly non-interest income driven activities for Spanish banks. Supervisors should conduct analysis and in-depth discussions with banks on business models.<sup>4</sup>
- **Digitalization and FinTech.** Going forward, the relevant data should be collected by supervisors to analyze the benefits and potential risks associated with digitalization, FinTech and their impact on bank business models (Box 1).

<b>Key Recommendations</b>	
	ST/MT
Banks and supervisors should take further steps to reduce problem assets on bank balance sheets, and to lessen the burden of unproductive assets on banks' profitability (BdE and ECB).	ST
Examine the scope for further consolidation in the banking sector through mergers and a rationalization of the extensive branch network in Spain (BdE).	MT
Analyze the benefits and potential risks associated with income diversification, particularly non-interest income driven activities for Spanish banks. Analysis and in-depth discussions on business models (BdE).	MT
Collect relevant data and analyze the benefits and potential risks associated with digitalization, FinTech and the impact on bank business models (BdE and ECB).	MT

<sup>4</sup> Efforts are underway to analyze bank business models at the SSM level through a thematic review.

## INTRODUCTION

**1. Despite a recovery since the crisis, profitability remains a concern for Spanish, and more generally for European banks.**<sup>5</sup> The return on equity of most banks is below the cost of equity, and the market's current assessment of banks' ability to meet profitability challenges is not optimistic, as valuations are below the balance sheet value of banks (GFSR, October 2016).<sup>6</sup>

**2. Low profitability can affect financial stability through multiple channels.** First, low profitability could prevent banks from proactively cleaning up their balance sheets, as write-downs could in turn affect the profitability and performance of banks. Second, weak profitability can have an immediate impact on bank capital as it limits banks' ability to generate earnings and retain and attract private capital. Banks could again become undercapitalized after an unexpected loss or during a broader downturn. Third, low profitability could potentially force banks to shrink their assets and reduce credit intermediation to the real economy. Fourth, weak profitability can potentially affect banks' business model and the associated risk-taking behavior. Therefore, banks would need to generate sufficient profits to sustain capital levels through adverse economic cycles, support intermediation and future expansion of their balance sheets, and meet future regulatory requirements.

**3. The Spain FSAP analyzed the determinants of profitability for Spanish, European and globally systemically important banks, in order to identify factors driving low profitability and steps required to improve it.**

- First, the analysis studies the *evolution of profitability* in Spanish, European and global systemically important banks (GSIBs), taking into account different income components including NIMs and non-interest income to assets ratio. This analysis compares the profitability of (i) the internationally-oriented Spanish banks and their domestic counterparts; (ii) Spanish banks and their European peers; and (iii) the two largest banks in Spain and their GSIB counterparts.
- Second, the FSAP uses regression analysis to examine the determinants of bank profitability for three samples of banks, Spanish, European and GSIBs. Specifically, 14 significant institutions (SIs) are included in the Spain sample; 64 European banks, including those covered in the 2016 EBA stress test are considered in the European sample; and finally,

<sup>5</sup> The low profitability of Spanish and other European banks has been highlighted recently, see e.g., the Bank of Spain (2016, 2015), ECB (2016, 2015), April, October 2016 GFSR and a number of FSAPs such as Germany 2016, Ireland 2016, and Italy 2013.

<sup>6</sup> For the significant institutions (SIs) under SSM supervision, the return on equity for four banks were above the average cost of capital for Spanish banks (6.8 percent, estimated by the BdE) at end-2015. The return on equity for the remaining banks were below the average cost of capital.



32 international global banks classified by the FSB are included in the GSIB sample.<sup>7</sup> The sample period spans from 2000 to 2015, using data from publicly available sources.<sup>8</sup> The empirical analysis applies panel data techniques to account for potential profitability drivers, including macro-financial linkages stemming from cyclical factors in the economy, bank characteristics as captured by financial soundness conditions, bank business models measured by the degree of income diversification and the share of deposit to assets ratio, industry structures captured by the degree of competition, concentration and excess capacity in the banking sector, as well as the role of monetary policy.

## EVOLUTION OF BANK PROFITABILITY AND POTENTIAL DRIVERS

### A. Spanish Banks

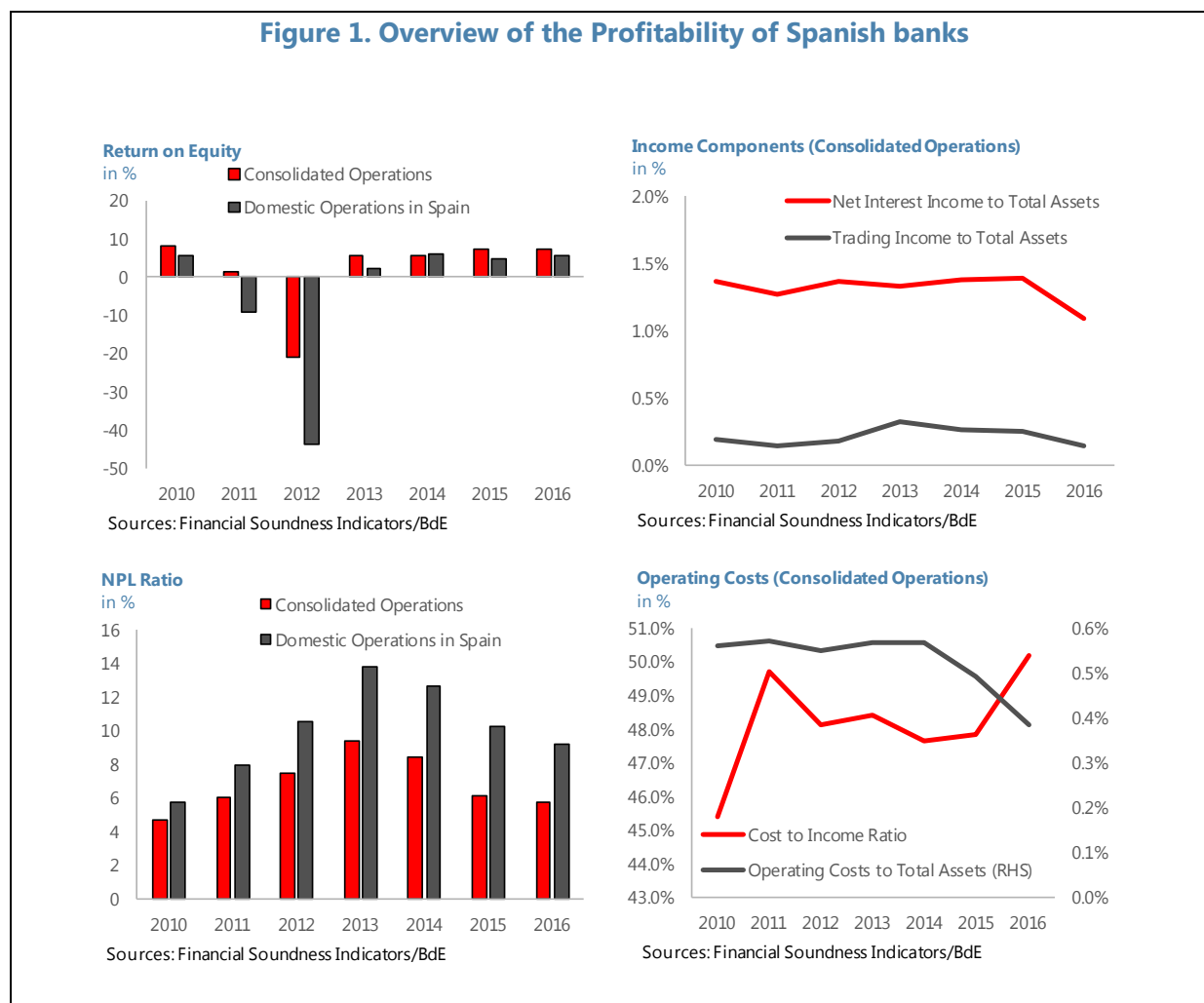
**4. The profitability of Spanish banks has improved, but is still below pre-crisis level** (Figure 1). The system-wide return on equity (ROE) for consolidated operations rose to 7.5 percent in 2016Q3, stronger than the ROE for domestic operations (5.6 percent). ROE has recovered substantially since the 2012–2014 crisis, which declined to -43 percent for domestic operations at the trough. However, ROE remains below the pre-crisis average of 14.3 percent between 2005 and 2010. Although overall more profitable than their European peers, some Spanish banks are still facing significant profitability pressures, especially for entities that carry out business primarily in Spain. In general, the return on equity remains below the cost of capital.<sup>9</sup>

<sup>7</sup> The same three samples of banks were used in both parts of the analysis, see Appendix I for the list of banks included in the samples. Please note that Banco Popular was resolved and sold to Banco Santander, and that Bankia started a merger process with BMN after the cut-off date of the empirical analysis.

<sup>8</sup> Given the lack of supervisory data, our regression analysis relied on publicly available data from FitchConnect, SNL, the IMF, and the ECB. Supervisory data would provide more granular information, for example, on price competition of individual banks, and shed light on the issues regarding competition on the asset and liability side of the balance sheet. However, supervisory information was not available to the FSAP for profitability analysis.

<sup>9</sup> Similar to France and Italy, the return on equity for Spanish banks was also below the cost of capital prior to the 2012–2014 crisis. Based on Bank of Spain estimates for European bank, the cost of capital for Spanish banks was 12.9 percent at end-2010, above the consolidated return on equity of 8 percent for the Spanish banking system. For France, the cost of capital was 13.2 percent at end-2010, above the return of equity of 12 percent in the banking system. For Italy, the cost of equity was 11.2 percent at end-2010 against a system-wide return of equity of 3 percent (BdE Financial Stability Report, May 2016).

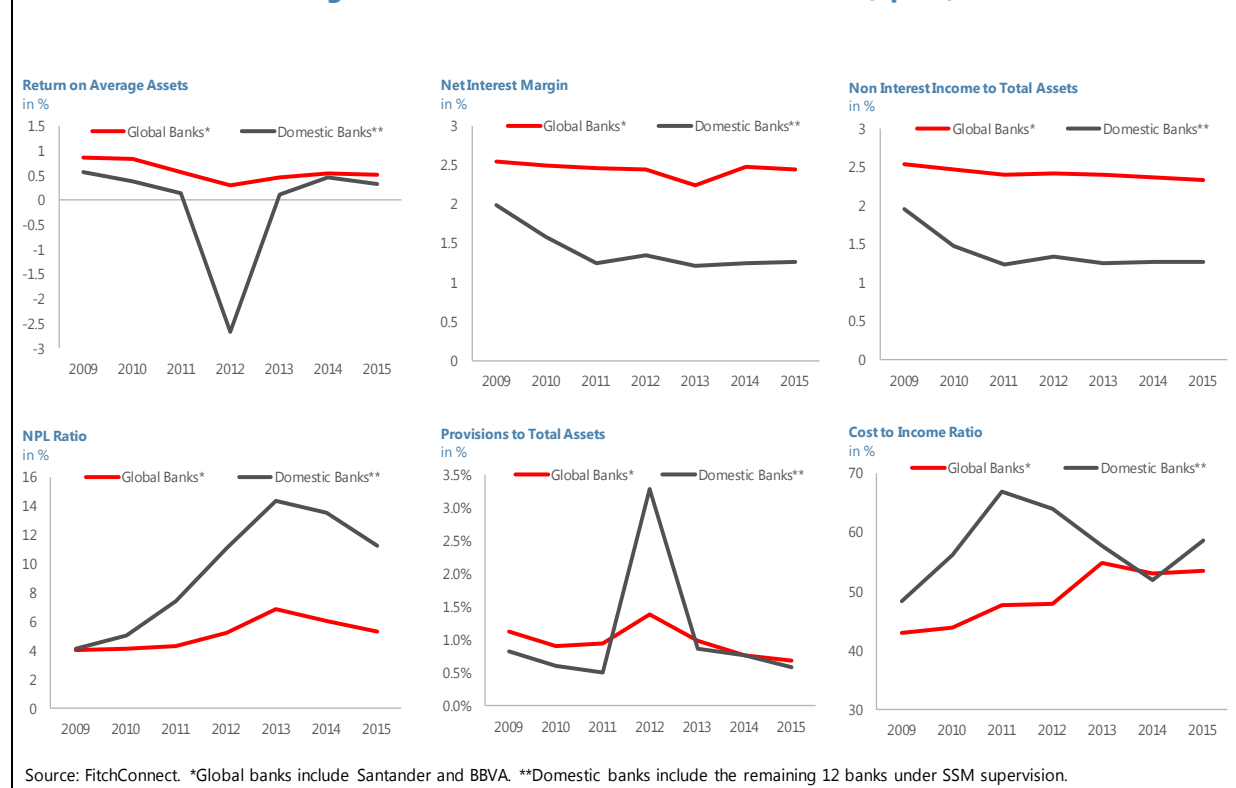
**Figure 1. Overview of the Profitability of Spanish banks**



**5. Net interest income has been a steady source of income, even during the crisis, while the NPL ratio for some banks remains high** (Figure 1). By income components, net interest income stood at around 1 percent of total assets for the banking system in 2016, higher compared with the income from other sources, such as trading income. While the NPL ratio has declined substantially since the crisis, it remains high at 5.7 percent on a consolidated basis and at 9.2 percent for domestic operations.<sup>10</sup> Provisions also declined from 3.3 percent of total assets in 2014 to 1.8 percent in 2016. The operating costs to total assets ratio declined slightly in recent years to about 0.4 percent in 2016, and the cost to income ratio remains at around 50 percent for the banking system.

<sup>10</sup> Unproductive assets refer to NPLs and foreclosed assets according to Bank of Spain definition, reaching 190 billion euros as of December 2016. Foreborne credit is another source of vulnerability, amounting to 144 billion euros in June 2016 (Bank of Spain November 2016 FSR).

Figure 2. Global Banks vs. Domestic Banks (Spain)

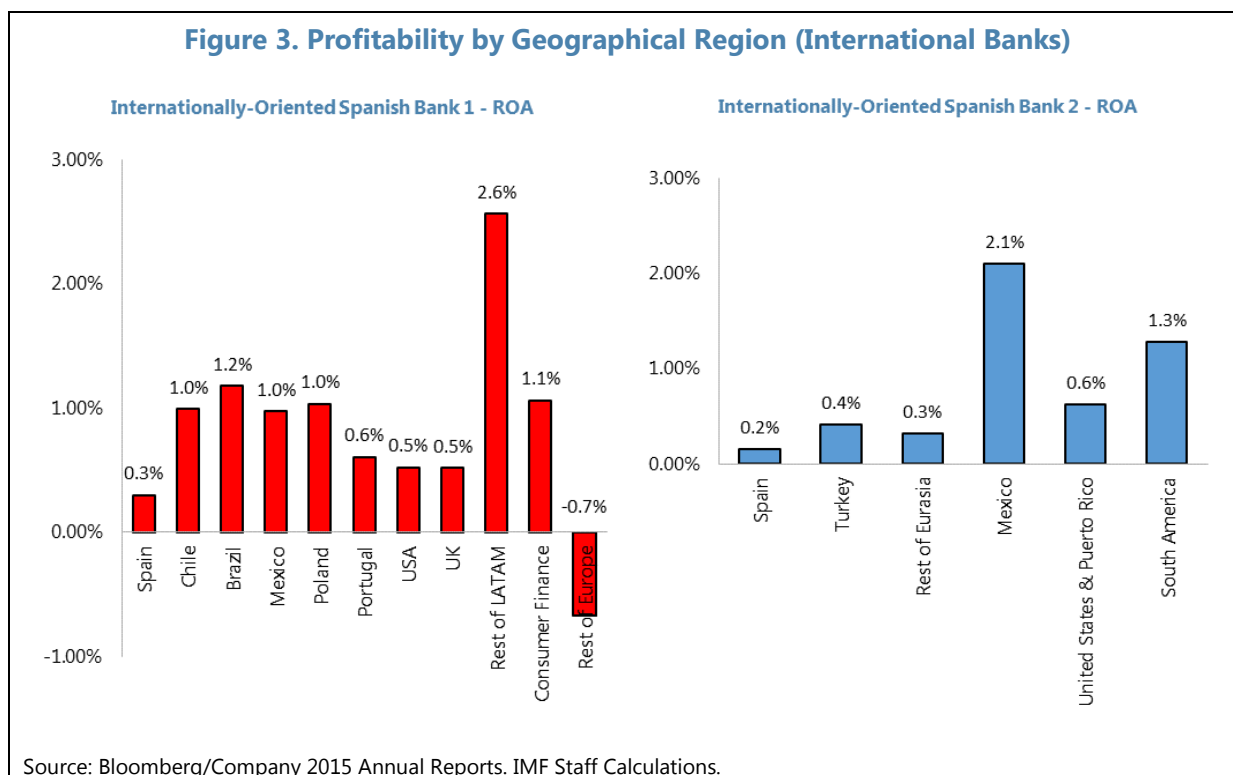


**6. The two most internationally-oriented Spanish banks are more profitable than their domestic counterparts** (Figure 2).<sup>11</sup> Due to their geographical diversification, the profitability of these two banks was less affected by the burst of the housing bubble in 2009 and the 2012–2014 European Sovereign Debt crisis, although they also fell below the cost of capital during the crisis. Both net interest margins and non-interest income to assets ratios were twice as large for the two international banks, compared with the more domestically oriented banks in recent years. Although starting at a similar level pre-crisis, the NPL ratio for these two banks increased less markedly during the crisis, about half of that of the domestic banks. The flow of provisions to total assets ratio for these two global banks were much lower than domestically oriented banks during the crisis, although they reached similar levels at end-2015. While the operating costs to assets ratio is higher for the two large banks, in part due to their extensive international operations and the subsidiary model, they remain more efficient, as measured by the cost to income ratio.<sup>12</sup>

<sup>11</sup> While three other Spanish banks have exposures outside Spain, they are much lower compared with the two international-oriented Spanish banks, and these exposures mainly concentrate in Europe.

<sup>12</sup> The two international-oriented Spanish banks follow the multinational-banking model or subsidiary model, which emphasizes local exposures in foreign banking markets (see McCauley et al., 2010; Gambacorta and Van Rixtel, 2013), with local exposures/claims largely funded by local liabilities in local currency. See TN on “Interconnectedness and Spillover in Spain’s Financial System” for details on the international operations of Spanish global banks.

**7. The majority of the profits for the two international banks are generated through their overseas operations** (Figure 3). International operations of these banks are more profitable than their domestic business. In particular, Latin American countries including Mexico, Chile, and Brazil are among the most important sources of income for these two firms, as measured by the return on assets and the net interest income to total assets ratio.<sup>13</sup> Spanish banks are important players in these markets and enjoy relatively high market shares. For example, Spanish banking assets account for 38 percent and 25 percent of total banking sector assets in Mexico and Chile, respectively, in 2016Q2.



**8. One important development in the Spanish banking sector is digitalization and FinTech (Box 1).** The share of on-line and mobile banking customers has increased significantly for Spanish banks in the past year. FinTech activities have also grown rapidly in Spain, with several banks incorporating FinTech solutions into banking business. Developments in digitalization has prompted banks' investments in the IT infrastructure including cloud computing, aimed to reduce costs and to better serve customer needs. Going forward, digitalization and FinTech could have important implications on cost savings and bank business models. It would be crucial for supervisors to monitor developments in digitalization and FinTech by collecting the relevant data and to analyze the potential impact on business models and the broader financial sector.

<sup>13</sup> If the international business were not considered, the ROA of international banks' Spain business would be broadly similarly to the more domestically-oriented banks.

**Box 1. Digitalization and FinTech in the Spanish Banking Sector**

Digitalization has started to impact Spanish banks, with important implications for banks' business models. Digital and mobile customer base has increased significantly for Spanish banks in the past year, with a growing portion of services and business provided through multi-channels (on-line and mobile banking). The move towards digitalization has triggered banks' investment in IT infrastructure including cloud computing to better meet client needs. This relatively new development could have important implications for business models as banking business was traditionally channeled through the extensive branch network in Spain.

A related development is FinTech, which could have an impact on the way in which banking activities, including payments services, are conducted. Broadly, FinTech innovations in the financial sector include machine learning, predictive analytics, big data, biometrics, distributed ledger technology and open source application programming interfaces. They have potential applications in the digitalization of back-office operations, integrated user experience, such as peer-to-peer models and infrastructures. Spain is identified as an emerging center for FinTech start-up, but remains much smaller compared with world or European leaders (see Deloitte and the Global Fintech Hubs Federation, April 2017 Report). FinTech activities in Spain have grown four-fold from 2013 to 2016, with 241 FinTech companies as of April 2017. Several Spanish banks have invested in FinTech business through acquisition and venture capital, to leverage on the innovations and developments in this field. FinTech could potentially provide cost saving solutions to banks, for example, through more cost-efficient payment system and back office operations.

Supervisors also started to pay more attention to FinTech related developments in European banks. In its annual process to identify and publish supervisory priorities, the ECB and SSM announced three main priorities for 2017, including (i) business models, (ii) profitability risks for banks in the Euro Area (EA), and (iii) a specific focus on FinTech and nonbank competition, exploring potential risks for banks' business models emanating from the emergence of these potentially disruptive innovations. Besides the efforts by European regulators (including the creation of a Fintech Task Force at the European Commission and the launch of a public consultation on FinTech), the Spanish securities Commission (CNMV) has opened a FinTech Portal to assist promoters and financial corporations with aspects of securities market rules and to facilitate information exchanges. The Treasury, the Bank of Spain, DGSyFP and the CNMV established an interagency working group on financial innovations in 2016. Spain is also one of the few European countries with specific regulation for alternative finance (*plataformas de financiación participative—crowdfunding platforms*). Indeed, it would be essential for supervisors to collect the relevant data on digitalization and FinTech developments and analyze the potential impact on bank profitability, business models and the wider financial industry.

## B. Cross Country Comparison with European Banks

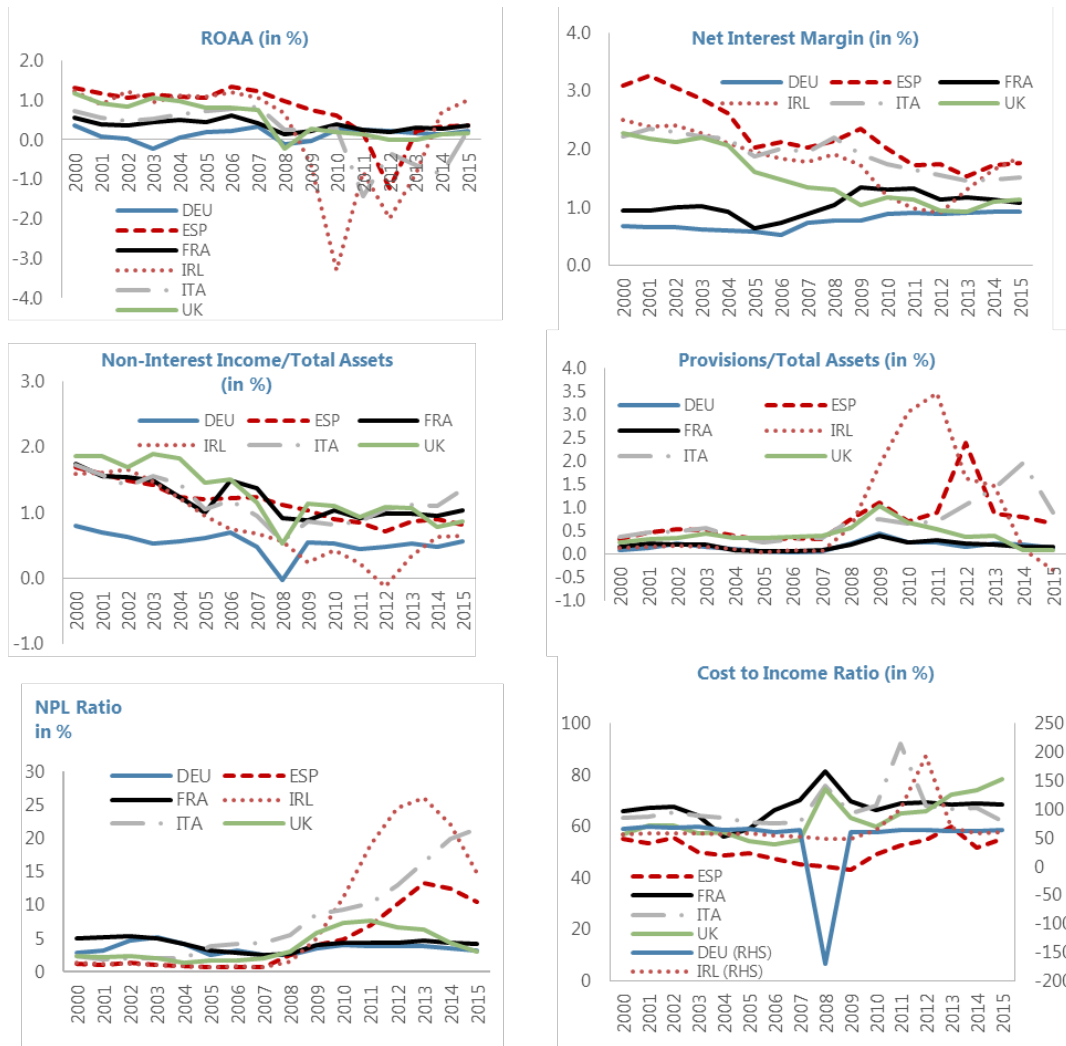
**9. Compared with European peers, Spanish banks' profitability has been supported by high net interest margins, but non-accrual assets (NPLs and foreclosed assets) and provisions in some banks remain high (Figure 4).** Spanish banks enjoy markedly larger net interest income, although NIMs have experienced downward trend amid the low interest rate environment. The traditional funding model of Spanish banks implies a relatively high reliance on retail deposits. As interest rates decline to extraordinarily low levels, the deposit rates cannot fall below zero, at least to any significant extent, which leads to an erosion of banks' interest margins. The non-interest income to assets ratio has also evolved in a downward trend for Spanish banks, in part driven by a fall in net fee and commission income. Compared with other European countries, Spanish banks' non-interest income to assets ratio was below French or Italian banks, but above German and Irish banks more recently. It should be noted that non-interest income is less volatile for Spanish banks compared with European peers, in part due the retail-based business model. On efficiency, Spanish banks have managed to keep the cost-to-income ratio at a favorable level despite costly retail banking business especially in terms of staff expenses.<sup>14</sup> Similar to Irish and Italian banks, Spanish banks experienced a sharp increase in NPL ratio and provisions during the crisis. Nevertheless, significant progress has been made in bringing down NPLs.

**10. Spanish banks vary noticeably in their comparison to their European counterparts** (Figure 5). On net interest margins, the majority of the six largest banks perform better than the median for European banks. The operating costs for two international banks are above median, as measured by non-interest expenses to average assets ratio, largely a result of the relatively expensive subsidiary model. However, these two banks remain cost efficient, as the foreign subsidiaries generate a substantial amount of income and profits. The asset quality of some Spanish banks, while lower compared with French and German banks, vary evidently among themselves.

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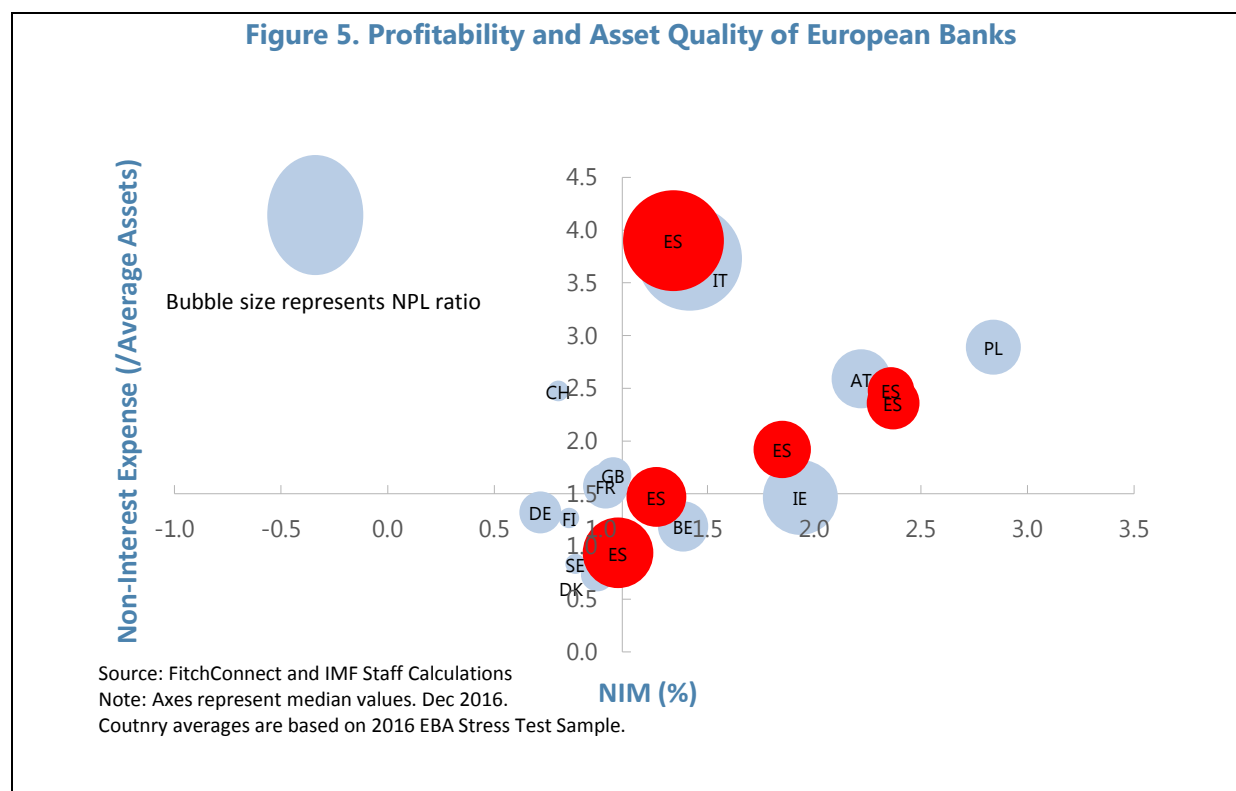
<sup>14</sup> The internationally-oriented Spanish banks are more cost efficient compared with their domestic counterparts.

**Figure 4. European Banks: Profitability and Income Components**



Source: FitchConnect and IMF staff calculations. Country average for Spain is computed based on a sample of Spanish banks under ECB supervision (SIs); peer banks for other countries: those participating in the 2016 EBA stress test.

**11. The branch density of the Spanish banking system remains high in European comparison, while bank employees per capita appear to be on the lower end** (Figure 6). Excess capacity as measured by branch per capita suggests that the branch density in the Spanish banking system remains relatively high in European comparison, despite some decline since 2008.<sup>15</sup> However, bank employees per capita in Spain appears to be on the lower end of the spectrum compared with European peers. This is supported by the fact that the number of employees per branch in Spain is relatively low in European comparison, in particular for bank branches in rural areas that specialize in agriculture business.<sup>16</sup> The CR5 index that measures the market share of the five largest banks shows a rise in the degree of concentration in the Spanish banking system following the consolidation of savings banks.<sup>17</sup> More recently, a number of Spanish banks have carried out cost cutting measures through branch reduction, and discussions on mergers are ongoing. The scope for further consolidation through mergers and a rationalization of branches for Spanish banks should be analyzed carefully by banks and supervisors. Furthermore, distinctions should be made between branches servicing rural communities and urban centers, with the latter more likely to be affected by digitalization.



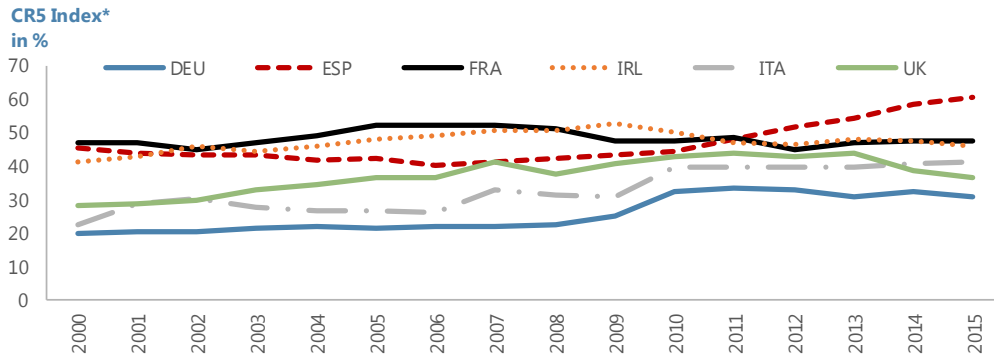
<sup>15</sup> April 2017 GFSR also found some evidence of overbanking at domestically-focused Spanish banks relative to their European peers.

<sup>16</sup> The size of bank assets per branch is also relatively low for Spanish banks in European comparison.

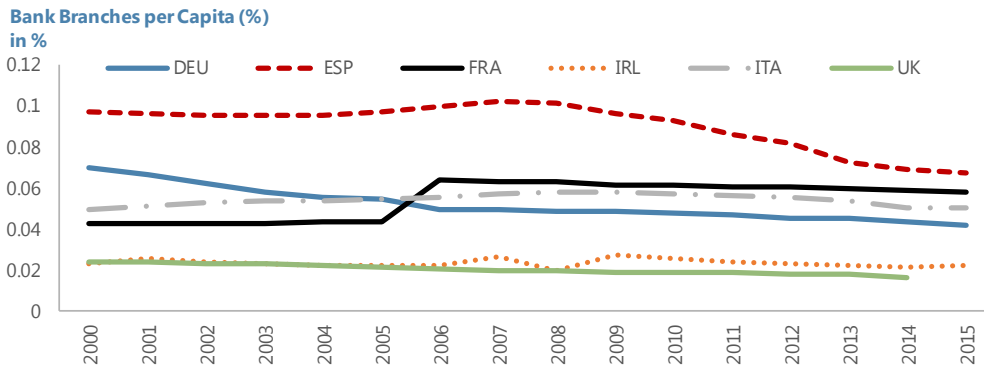
<sup>17</sup> The concentration of the Spanish banking system remains below that of Belgium, Denmark, Finland, the Netherlands and Portugal.



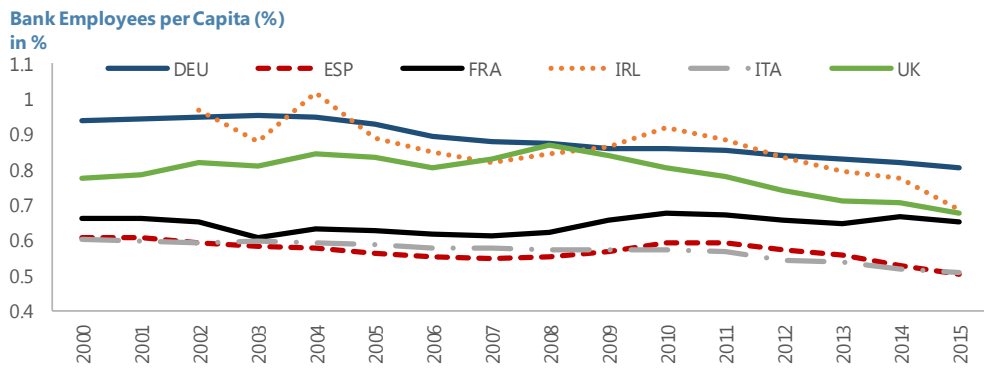
**Figure 6. European Banks: Structural Indicators**



\*The Top 5 Bank Concentration (CR5) Index is defined as the market share of the top five institutions in terms of assets  
Source: ECB, Statistical Data Warehouse



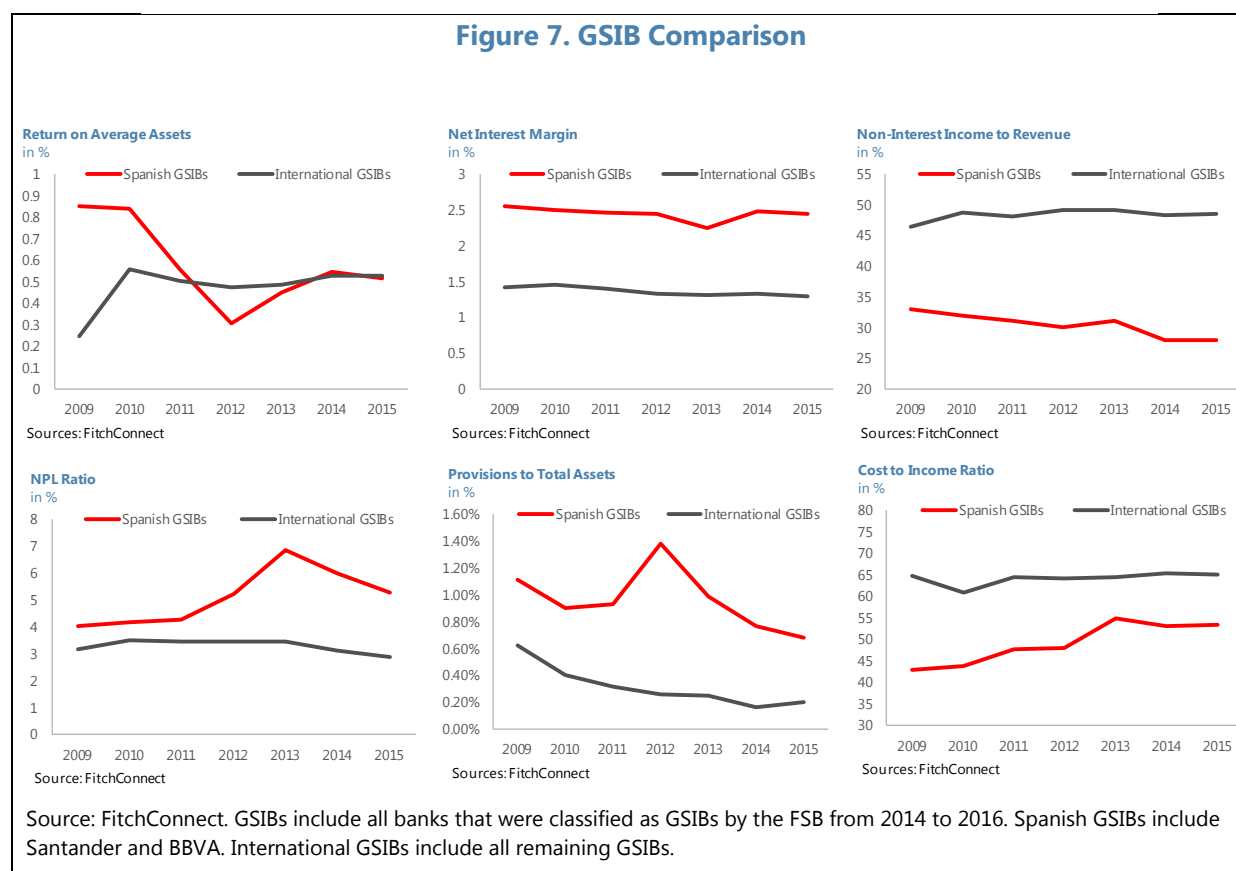
Source: ECB, Statistical Data Warehouse/Haver



Source: ECB, Statistical Data Warehouse/Haver

## C. Comparison with GSIBs

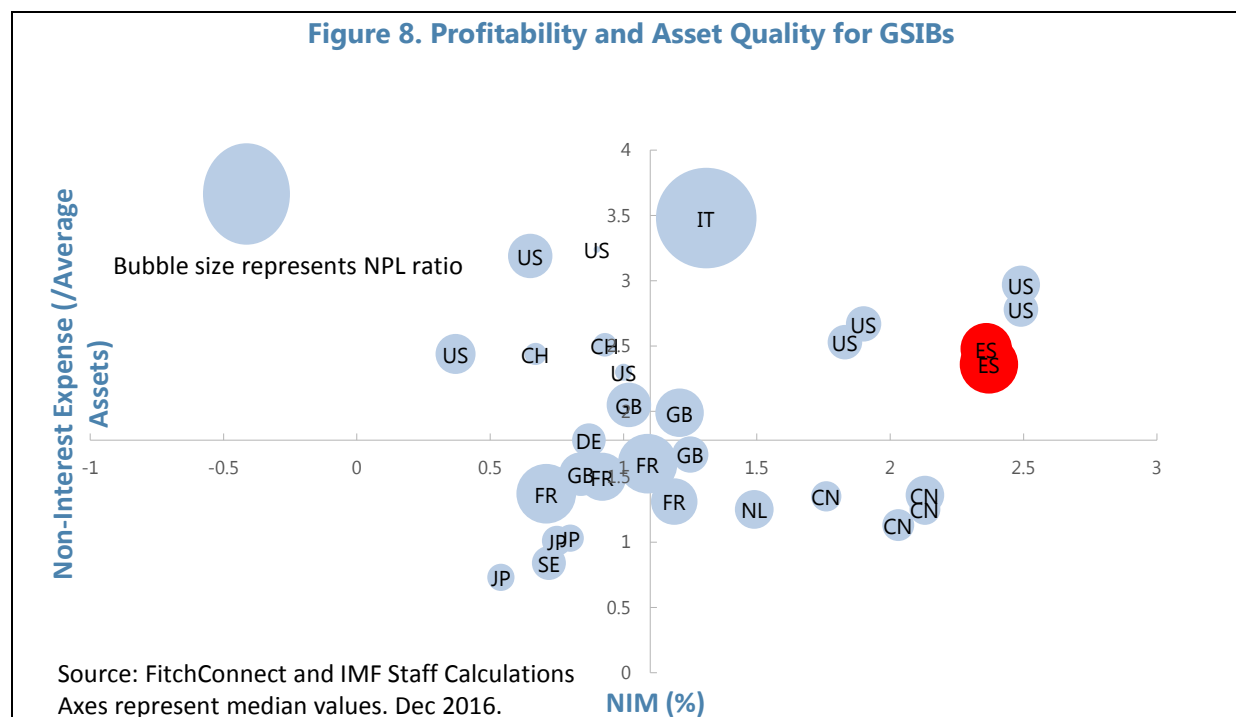
**12. Compared with foreign GSIBs, Spanish global banks tend to have higher net interest margins, more efficiency but also higher NPL ratios** (Figure 7).<sup>18</sup> Measured by return on average assets, Spanish global banks' profitability has recovered to a level comparable with other GSIBs. Net interest margins perform more favorably, but the non-interest income to revenue ratio remains lower for Spanish GSIBs, due to their retail-focused business model. Provisions in these two banks are relatively low, despite a slight pickup in 2014. While operating costs are relatively high for Spanish global banks, given their multi-banking subsidiary model, the efficiency of these two banks, as measured by the cost-to-income ratio, is more favorable compared with other GSIBs. However, the NPL ratio for the Spanish global banks is still higher, about twice as large compared with their international peers.<sup>19</sup>



<sup>18</sup> GSIBs are classified by the Financial Stability Board (FSB), see <http://www.fsb.org/2016/11/2016-list-of-global-systemically-important-banks-g-sibs/>. While BBVA was dropped from the 2015 and 2016 GSIB list, we keep it for international comparison purpose, together with Commerzbank.

<sup>19</sup> A similar pattern can be seen when Spanish GSIBs are compared with those from advanced economies only. However, the average NPL ratio for the Spanish global banks is similar to the average NPL ratio of non-Spanish euro area GSIBs.

**13. The two Spanish global banks perform comparably in terms of profitability and asset quality** (Figure 8). The net interest margins for both firms are above the medium for GSIBs, as well as their operating costs measured by non-interest expenses to assets ratio. Both indicators reflect the retail based subsidiary business model. The asset quality of these two banks remains relatively low compared with the majority of GSIBs, although more favorable compared with the Italian GSIB.



## SCOPE AND METHODOLOGY FOR THE REGRESSION ANALYSIS

### A. Data and Scope

**14. The regression analysis considers three samples of banks: Spanish, European and GSIBs.** The sample of Spanish banks covers the Significant institutions (SIs) under SSM supervision. The European sample includes the Spanish SIs and all other banks included in the 2016 EBA stress testing sample.<sup>20</sup> Finally, the sample of GSIBs includes all banks classified as GSIBs by the FSB from 2014 to 2016.<sup>21</sup>

<sup>20</sup> Three Portuguese banks were also included in the sample due to the close relationship between the Spanish and the Portuguese banking systems.

<sup>21</sup> The list of banks included in the three samples can be found in Appendix I.

**15. The regression analysis largely relies on publicly available bank balance sheet and macroeconomic and structural data from FitchConnect, SNL, the IMF and the ECB.** Specifically, we construct a database of bank balance sheets from 2000 to 2015 using FitchConnect and SNL. Macroeconomic variables are taken from the IMF International Financial Statistics, the IMF World Economic Outlook database and Haver Analytics. Finally, structural indicators for European banks are taken from the ECB Banking Structural Statistics Indicators database.<sup>22</sup>

## B. Empirical Methodology for the Regression Analysis

**16. The empirical analysis applies panel data techniques to examine the determinants of profitability.** The panel analysis controls for bank characteristics, business models, industry structures, macroeconomics and cyclical factors and monetary policy of the home country. The dependent variables include headline profitability measures such as ROAE and ROAA, and different income components including NIMs and the non-interest income to assets ratio.

**17. The contribution of our analysis lies in a comprehensive assessment of the drivers of bank profitability.** In this analysis, we account for macro-financial linkages stemming from cyclical factors in the economy, bank characteristics captured by financial soundness conditions, business models measured by income diversification and retail banking, the degree of concentration, as well as the role of monetary policy. Our proposed empirical approach is closest to the methodologies in ECB (2015) and Borio, Gambacorta and Hofmann (2015). The focus of our analysis differs from Borio, Gambacorta and Hofmann (2015) in that they study the non-linear impact of monetary policy on bank profitability, while we examine the broader question of what drives bank profitability. While ECB (2015) also considers the role of cyclical and structural factors in influencing profitability in the euro area, their analysis does not explicitly consider the role of monetary policy, the impact of the low interest rate environment nor the role of excess capacity in the banking system.

**18. The panel regression is estimated with the Arellano-Bover/Blundell-Bond linear dynamic panel-data estimator with robust standard errors<sup>23</sup>,** specified as follows:

$$Y_{k,j,t} = \delta Y_{k,j,t-1} + \vartheta_k + \phi' X_{k,j,t} + \theta' I_{j,t} + \Lambda' M_{j,t} + \varepsilon_{k,j,t} \quad (1)$$

where  $Y_{k,j,t}$  captures headline profitability measures including ROAE and ROAA, and the relevant income component (net interest margins and the non-interest income to assets ratio) for bank  $k$ , headquartered in country  $j$  at time  $t$ . In order to take into account bank characteristics, we include a set of bank-fixed effects ( $\vartheta_k$ ) and a vector of (time-varying) bank-specific indicators  $X_{k,j,t}$ , capturing bank characteristics and bank business models. Banking industry structural indicators,  $I_{j,t}$ , take into

<sup>22</sup> The data sources, variable definitions and descriptive statistics are included in Appendix II.

<sup>23</sup> A dynamic panel regression is specified due to the persistence in profitability and some income components. An alternative fixed effect static panel was specified as a robustness check and the results were found to be broadly similar. The Arellano-Bover/Blundell-Bond system estimator is an extension of the Arellano-Bond estimator that accommodates large autoregressive parameters and a large ratio of the variance of the panel-level effect to the variance of idiosyncratic error. The Arellano-Bover/Blundell-Bond system estimator is designed for datasets with many panels and few periods, which is the case for our datasets (for example, data is only available for some Spanish banks from 2012 due to merger and acquisitions).

account the extent of concentration and excess capacity in the banking industry. Finally, the macroeconomic and cyclical variables,  $M_{j,t}$ , capture GDP growth and the level of short term interest rates, following Albertazzi and Gambacorta (2009).

**19. Bank characteristics account for bank size, solvency, credit risk and cost efficiency, while business model variables capture the extent of retail banking.** Bank size is measured the natural logarithm of total assets, and bank solvency is captured by the Tier 1 capital ratio. Credit risk is measured by the NPL ratio, and cost efficiency is defined as the cost-to-income ratio following Borio, Gambacorta and Hofmann (2015). Bank business model is proxied by two variables: first, a measure of income diversification, defined as the share of non-interest income over total revenue (ECB, 2015); second, the deposit to total assets ratio that measures the extent of retail banking.<sup>24</sup> We also consider the extent of geographical diversification in the sample of Spanish banks by constructing a ratio of non-domestic loans to domestic loans.

**20. The banking industry structural indicators,  $I_{j,t}$ , reflect concentration and excess capacity in the banking sector.** The top-five bank concentration (CR5) index is defined as the market share of the top five institutions in terms of assets (ECB, 2015).<sup>25</sup> Excess capacity in a country is captured by the number of bank branches per capita and bank employees per capita, based on the ECB Structural Banking Statistics.

## EMPIRICAL FINDINGS BASED ON REGRESSION ANALYSIS

### A. Spanish Banks

**21. Credit risk, efficiency and business model variables appear to be important drivers for Spanish banks' profitability** (Table 1).<sup>26</sup> Bank solvency as measured by Tier 1 capital ratio is positively related to both ROAE and ROAA. This is consistent with the view that banks with strong capital positions tend to have lower funding costs due to lower perceived profitability of default (see, for example, Molyneux and Thornton, 1992).<sup>27</sup> The NPL ratio, on the other hand, appears to be a drag on the profitability of banks. Banks exposed to higher credit risks tend to incur higher loan losses (see, Bikker and Hu, 2002, and ECB, 2015). The cost to income ratio is negatively related to

<sup>24</sup> The deposit to total assets ratio could also be considered as a bank funding proxy. In general, retail based banks tend to rely more on deposits as a source of funding compared with wholesale funding.

<sup>25</sup> The pairwise correlation between the CR5 index and the Herfindahl index is 95 percent.

<sup>26</sup> A number of robustness checks are considered as part of the analysis. First, we consider an alternative specification where the two global banks are excluded from the Spain sample, to focus on the more domestically-oriented banks. Second, to account for potential endogeneity issue related to bank capital position, we consider an alternative specification with lagged Tier 1 capital. The core results of the analysis are found to be robust, see Appendix III. Furthermore, tests for second-order correlation also support the specification used in the analysis.

<sup>27</sup> Using an alternative measure of capital ratio, Borio, Gambacorta and Hofmann (2015) also found that the capital-to-total-assets ratio was positively associated with net interest income and the ROA.

profitability as it is inversely related to cost efficiency. As expected, the more efficient banks are found to be more profitable. Business model related variables such as the non-interest income to revenue ratio suggest that there may be some value in income diversification for Spanish banks. At the same time, a large deposit base (measured by the deposit to assets ratio) appears to have a positive impact on bank profitability.<sup>28</sup>

VARIABLES	(1) ROAE	(2) ROAA	(3) NIM	(4) Non-interest income/Assets
Lagged dependent variables	<b>-0.217***</b> (0.0519)	<b>-0.200***</b> (0.0448)	<b>0.636***</b> (0.0316)	<b>0.387***</b> (0.0847)
NPL ratio	<b>-3.380**</b> (1.493)	<b>-0.116***</b> (0.0290)	<b>-0.0118**</b> (0.00593)	<b>-0.0136***</b> (0.00361)
Total asset (ln)	6.262 (5.373)	0.0444 (0.137)	0.0508 (0.0458)	-0.0121 (0.0338)
Tier 1 capital ratio	<b>11.83*</b> (6.207)	<b>0.271***</b> (0.103)	-0.00373 (0.0141)	-0.00351 (0.00821)
Deposit to asset ratio	0.336 (0.457)	<b>0.0196*</b> (0.0106)	<b>0.0183***</b> (0.00417)	<b>0.00962***</b> (0.00328)
Non interest income to revenue	<b>0.924*</b> (0.502)	<b>0.0264**</b> (0.0103)	<b>-0.0168***</b> (0.00340)	<b>0.0214***</b> (0.00254)
Cost to income (efficiency)	<b>-1.944**</b> (0.756)	<b>-0.0543***</b> (0.0170)	<b>-0.0120***</b> (0.00239)	<b>-0.00678***</b> (0.00168)
GDP growth	<b>2.214*</b> (1.232)	<b>0.0541**</b> (0.0217)	0.000554 (0.0132)	<b>-0.0144***</b> (0.00388)
Short term interest rate (EURIBOR)	<b>6.858**</b> (2.880)	<b>0.238***</b> (0.0711)	<b>0.0482**</b> (0.0224)	<b>0.0160**</b> (0.00808)
Constant	-124.8 (103.9)	-1.414 (2.269)	0.431 (0.660)	-0.0101 (0.504)
Observations	122	122	122	126
Number of Banks	14	14	14	14

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation with robust standard errors.

**22. Macroeconomic variables including GDP growth and short term interest rates are important drivers for profitability** (Table 1). GDP growth is positively related to headline profitability (ROAE and ROAA); as stronger macroeconomic conditions are likely to be associated with stronger demand for credit and lower loss provisions. This finding is consistent with the interpretation that profitability is pro-cyclical, driven by cyclical patterns in lending and other financial intermediation activities as well as loan loss provisions via credit portfolio quality (see, for example, Albertazzi and Gambacorta, 2009 and ECB, 2015). Higher short term interest rate is also

<sup>28</sup> The positive relationship between the deposit to assets ratio and bank profitability could in part be attributed to the relatively low funding costs for deposits. The average interest rate on bank deposits is lower compared with the average cost of wholesale funding between 2005 and 2016 in Spain. However, the positive impact of deposit to assets ratio on profitability is sensitive to the sample size.

positively related to net interest margins, resulting from high interest rates (price component) on loans and on fixed income portfolios. Higher margins also contribute to the broader measures of profitability, ROAE and ROAA. The positive relationship between short term interest rate and profitability could in part be attributed to the low interest rate environment in recent years, when ultra low-interest rate put pressure on bank profitability.<sup>29</sup>

### **23. Geographic diversification is found to support the profitability of Spanish banks.**

Geographic diversification is measured by the ratio of non-domestic loans to domestic loans extended by banks.<sup>30</sup> For Spanish banks, it appears that geographical diversification has a positive impact on NIMs and on the non-interest income to assets ratio, as well as on ROAA. This is consistent with the fact that the banks with international activity are more profitable compared with the more domestically-oriented banks, and their profitability was less affected during the European Sovereign Debt Crisis due to their overseas operations in Latin America. The significant international presence of Spanish banks provides welcome diversification effects, however, the high reliance on foreign subsidiaries in profit generation could imply significant vulnerabilities if the economic and financial conditions in host countries were to deteriorate.

## **B. European Banks**

**24. European banks' profitability is driven by similar bank-specific factors as Spanish banks** (Table 2). The NPL ratio tends to be negatively associated with profitability, as high NPLs often lead to higher provisions and therefore put pressure on profitability. The Tier 1 capital ratio has a positive impact on ROAA, and the cost to income ratio is again negatively related to NIMs and ROAA. On business model variables, it is interesting to note that the non-interest income to revenue ratio affects profitability negatively, possibly due to the losses incurred by some European investment banks in their trading activities during the last two crises. Some studies have found that the high share of non-interest income is likely to be associated with more volatile bank profitability (see, Bikker and Hu, 2002), and diversification benefits may be non-linear, that is, up to an optimal degree (Gambacorta, Scatigna and Yang, 2014). Furthermore, non-interest income, in particular, fees and commission income is found to be sensitive to different macroeconomic developments (ECB, 2016).<sup>31</sup> On the other hand, retail oriented business model as captured by the deposit to assets ratio seems to have fared better in the sample period of consideration (2000 to 2015), consistent with

<sup>29</sup> The low interest rate period features prominently in the sample period from 2000 to 2015, as the data availability for the Spanish SIs is considerably better in the later part of the sample. As part of the consolidation process in the Spanish banking system, several of the SIs were formed after the crisis, and the data for these banks prior to the crisis was limited.

<sup>30</sup> The data on domestic vs. non-domestic loans is only available for 7 out of the 14 Spanish banks in the sample. As a result, the size of the panel is reduced to seven banks. Please see Appendix III for detailed regression results.

<sup>31</sup> For European banks, fees and commission income is generated through a wide range of activities (ECB, 2016). Payment services represented the largest single category in 2015 (18 percent) for banks under SSM supervisor, followed by asset management (15 percent), distributed investment products (13 percent) and securities business (10 percent). Other fee-generating activities include custody services, the provision of loan commitments and financial guarantees, clearing and settlement-related activities, and structured finance and securitization transactions.

other cross-country studies of European banks that suggest retail banks tend to outperform banks with other business models such as wholesale and investment banks (Gambacorta and van Rixtel, 2013, and ECB, 2015).<sup>32</sup>

**25. Cyclical and macro factors including GDP growth and short term interest rate also influence European banks positively.** Both GDP growth and three-month interest rates have sizable and significant impact on ROAA and ROAE. The positive influence of the short-term interest rate is consistent with the suggestion that the current low interest rate environment may have been an important contributor to the low profitability of European banks (see, for example, Borio, Gambacorta and Hofmann, 2015).

**Table 2. Panel Regression Results (European Sample)**

VARIABLES	(1) ROAE	(2) ROAA	(3) NIM	(4) Non-interest income/Assets
Lagged dependent variables	-0.0435 (0.0275)	-0.000303 (0.0338)	<b>0.663***</b> (0.0843)	<b>0.367***</b> (0.101)
NPL ratio	<b>-1.018*</b> (0.618)	<b>-0.0628***</b> (0.0191)	0.00454 (0.00601)	-0.0198** (0.00840)
Total asset (ln)	2.174 (4.390)	-0.0703 (0.157)	-0.0735 (0.0555)	<b>-0.143***</b> (0.0464)
Tier 1 capital ratio	1.443 (0.929)	<b>0.0739*</b> (0.0386)	0.00586 (0.0106)	-0.0113 (0.00933)
Deposit to asset ratio	<b>0.669*</b> (0.350)	<b>0.0217*</b> (0.0122)	<b>0.00897***</b> (0.00212)	<b>0.00974***</b> (0.00302)
Non interest income to revenue	-0.240 (0.179)	<b>-0.00843*</b> (0.00479)	<b>-0.00730***</b> (0.00163)	<b>0.00554**</b> (0.00239)
Cost to income (efficiency)	-0.251 (0.201)	<b>-0.00914*</b> (0.00533)	<b>-0.00796***</b> (0.00180)	<b>0.00639**</b> (0.00271)
GDP growth	<b>1.575***</b> (0.306)	<b>0.0560***</b> (0.0131)	-0.00345 (0.00399)	-0.00721 (0.00490)
Short term interest rate	<b>3.109**</b> (1.329)	<b>0.0997***</b> (0.0367)	<b>0.0540**</b> (0.0219)	<b>-0.0563***</b> (0.0152)
Branch per capita	-0.318 (0.318)	0.000519 (0.00622)	<b>-0.00424**</b> (0.00216)	-0.00119 (0.00380)
Bank Employee per capita	-0.0437 (0.0285)	<b>-0.00250***</b> (0.000631)	-4.97e-05 (0.000292)	-0.000260 (0.000497)
ShareFive	-0.449 (0.417)	-0.0131 (0.0126)	-0.00280 (0.00336)	<b>-0.00706*</b> (0.00405)
Constant	23.89 (66.66)	2.751 (2.835)	1.995** (0.948)	2.286*** (0.858)
Observations	708	708	706	716
Number of Banks	61	61	61	61

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

Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation with robust standard errors.

<sup>32</sup> One argument proposed in the literature was that retail based banks tend to have more stable sources of income (NIMs), while banks that rely on wholesale funding tend to rely on non-interest income which is more volatile.



**26. Excess capacity measured by the number of bank branches per capita and bank employees per capita is negatively associated with profitability at the European level.**

Specifically, higher number of branches per capita appears to reduce NIMs, while bank employee per capita is negatively associated with the ROAA. Finally, the degree of concentration at the national level does not appear to have a significant impact on headline profitability (ROAA and ROAE).<sup>33</sup>

### C. GSIBs

**27. Global banks' profitability is driven by a combination of structural and cyclical factors, similar to those influencing Spanish and European banks** (Table 3). The NPL ratio and the cost to income ratio are again negatively associated with profitability, while the Tier 1 capital ratio and some degree of income diversification affect profitability positively. An interesting observation is that bank size affects headline profitability negatively, which could be a result of some degree of diseconomies of scale in the world's largest banks. This is consistent with the literature that suggests that economies of scale and efficiency gains mainly exist for smaller banks and that large banks could suffer from diseconomies of scale due to higher agency costs and overhead costs related to managing large operations (see, for example, Tregenna, 2009 and ECB, 2015). Consistent with earlier findings, both GDP growth and short term interest rates are positive drivers for the profitability of the GSIBs.

**28. Empirical results based on panel regressions reveal some common drivers for profitability across three different sample of banks.** First, on bank specific characteristics, stronger solvency position and lower NPLs are often associated with higher bank profitability. More cost efficient banks also perform better and post stronger results. The benefit of income diversification through non-interest income appears to be mixed. While there is positive evidence for Spanish banks, the higher volatility associated with non-interest income has a negative impact on profitability in the European sample. Second, cyclical factors such as GDP growth and short term interest rates (proxy for monetary policy) are consistently positive drivers for bank profitability. On the European level, excess capacity measured by the number of bank branches per capita and bank employees per capita is negatively associated with profitability.

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<sup>33</sup> By income components, the concentration ratio (CR5) appears to be weakly associated with non-interest income, with no significant relationship with NIMs. Overall, the relationship between bank concentration and profitability appears to be inconclusive.

Table 3. Panel Regression Results (GSIB Sample)

VARIABLES	(1) ROAE	(2) ROAA	(3) NIM	(4) Non-interest income/Assets
Lagged dependent variables	0.0389 (0.0584)	0.0433 (0.0815)	<b>0.860***</b> (0.0600)	<b>0.285***</b> (0.0859)
NPL ratio	<b>-0.754***</b> (0.265)	<b>-0.0346***</b> (0.0101)	0.00529 (0.00886)	-0.0181 (0.0122)
Total asset (ln)	<b>-3.483***</b> (1.089)	<b>-0.126**</b> (0.0617)	-0.0114 (0.0304)	<b>-0.515***</b> (0.181)
Tier 1 capital ratio	0.189 (0.218)	<b>0.0329**</b> (0.0144)	-0.00203 (0.00865)	0.0188 (0.0134)
Deposit to asset ratio	-0.0127 (0.0728)	0.00304 (0.00582)	<b>0.00422*</b> (0.00233)	<b>-0.0177***</b> (0.00587)
Non interest income to revenue	<b>0.110***</b> (0.0127)	0.00161 (0.00162)	-0.00222 (0.00148)	<b>0.00706**</b> (0.00329)
Cost to income (efficiency)	<b>-0.366***</b> (0.0506)	<b>-0.0178***</b> (0.00184)	-0.00170 (0.00163)	<b>-0.0137***</b> (0.00291)
GDP growth	<b>0.775***</b> (0.229)	<b>0.0361***</b> (0.00839)	-0.00227 (0.00497)	<b>-0.0413***</b> (0.0149)
Short term interest rate	0.462 (0.454)	<b>0.0648**</b> (0.0305)	0.00964 (0.0136)	-0.0172 (0.0347)
Constant	74.04*** (18.31)	2.764** (1.127)	0.356 (0.533)	9.504*** (2.744)
Observations	381	386	386	391
Number of Banks	32	32	32	32

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation with robust standard errors.

## CONCLUSIONS AND POLICY RECOMMENDATIONS

**29. Spanish banks' profitability has recovered gradually since the crisis, but the return on equity remains below the cost of capital.** Net interest margins for Spanish banks remain competitive, in part due to the retail business model, although they have experienced downward trend amid the low interest rate environment. The efficiency of Spanish banks as measured by the cost-to-income ratio remains favorable compared with peers, although the NPL ratio is still relatively high. Furthermore, branch density remains high in European comparison, despite a relatively low bank employee per capita ratio.

**30. Spanish banks' profitability is influenced by a combination of structural and cyclical factors, similar to those influencing other European banks and GSIBs.** NPL ratios influence profitability negatively, as unproductive assets on the balance sheet are costly to maintain and drive up provisions. Stronger solvency position as measured by the Tier 1 capital ratio tends to be associated with better performance in both returns on assets and returns on equity. The efficiency of the banking sector as measured by cost-to-income ratio is strongly associated with profitability, with

more efficient banks (lower cost-to-income ratio) performing more favorably. Cyclical factors such as GDP growth are positively related to bank profitability, as banks benefit from improved macroeconomic environment, in part through higher demand for credit. On monetary policy, short term interest rate is found to be a positive driver for profitability, as NIMs tend to rise with higher interest rates. Finally, on the European level, excess capacity as measured by the number of branches per capita and bank employees per capita are negatively associated with profitability, as higher branch density tends to be associated with higher operating costs.

**31. The authorities and banks should take further steps to reduce problem assets in bank balance sheets, given the impact of unproductive assets on bank profitability.** While substantial progress has been made in reducing problem assets since the crisis, the NPL ratio remains relatively high in some banks compared with other European and international banks. The authorities and banks should work together to identify means to further reduce problem assets, and to lessen the burden of unproductive assets on banks' profitability.

**32. The authorities should work with banks to analyze the scope for further cost reduction through mergers and a rationalization of the extensive branch network.** Many Spanish banks have carried out branch reduction and cost cutting measures since the crisis, but the branch density of the Spanish banking system remains relatively high in European comparison. Nevertheless, Spanish banks are amongst the most efficient across Europe. Bearing that in mind, supervisors and banks should analyze the optimal size of the branch network, especially, given the impact of digitalization and the move towards internet and mobile banking. The scope for further reductions in Spanish banks' operating costs through branch reduction should be examined carefully. Furthermore, distinctions should be made between branches servicing rural communities and urban centers, with the latter more likely to be affected by digitalization.

**33. The authorities should engage closely with banks to analyze the benefits and potential risks associated with income diversification.** Given the low interest rate environment, banks are moving towards adjusting their business models to diversify income sources and to improve fee-based income. While non-interest income may help improve bank profitability when NIMs are under pressure from low interest rates, potential risks associated with non-interest income driven activities should be examined by bank supervisors adequately. In addition, the potential negative impact of fee-based income on client relations and on the volume of banking activities should be taken into consideration.

**34. Going forward, the authorities should collect data on digitalization and FinTech activities, and conduct analysis on their impact on banks' profitability and business models.** Supervisors should start collecting data on the extent of digitalization, including the share of sales and transactions conducted through on-line and mobile banking. The benefits and potential risks associated with digitalization and FinTech should be analyzed carefully, as well as their impact on bank profitability and business models. Timely investment and upgrade in the IT infrastructure may be warranted to better prepare banks for the trend of digitalization in global banking.

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## Appendix I. Sample

### Appendix I. Table 1. Spain Sample

<b>Banks</b>	<b>Country</b>	<b>Banks</b>	<b>Country</b>
Banco Santander, S.A.	ESP	Bankinter	ESP
Banco Bilbao Vizcaya Argentaria, S.A.	ESP	Ibercaja Banco, S.A.	ESP
CaixaBank, S.A.	ESP	Grupo Cooperativo Cajamar (GCC)	ESP
Bankia S.A.	ESP	Kutxabank, S.A.	ESP
Banco Popular Espanol S.A.	ESP	Liberbank S.A.	ESP
Banco de Sabadell	ESP	Unicaja Banco S.A.	ESP
Banco Mare Nostrum S.A.	ESP	ABANCA Corporacion Bancaria, S.A.	ESP

### Appendix I. Table 2. GSIB Sample

<b>Banks</b>	<b>Country</b>	<b>Banks</b>	<b>Country</b>
Industrial and Commercial Bank of China	CHN	Banco Santander, SA	ESP
China Construction Bank Corporation	CHN	Nordea Bank AB (publ)	SWE
Bank of China Ltd.	CHN	Credit Suisse Group AG	CHE
Agricultural Bank of China Limited	CHN	UBS Group AG	CHE
BNP Paribas SA	FRA	Barclays Plc	GBR
Crédit Agricole Group	FRA	HSBC Holdings Plc	GBR
Groupe BPCE	FRA	Royal Bank of Scotland Group Plc	GBR
Société Générale SA	FRA	Standard Chartered Plc	GBR
Commerzbank AG	DEU	Bank of America Corporation	USA
Deutsche Bank AG	DEU	Bank of New York Mellon Corporation	USA
UniCredit SpA	ITA	Citigroup Inc.	USA
Mitsubishi UFJ Financial Group, Inc.	JPN	Goldman Sachs Group, Inc.	USA
Mizuho Financial Group, Inc.	JPN	JPMorgan Chase & Co.	USA
Sumitomo Mitsui Financial Group, Inc.	JPN	Morgan Stanley	USA
ING Bank NV	NLD	State Street Corporation	USA
Banco Bilbao Vizcaya Argentaria, SA	ESP	Wells Fargo & Company	USA

Appendix I. Table 3. European Sample

<b>Banks</b>	<b>Country</b>	<b>Banks</b>	<b>Country</b>
Erste Group Bank AG	AUT	ING Group	NLD
Raiffeisen Zentralbank Oesterreich	AUT	Cooperatieve Rabobank U.A.	NLD
Belfius Bank SA/NV	BEL	ABN AMRO Group N.V.	NLD
KBC Groep NV	BEL	DNB Group	NOR
Danske Bank AS	DNK	Powszechna Kasa Oszczednosci Bank Polski	POL
Jyske Bank A/S	DNK	Caixa Geral de Depositos, S.A.	PRT
Nykredit Realkredit A/S	DNK	Banco Comercial Portugues, S.A.	PRT
OP Financial Group	FIN	Banco BPI S.A.	PRT
Societe Generale (SG)	FRA	Banco Santander, S.A.	ESP
Crédit Mutuel Group	FRA	Banco Bilbao Vizcaya Argentaria, S.A.	ESP
BNP Paribas	FRA	CaixaBank, S.A.	ESP
Credit Agricole	FRA	Bankia S.A.	ESP
La Banque Postale	FRA	Banco Popular Espanol S.A.	ESP
Groupe BPCE	FRA	Banco de Sabadell	ESP
Landesbank Baden-Wuerttemberg	DEU	Banco Mare Nostrum S.A.	ESP
Deutsche Bank AG	DEU	Bankinter	ESP
Commerzbank AG	DEU	Ibercaja Banco, S.A.	ESP
NRW.BANK	DEU	Grupo Cooperativo Cajamar (GCC)	ESP
Bayerische Landesbank	DEU	Kutxabank, S.A.	ESP
DekaBank Deutsche Girozentrale	DEU	Liberbank S.A.	ESP
Landesbank Hessen-Thuringen Girozentrale	DEU	Unicaja Banco S.A.	ESP
Norddeutsche Landesbank Girozentrale	DEU	ABANCA Corporacion Bancaria, S.A.	ESP
Volkswagen Bank GmbH	DEU	Credit Suisse Group AG	CHE
OTP Bank Plc	HUN	UBS AG	CHE
Allied Irish Banks, plc	IRL	Skandinaviska Enskilda Banken AB	SWE
Bank of Ireland	IRL	Swedbank AB	SWE
UniCredit S.p.A.	ITA	Svenska Handelsbanken AB	SWE
Banca Monte dei Paschi di Siena SpA	ITA	Nordea Bank AB	SWE
Intesa Sanpaolo S.p.A.	ITA	HSBC Holdings plc	GBR
Unione di Banche Italiane S.p.A.	ITA	The Royal Bank of Scotland Group plc	GBR
Banco Popolare	ITA	Lloyds Banking Group plc	GBR
Bank Nederlandse Gemeenten (BNG)	NLD	Barclays plc	GBR

## Appendix II. Data and Variables

Appendix II. Table 1. Data source and variable definitions

<i>Category</i>	<i>Variable</i>	<i>Definition</i>	<i>Source</i>
<b>Profitability</b>			
<b>Headline Profitability</b>	ROAE	Net Income/ Average Total Equity	FitchConnect
	ROAA	Net Income/ Average Total Assets	FitchConnect
<b>Income components</b>	Net interest margins	Net Interest Income / Average Assets	FitchConnect
	Net interest income	Gross Interest and Dividend Income - Total Interest Expense	FitchConnect
	Non-interest income	Net Gains (Losses) on Trading and Derivatives + Net Gains (Losses) on Other Securities + Net Gains (Losses) on Assets at FV through Income Statement + Net Insurance Income + Net Fees and Commissions + Other Operating Income	FitchConnect
<b>Bank Characteristics</b>			
<b>Bank size</b>	Total assets	Consolidated Total Assets	FitchConnect
<b>Bank solvency</b>	Tier 1 capital ratio	Regulatory Tier 1 Capital / Risk Weighted Assets	FitchConnect, SNL
<b>Credit risk</b>	NPL ratio	Impaired Loans (NPLs)/ Gross Loans	FitchConnect
<b>Bank efficiency</b>	Cost-to-income ratio	Total Non-Interest Expenses/Total Income	FitchConnect
<b>Bank business models</b>			
<b>Diversification</b>	Income diversification (Non-interest income to total revenue)	Total Non-Interest Operating Income / (Total Non-Interest Operating Income + Net Interest Income )	FitchConnect
	Geographical diversification	Non-domestic loans/Domestic loans	FitchConnect, SNL
<b>Retail business model</b>	Deposits to assets ratio	Total deposits/total assets	FitchConnect
<b>Macro and monetary policy</b>			
	GDP Growth		World Bank WDI
	Short Term Interest Rate	3-month interest rates	Haver Analytics; WEO: FIDR (Short-term interest rate)
<b>Concentration</b>			
	Herfindahl	The sum of the squares of the market shares of all firms within the industry, where the market shares are expressed as fractions.	ECB Banking Structural Indicators
	ShareFive	Shares of the 5 largest CIs in total assets (CR5)	ECB Banking Structural Indicators
<b>Excess capacity</b>			
	Branch per capita	Number of Branches in Country / Population of Country	ECB Banking Structural Indicators, Haver Analytics
	Bank employees per capita	Number of bank employees in Country / Population of Country	ECB Banking Structural Indicators, Haver Analytics

## Appendix II. Table 2. Descriptive Statistics

### Descriptive Statistics for bank-year observations (Spain Sample)

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
ROAE	148	1.1	53.9	-460.2	36.4
ROAA	148	0.4	1.4	-11.8	2.2
NIM	148	1.8	0.7	0.8	4.1
Non-interest income/Assets	152	0.9	0.4	0.3	1.9
NPL ratio	152	6.1	5.6	0.3	21.5
Total assets (ln)	152	11.5	1.2	9.4	14.1
Tier 1 capital ratio	139	9.8	2.1	5.0	14.9
Deposit to asset ratio	152	49.0	10.5	25.2	78.6
Non interest income to revenue	152	34.7	9.1	15.6	54.5
Cost to income (efficiency)	152	54.7	10.4	34.2	104.9
GDP growth	224	1.7	2.6	-3.6	5.3
Short term interest rate (EURIBOR)	224	2.2	1.6	0.0	4.6
Geographic Diversification	54	0.7	1.0	0.0	3.9

### Descriptive Statistics for bank-year observations (European Sample)

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
ROAE	884	7.0	25.3	-460.2	39.1
ROAA	884	0.4	0.8	-11.8	3.5
NIM	883	1.5	0.9	-0.1	6.9
Non-interest income/Assets	896	1.0	0.6	-0.8	4.1
NPL ratio	838	4.4	4.8	0.0	34.9
Total assets (ln)	897	12.5	1.2	8.9	15.2
Tier 1 capital ratio	862	10.9	4.4	3.8	44.0
Deposit to asset ratio	897	40.3	15.8	0.0	87.5
Non interest income to revenue	896	40.6	71.9	-220.9	2044.1
Cost to income (efficiency)	896	61.1	81.2	-1753.9	1516.1
GDP growth	1024	1.5	2.4	-8.3	10.2
Short term interest rate	1024	2.4	1.9	-0.8	14.2
Branch per capita	972	52.2	25.6	10.4	101.6
Bank employees per capita	969	674.4	152.3	268.1	1015.9
Share Five Concentration ratio	976	48.5	17.2	19.9	87.0

### Descriptive Statistics for bank-year observations (GSIB Sample)

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
ROAE	475	10.9	10.6	-59.0	83.5
ROAA	480	0.6	0.5	-1.7	3.1
NIM	480	1.5	0.9	0.0	4.6
Non-interest income/Assets	486	1.5	1.1	-0.4	5.5
NPL ratio	438	3.7	4.7	0.0	34.2
Total assets (ln)	486	13.7	0.8	11.1	15.2
Tier 1 capital ratio	443	10.6	3.2	4.8	21.3
Deposit to asset ratio	466	49.0	19.7	4.2	103.4
Non interest income to revenue	486	47.6	24.0	-220.9	100.7
Cost to income (efficiency)	486	65.9	69.0	26.8	1516.1
GDP growth	512	2.6	3.4	-8.3	14.2
Short term interest rate (EURIBOR)	512	1.8	1.8	-0.8	6.5



## Appendix III. Additional Results and Robustness Checks

Appendix III. Table 1. Results: Spain Sample with Geographical Diversification				
VARIABLES	(1) ROAE	(2) ROAA	(3) NIM	(4) Non-interest income/Assets
Lagged dependent variables	-0.0565 (0.105)	0.0475 (0.145)	<b>0.314***</b> (0.0370)	<b>0.264***</b> (0.0613)
NPL ratio	<b>-1.982***</b> (0.654)	<b>-0.0664***</b> (0.0235)	<b>-0.0219***</b> (0.00622)	<b>-0.00981*</b> (0.00572)
Total asset (ln)	4.818 (8.057)	-0.451 (0.310)	0.000120 (0.0945)	<b>-0.0749**</b> (0.0350)
Tier 1 capital ratio	<b>12.42*</b> (7.025)	<b>0.414*</b> (0.212)	-0.0315 (0.0310)	0.00647 (0.0142)
Deposit to asset ratio	<b>-0.992**</b> (0.495)	<b>-0.0377***</b> (0.0131)	<b>0.0100**</b> (0.00474)	<b>0.00665**</b> (0.00316)
Non interest income to revenue	<b>2.078***</b> (0.798)	<b>0.0697***</b> (0.0252)	<b>-0.0138**</b> (0.00552)	<b>0.0280***</b> (0.00320)
Geographic Diversification	9.002 (7.001)	<b>0.444**</b> (0.184)	<b>0.220**</b> (0.0956)	<b>0.133***</b> (0.0460)
Cost to income (efficiency)	<b>-3.624***</b> (1.310)	<b>-0.104***</b> (0.0325)	<b>-0.0152***</b> (0.00509)	<b>-0.00603**</b> (0.00236)
GDP growth	0.655 (0.730)	0.00993 (0.0347)	-0.0109 (0.0131)	<b>-0.0196***</b> (0.00458)
Short term interest rate (EURIBOR)	4.729 (4.356)	0.138 (0.103)	-0.00506 (0.0287)	<b>0.0220***</b> (0.00748)
Constant	-25.20 (135.9)	6.364* (3.805)	2.452 (1.585)	0.587 (0.531)
Observations	49	49	49	49
Number of Banks	7	7	7	7

Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
 Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation with robust standard errors.

Appendix III. Table 2. Robustness Check: Spain Sample without Global Banks

VARIABLES	(1) ROAE	(2) ROAA	(3) NIM	(4) Non-interest income/Assets
Lagged dependent variables	<b>-0.208***</b> (0.0637)	<b>-0.205***</b> (0.0729)	<b>0.511***</b> (0.0466)	<b>0.268***</b> (0.103)
NPL ratio	<b>-2.617**</b> (1.128)	<b>-0.0991***</b> (0.0373)	<b>-0.0121*</b> (0.00659)	-0.00772 (0.00604)
Total asset (ln)	0.596 (7.136)	0.0324 (0.290)	-0.154 (0.105)	<b>-0.197***</b> (0.0633)
Tier 1 capital ratio	<b>13.56*</b> (7.154)	<b>0.306***</b> (0.116)	-0.0167 (0.0128)	-0.0112 (0.00760)
Deposit to asset ratio	0.412 (0.722)	<b>0.0233*</b> (0.0135)	<b>0.0153***</b> (0.00408)	<b>0.0101***</b> (0.00298)
Non interest income to revenue	0.290 (0.832)	0.0120 (0.0153)	<b>-0.0119***</b> (0.00311)	<b>0.0242***</b> (0.00222)
Cost to income (efficiency)	<b>-2.137**</b> (0.851)	<b>-0.0569***</b> (0.0213)	<b>-0.0122***</b> (0.00286)	<b>-0.00761***</b> (0.00233)
GDP growth	1.909 (1.357)	<b>0.0547**</b> (0.0269)	0.00677 (0.0143)	<b>-0.0152**</b> (0.00617)
Short term interest rate (EURIB)	<b>6.823**</b> (2.650)	<b>0.281***</b> (0.0802)	0.0261 (0.0188)	0.00440 (0.00877)
Constant	-53.83 (120.5)	-1.374 (4.543)	<b>3.045**</b> (1.316)	<b>2.073***</b> (0.788)
Observations	92	92	92	96
Number of Banks	12	12	12	12

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Appendix III. Table 3. Robustness Check: Spain Sample with Lagged Capital Ratio**

VARIABLES	(1) ROAE	(2) ROAA	(3) NIM	(4) Non-interest income/Assets
Lagged dependent variables	<b>-0.176***</b> (0.0482)	<b>-0.156***</b> (0.0377)	<b>0.640***</b> (0.0379)	<b>0.397***</b> (0.0982)
NPL ratio	<b>-3.009**</b> (1.335)	<b>-0.105***</b> (0.0320)	<b>-0.0133**</b> (0.00628)	<b>-0.0126***</b> (0.00342)
Total asset (ln)	6.323 (5.582)	0.0546 (0.111)	0.0421 (0.0480)	-0.0194 (0.0349)
Tier 1 capital ratio	<b>13.70*</b> (8.097)	<b>0.320***</b> (0.113)	-0.0170 (0.0144)	5.59e-05 (0.0118)
Lagged Tier 1 capital ratio	-4.378 (5.335)	-0.121 (0.100)	<b>0.0282***</b> (0.00846)	-0.00754 (0.0129)
Deposit to asset ratio	0.360 (0.439)	<b>0.0205**</b> (0.00985)	<b>0.0184***</b> (0.00452)	<b>0.00922***</b> (0.00319)
Non interest income to revenue	0.639 (0.705)	0.0184 (0.0158)	<b>-0.0142***</b> (0.00347)	<b>0.0204***</b> (0.00351)
Cost to income (efficiency)	<b>-1.848**</b> (0.823)	<b>-0.0513**</b> (0.0200)	<b>-0.0133***</b> (0.00228)	<b>-0.00642***</b> (0.00206)
GDP growth	2.899 (1.775)	<b>0.0727**</b> (0.0308)	-0.00508 (0.0130)	<b>-0.0118**</b> (0.00493)
Short term interest rate (EURIBOR)	<b>5.124**</b> (2.329)	<b>0.187***</b> (0.0693)	<b>0.0578***</b> (0.0206)	0.0120 (0.00793)
Constant	-98.54 (101.3)	-0.801 (2.034)	0.365 (0.675)	0.132 (0.465)
Observations	119	119	119	123
Number of Bank_id	14	14	14	14

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1