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THE DRIVERS OF BANK M&A IN THE EURO AREA DURING THE CRISIS: THE ROLE OF MACRO DETERMINANTS AND NON-PERFORMING LOANS

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Abstract

Banking sector integration in Europe reversed its momentum with the Financial Crisis, with Mergers and Acquisitions (M&A) withdrawing to national borders, in a time where uncertainty over asset quality and sovereign risk became the new paradigm. The M&A literature mostly focuses on the typical factors determining M&A in the banking industry during economic upswings yet gives little attention to periods of crisis. Taking this into account, this paper intends to shed some light on the drivers of M&A in the Euro Area during this troubled period. Making use of a multinomial logit model, results show that acquisitions during the crisis were effectively curbed by widespread credit risk, in the form of non-performing loans, and do not appear to have been spurred by supervision nor by regulation. M&A activity during this period is driven by performance and liquidity, being most intense for banks in countries under higher macroeconomic distress and exhibiting higher levels of idiosyncratic risk and poor loan quality.

JEL Codes: C35, G21, G28, G34

Keywords: Acquisitions, Banks, Logistic regression, Non-performing loans

"*I think that with growth returning and with the huge amount of work that is being done in relation to non-performing loans, we are going to see a number of mergers taking place within countries and across borders."*

Danièle Nouy, Chair of the Supervisory Board of the European Central Bank, Dec. 2017

1. Introduction

Banking sector integration in Europe is hardly a reality, as highlighted by Cabral et al. (2002). Fostered by politicians (EU Commission, 2005) and supervisors (Nouy (2017a)) alike, M&A activity experienced a boost in the years following the creation of the European Monetary Union, yet it reversed its momentum with the Financial Crisis. Poor macroeconomic performance, financial distress and sinking profitability tainted the Euro Area (EA) and caused agents to withhold their investment decisions, such as potential acquisitions. Amid widespread risk and chaos, national authorities acted at both national and supranational levels (e.g.: Banking Union) to control the situation, impacting the real and financial sectors.

However, M&A activity did not come to a full halt, even if it is at values hardly comparable to pre-crisis years. This raises two questions: i) what are the factors causing investment decisions to be cancelled and ii) what has been driving M&A during the crisis period. The literature on the determinants of M&A in the European context provides many answers for periods of economic upswing, discussing the impact of macroeconomic and regulatory variables (e.g.: Buch and DeLong (2004), Pasiouras et al. (2011)) and bank-specific determinants (e.g.: Beccalli et al. (2013)). Yet, it barely gives – if any – attention to downturns.

The purpose of this paper is to provide answers to these questions at the EA level, covering the period of the financial and sovereign debt crises, by attempting to understand which factors reduced the likelihood of banks becoming acquirers and, on the other hand, those increasing the chances of banks being involved in M&A (both as acquirers and targets). By employing a multinomial logit model, used in the

literature to distinguish between banks, this paper provides tentative explanations to these questions, showing that i) widespread credit risk, in the form of non-performing loans (NPLs), curbed the decision to invest and ii) bank M&A was more intense in countries with unfavorable economic conditions, fundamentally driven by profitability, overall market liquidity and involving targets with higher credit risk. In the end, Ms. Nouy may be right if NPLs are tackled simultaneously across countries without imposing too much stringency, as banks in the EA manage to escape the current low-profitability environment.

This study is structured as follows: section 2 reviews the literature on the determinants of M&A, taking on a forward-looking perspective; section 3 presents the methodology; section 4 describes the data; section 5 outlines overall and robustness checks results; section 6 concludes this study.

2. Literature Review

Bank M&A in Europe is undoubtedly small compared to other sectors, especially at cross-border level. While Berger et al. (2001) pointed out that efficiency barriers may provide an adequate, broad explanation to this fact, researchers have attempted to understand what are exactly these drivers at EU level.

i) Outlook of the literature

Studies covering the determinants of bank M&A in Europe are scarce, especially when compared to the abundant US-based studies. Despite the European focus of this paper, several US seminal papers are important references in the literature, such as the in vs. out-market M&A studies of Hannah and Rhoades (1987) and Moore (1996), as well as those of Wheelock and Wilson (2000) and Hannah and Piloff (2006), which attempt to discern between the characteristics that make banks acquirers or targets. European studies build upon the hypothesis, methodologies (e.g.: multinomial logit models) and results of these authors.

This said, Europe-based studies are extremely diverse, covering distinct countries/periods and focusing on different determinants and types of acquisitions. Attempting to understand macro drivers of

bank M&A, Focarelli and Pozzolo (2001) and Buch and DeLong (2004) examine target vs. acquirer characteristics for European countries within the OECD context. Focusing on bank-specific characteristics in domestic vs. cross-border deals, Lanine and Vander Vannet (2007) delve into acquisitions in Central and Eastern Europe, while Hernando et al. (2009) and Köhler (2009) look at the EU-25. More recently, Pasiouras et al. (2011) analyze both bank and country-wide factors determining M&A in the EU-15, while Beccalli et al. (2013) enlarge this scope to consider acquisitions by banks in 23 European countries. These are just some of the studies on the subject; a more comprehensive summary can be found in Appendix A.

These papers share two characteristics: none goes beyond 2006, meaning M&A during the crisis remains unstudied, and all combine macro and micro determinants. M&A activity cannot be explained without considering both levels and, as seen further ahead, unexpected results arise from combining systematic and idiosyncratic factors, with important implications for this study.

ii) Determinants of M&A

This section examines, for each relevant determinant identified in the literature, the rationales on how these drive M&A and the conclusions of different studies.

- **Macro determinants**

Economic performance. The decision to invest in M&A is highly influenced by the macroeconomy, but this relation is unclear for bank M&A, as argued by Buch and DeLong (2004). Intense M&A may happen in periods of economic distress due to restructuring, being fostered by supervisors to promote financial stability. This is pointed out by Hernando et al. (2009) and Köhler (2009), who find a negative relation between GDP growth and M&A. Koetter et al. (2005) distinguish between '*normal*' vs. '*distressed*' M&A and find that financial distress increases the likelihood of becoming a target. Pasiouras et al. (2011) find the opposite result, nevertheless.

Albeit an appropriate measure of performance, GDP may not be enough to capture the effect of the cycle. Yet, the literature does not include a control for the cycle even though Beitel et al. (2013) recognize that different stages of the business cycle matter in determining M&A in banking and investment and profitability are seen to be pro-cyclical, as shown by Albertazzi and Gambacorta (2009).

Regulation. With the 2004 EU merger law[1], the harmonization of merger regulation deemed differences between countries irrelevant in determining M&A, as stated by Köhler (2009). Yet changes in bank regulation may impact domestic M&A by affecting banks' efficiency, as Pasiouras et al. (2011) point out, and cross-border deals by constituting barriers to M&A, as noticed by Berger et al. (2001). Pasiouras et al. (2011) show that banks operating in countries with stricter capital/liquidity regulation are less prone to be involved in M&A, but this relation remains unclear, as Karolyi and Taboada (2015) find acquisition flows to involve acquirers from countries with stronger regulations than the targets (regulatory arbitrage).

Other determinants. Among the myriad of factors employed in the literature, some common controls include market concentration measures and other macroeconomic variables (e.g.: Credit-to-GDP) as used by Köhler (2009) and Hernando et al. (2009), as well as market conditions (e.g.: average return on equity/assets) as included by Focarelli and Pozzolo (2001), Pasiouras et al. (2011) and Caiazza et al. (2012). For instance, Pasiouras et al. (2011) find the impact of profitability on a bank's decision to expand abroad to exhibit contrary signs according to whether it is an individual bank or average sector characteristic. This result is highly relevant for the current study given the strong link between NPLs and market conditions, as found by Louzis et al. (2011), while reinforcing the importance of controlling for the business cycle.

[1] Council Regulation (EC) No 139/2004 on the control of concentrations between undertakings (the EC Merger Regulation), followed by the Commission Regulation (EC) No 802/2004 of 7 April 2004 implementing the former regulation.

- **Bank-specific determinants**

Size. Larger banks are more expensive to be acquired, posing higher integration costs, and can take on hostile takeovers easily; however, the purchase of larger banks may also entail higher market power and attractive economies of scale and scope for the acquirer, as shown by Berger et al. (1993). The results of Caiazza et al. (2012) and, for cross-border deals, those of Hernando et al. (2009) show that larger banks are more attractive. From the acquirers' perspective, Hannah and Pilloff (2006) as well as Beccalli and Frantz (2013) find that larger banks dominate acquisitions.

Performance. The '*inefficient management*' hypothesis of Palepu (1986) states that potential efficiency gains from acquisition should increase as returns (i.e. on assets) decrease and cost inefficiency increases for the target, especially for in-market acquisitions. Moore (1996) and Wheelock and Wilson (2000) reject this hypothesis for the US. For Europe, higher profitability and better cost management are seen to decrease the likelihood of a bank becoming a target, as found by Köhler (2009) and Pasiouras et al. (2011), using accounting ratios, as well as by Beccalli and Frantz (2013), who estimate X-efficiency measures. However, acquirers are more often efficient banks, as shown by Focarelli and Pozzolo (2001).

Growth. Hannah and Rhoades (1987) hypothesized that banks with high (asset) growth would be attractive for banks willing to expand in the market of the target. Hernando et al. (2009) and Beccalli and Frantz (2013) find an insignificant positive relation between growth and the likelihood of becoming a target. Contrary to these results are those of Moore (1996), who finds that low growth of targets can also be perceived as unexploited higher potential profit by acquirers (in the US). On the buyer side, the rationale for acquirers to have higher growth rates is based on historical evidence that banks quickly becoming large gain greater capacity to acquire others, as suggested and proven by Beccalli and Frantz (2013).

Capital strength. Capital ratio optimization is paramount to satisfy the several stake-holders of a bank, which involves different conflicting goals for managers. According to Harper (2000), the

rationalization of capital usage is the main driver of financial M&A, yet the sign of capital strength is not clear. From the target side, lower capitalization may lure acquirers, as found by Beccalli and Frantz (2013), since: i) supervisors may encourage M&A to improve financial stability; ii) targets may be more efficiently managed if the capital ratio is perceived as an index of *efficient management* (better capital optimization); iii) high leverage maximizes return on investment while reducing the purchase price premium. Yet, higher target capitalization may be desired if: i) supervisors pressure less-capitalized banks to seek out capital abundant targets; ii) managers do not exploit banks' full profit potential to extract high earnings, as shown by Lanine and Vander Vennet (2007). From the acquirer side, Pasiouras et al. (2011) and Beccalli and Frantz (2013) hypothesize and find a negative relation with capital: low capital may be associated with i) more efficiently managed banks and ii) higher supervisory pressure to merge so as to safeguard stability.

Liquidity. Theoretically, some ambiguity exists regarding the impact of liquidity. While a bank may be targeted due to high liquidity, which is interesting for an acquirer, acquisitions may be triggered due to illiquidity and financial distress. Pasiouras et al. (2011) and Beccalli and Frantz (2013) find negative relationships for both targets and acquirers, albeit not always significant.

Lending activity. Loans constitute 58% of Euro Area banking assets (ECB, 2017a). Loan concession and its characteristics are bound to influence investment decisions: higher loan activity may be associated to aggressive expansion strategies and higher risk-taking, attracting potential investors. For acquirers, higher specialization can increase post-deal integration costs, according to Beccalli and Frantz (2013). In this regard, Pasiouras et al. (2011) find no significant relation, while Moore (1996) and Beccalli and Frantz (2013) find evidence of such a negative impact.

Loan quality also impacts cross-border banking activity, as seen by Emter et al. (2018), who accuse NPLs of originating the recent retrenchment in cross-border banking flows. Some country-specific studies pay some attention to loan quality. For Germany, Behr and Heid (2008) recognize the importance of banks'

credit risk differences in M&A performance, while Koetter et al. (2005) find that higher loan loss provisioning of a bank, an *ex-post* measure of credit risk, increases the probability of distress and that of becoming a target. For Italy, Focarelli et al. (2002) find that targets are linked with higher 'bad loan' ratios[2]. However, NPLs in their current definition have not been considered as determinants in the literature so far.

Again, it should be highlighted that M&A during a crisis may not be similar, nor necessarily its determinants, to that of periods of growth and financial stability. M&As during a crisis is often driven by restructuring to avoid contagion and acquisition decisions by banks may be distorted and delayed in periods of high uncertainty, as argued by Beltratti and Paladino (2012). Hence, it is interesting to investigate whether the typical characteristics of M&As remain determinant in defining banks' investment decisions.

3. Methodology

Following the literature, a **multinomial logistic regression** is employed to understand the effects of macroeconomic, regulatory and bank-specific variables on bank M&A. First proposed by McFadden (1973), the model builds on existing logit and probit models used in the literature, with the advantage to distinguish between acquirers, targets and non-involved banks. In panel form, it can be written down as:

$$P(Y_t = i|X_t) = \frac{e^{\alpha+\beta' X_t}}{1 + e^{\alpha+\beta' X_t}}, i = 0, 1, 2 \qquad (1)$$

where $P(Y_t = i|X_t)$ is the probability of occurrence of $Y_t = i$ for a given bank at time t, given the characteristics of vector X_t Three different scenarios are considered: $i = 1$ stands for the event of a bank becoming an acquirer, $i = 2$ if it is acquired and $i = 0$ if it is not involved in M&A. The determinants in vector X_t include bank-specific, macroeconomic, regulatory and market variables which, following the literature, are lagged one year, according to the following specification:

[2] Defined as '*loans to firms in liquidation or other bankruptcy proceedings plus loans to firms having defaulted on repayment installments for at least six months*'. This definition is close to that of NPL (see Appendix B) yet not entirely similar.

$$\beta' X_t = \phi' Bank\ variables_{i,t-1} + \theta' Macro_{i,t-1} + \delta' Regulation_{i,t-1} + \mu' Market\ controls_{i,t-1} \quad (2)$$

$Bank\ variables_{i,t}$, includes the bank-specific characteristics suggested from the literature, as surveyed in section 2.ii and for which a description can be found in Appendix B. Following Pasiouras et al. (2011) and Hernando et al. (2009), bank variables are defined in relation to the country average at time t, as standardization controls for yearly shifts in means bank ratios. These include the logarithm of total assets (Size), return on assets[3] (Profitability), the operating expenses-to-assets ratio[4] (Cost Inefficiency), the growth rate of total assets (Asset Growth), the equity-to-assets ratio (Capitalization), the ratio of cash and cash convertibles to total assets (Liquidity) and the loan-to-deposit ratio (Loan specialization). Moreover, it includes loan quality, as expressed by the ratio of non-performing loans to total assets (NPL). This last variable is an addition to the literature and can proxy for credit risk, in the line of Behr and Heid (2008).

Higher NPLs put pressure on a bank's capacity to generate profits, implying higher provisions, funding costs and capital rationalization efforts, crowding out lending to the economy and increasing systemic risk and financial instability. As highlighted by Anastasiou et al. (2016), the expectations of economic agents may be affected by these conditions, aggravating these impacts: expectations on instability may lead quickly to illiquidity and, ultimately, to insolvency.

Yet, financial distress may actually be a driver of M&A by pushing down the price of a bank and its assets so that it is below the perceived value to the investor, that will intend to grasp that profitable opportunity. Additionally, in such cases, an acquisition may even be fostered and facilitated by the supervisory authorities. As such, it is necessary to understand what is the impact of an idiosyncratic NPL

[3] Some of the performance indicators employed in the literature face some caveats, especially given the period under study. As such, this paper employs the return on assets, which is preferred to return on equity given its sign stability even under crisis (e.g.: negative equity and losses will produce a positive return on equity). This practice follows that of Caiazza et al. (2012).
[4] The operating expenses-to-assets ratio is also preferred to the cost-to-income ratio, as it is less directly related to profitability, not affected by interest rate changes and can give a better picture of gains/efficiency deterioration, also following Caiazza et al. (2012)

ratio increase for a bank on the likelihood of becoming a target: does it make it more attractive to acquirers or does it signal too much uncertainty on its asset quality and future profitability perspectives?

For acquirers, a higher NPL ratio may mean less availability of resources to invest due to pressure on profitability and capital, yet it may also translate an aggressive strategy, transposing the argument of Beccalli and Frantz (2013) on asset growth. As such, the current paper's prediction of the impact on acquirers is, *a priori*, uncertain, requiring investigation.

$Macro_{i,t}$ is a set of macroeconomic variables for country of bank i at time t which includes GDP growth and also the unemployment rate, given the dependency of bank M&A on the cycle, as identified in section 2.ii. Given the crisis period under study, it is important to properly control for the state of the economy, namely for sovereign debt crisis. The addition of said controls should allow to disentangle the effects of the crisis (constraining fiscal policy and the real economy), imbedded in bank-level variables – e.g.: NPLs are extremely driven by the cycle, according to Nkusu (2011) and Klein (2013).

Other aspects affected banks simultaneously across Europe or on a country-wide basis, reason for which a group of regulatory dummies is considered in the model. A novelty in the literature, $Regulation_{i,t}$ is a set of variables for the inception of the Single Supervisory Mechanism (SSM) and for binding, country-wide regulatory changes on NPLs.

The birth of the SSM and first comprehensive assessment (Asset Quality Review) in 2014 marks an effort in ensuring banks' adequate capitalization and resilience to financial shocks. As stated by Mersch (2013), a new single, stricter regime of supervision and resolution was set in place, with Euro Area wide consequences on banks' businesses which ramify throughout time and beyond the pool of banks under SSM supervision. Daluiso (2013) postulates that the lack of a single system, namely during the crisis period, might have discouraged cross-border activity, but Pasiouras et al. (2011) argue that stricter regulation is

bound to affect M&A. Hence, there is interest in understanding what has been the impact of the SSM on banks' likelihood of being engaged in M&A. For this purpose, a binary variable is created for the inception of the SSM, taking the value 1 from 2014 onwards.

The possibility of endogeneity between banking sector consolidation and NPLs cannot be discarded. The ESRB (2017) underlines the role of M&A in the resolution of high stocks of NPLs, which often involves bank restructuring. after the merger/purchase, the new entity should have a higher capacity to reduce 'bad loans', as found by Focarelli et al. (2002), reducing the disparities in NPL and capitalization ratios between more robust acquirers and weaker targets. The '*new*' bank is in a better position to proceed to internal resolution, write-off and should be able to dispose of NPL portfolios at a lower purchase price discount than if the target bank was to perform that operation on its own before – and bid-ask spreads are quite considerable for asset sales of banks close to/in distress, as documented by Fell et al. (2017).

To tackle the possible problem of endogeneity, vector X already includes lagged variables, yet also exogenous regulatory actions on NPLs are also considered, which might have produced an impact on loan quality and therefore on M&A. EA countries have proactively undertaken uncoordinated prudential measures to tackle NPLs in the last years, as stated in ECB (2017a), and, to capture the impacts of said regulatory actions, an exogenous categorical variable ranging from 1 to 5 is built, increasing with higher number and stringency of binding NPL-related regulatory actions undertaken in the country where a bank is headquartered. This approach follows that of Pasiouras et al. (2011) and is preferred to several dummies, as the effect of an additional regulation adds more stringency on those already imposed.

Finally, $Market\ controls_{i,t}$ includes a group of market variables proxying for market conditions. This set of variables for the country of each bank i includes the Herfindahl-Hirschman Index, as used by Hernando et al. (2009) to control for banking sector concentration, as well as market profitability, liquidity, following Focarelli and Pozzolo (2001) and Pasiouras et al. (2011), and market loan quality (NPL)

ratios. The last market variable is an addition to the existing literature and is included since systemic increases in NPLs reflect generalized constraints on overall banks' current (and future) financials, affecting lending, investment and confidence at country-level, which may channel into sovereign risk. Decreasing market profitability, liquidity and loan quality makes investors unsure of the economic value generated by future M&A, as defended by Nouy (2017b), so that uncertainty on overall, rather than individual, asset quality and business model sustainability dissuades potential acquirers from engaging in M&A.

4. Data

This project makes use of a broad database covering from 2005 to 2016, comprising 1588 EA banks. The period under study has not been yet covered by the literature, as argued previously; moreover, it post-dates the 2004 EU merger reform and thus is not affected by country-specific M&A regulatory changes. Going further in time would be impossible due to lack of data; moreover, observations coming from different regimes would be mixed, which is not advisable to do, according to Beltratti and Paladino (2013). The relevance of conducting this study at the EA level is justified by the fact that banks in the EA are subject to common monetary policy conditions, regulations and, from 2014 onwards, supervision.

This database combines several types of data from different sources: financial panel data, M&A data, macroeconomic data and a newly built data set on regulatory changes across the EA. Following the literature, extracted data exhibits yearly frequency.

Financial bank-level data is obtained from the market data platform of Standard and Poor's (SNL). For the case of merged banks, pre-merger information is consolidated from the information of pre-merger entities. The extracted data serves as the basis to build the variables driving M&A. In this regard, it should be noted that the definition of NPL definitions varied across countries and was only harmonized recently, as recognized in the EU 'Vienna' Initiative (Sirtaine and Rosenberg (2012)), which constitutes a limitation

of any paper analyzing NPLs on a multi-country scale. Acknowledging this, the data collection exercise strived, however, to the best extent possible given the information reported by the banks, to include data for loans more than 90 days past-due, instead of the accounting concept of impaired loans. The availability of NPL data conditioned this collection exercise, which could eventually cover a wider number of banks.

M&A data on 582 intra-EA deals between 2005 and 2016 is obtained from SNL, comprising transactions performed by subsidiaries and being limited to credit institutions as defined in the EU's Second Banking Directive Data, excluding deals involving investment/insurance firms. Completed mergers are acquisitions in which the buyer is the new entity created and the seller is the entity dismissed. Transaction data is aggregated to obtain annual estimates of the total number and value of acquisitions of banks located in a given country, a summary for which can be found in Appendixes C.1 and C.2. Applying the previously mentioned criteria, transaction data is linked to the bank-level database so that each bank receives a value of 1 in a given year if involved as an acquirer in a given deal, a value of 2 if involved as a target and a value of 0 if non-involved. Several transactions cannot be included as the acquirer/target is not disclosed; in the end, sample banks are involved in 175 acquisitions and in 157 sales. Appendix C.3 shows the total number of acquirer, target and non-involved banks for each country per year. This number may not match exactly the number of observations since the panel data set is unbalanced, yet robustness checks are performed to guarantee that results are not biased by the different information content of each year/bank.

Macroeconomic data is gathered from several sources: GDP growth from Eurostat, unemployment rate from the World Bank and the Herfindahl-Hirschman index from the ECB's European Data Warehouse. Regulatory data for NPL-related regulatory changes is collected and based on ECB (2017b) and built as described in section 3. Regulations by year, type and binding status are presented by country in ECB (2017b). Appendix C.4 summarizes them.

A quick overview of the data can provide some insights on M&A for the EA in recent years. From Appendix C.2 it can be seen that M&A, which is mostly domestic[5], fell drastically after the financial crisis and did not recover to pre-crisis levels, behaving in countermotion relative to the average EA NPL ratio.

Based on Appendix C.5, which presents statistics for each variable by category of bank[6], it is possible to find statistically significant differences across bank categories. Banks involved in M&A present lower equity-to-asset ratios, howbeit the average equity-to-assets of acquirers is higher than that of targets. Focusing on assets, acquirers exhibit the fastest growth while targets the slowest. Acquirer banks are the least liquid, while exhibiting the highest degree of loan specialization and capacity to cover any unforeseen fund requirements. Only differences in profitability/cost efficiency are not significant across categories.

Macroeconomic conditions are, on average, worse for banks involved in M&A and better for targets than for acquirers, which are based on countries with lowest growth and highest unemployment. However, non-involved banks belong to countries subject to more regulatory actions; the average NPL ratio is indeed the lowest for that category, while the highest for targets. Moreover, banks involved in M&A, especially targets, are found to be located in more concentrated markets.

Appendix C.6 exhibits the correlations between variables. Relevant correlations are found between market credit risk and macroeconomic variables, as expected from Klein (2013), and between bank and market profitability, liquidity and loan quality. However, variables are scaled to country averages in the model to avoid biases hence correlations between scaled bank variables and market controls fall very close to zero and become insignificant at a 5% significance level.

[5] Only 31% (173) of the total number of deals are cross-border deals, corresponding to 25% of the aggregate deal value.
[6] Appendices D.3.iii, D.3.iv and D.4.i, D.4.ii explore this data in a more granular fashion, by splitting the sample intro groups.

5. Empirical results and robustness checks

i) Base results

The multinomial model is estimated via maximum likelihood for the two approaches. Table 1 below provides the estimates for $\hat{\alpha}$ and $\hat{B}$ in (1). The first two columns of the output do not report the typical odds ratios due to the existence of multiple categories[7] but, instead, show log relative risk ratios.

To facilitate model interpretation, the result is also shown in terms of relative risk ratios. This procedure is undertaken so that, for a given category i, the exponentiated coefficient $e^{\beta_j^{(i)}}$ will correspond to the amount by which the relative risk ratio is multiplied when variable X_j increases by 1 unit. To facilitate interpretation, $e^{\beta_j^{(i)}}$ is adjusted by the dimension of each variable: 1 p.p. increase for all variables except Size, the SSM dummy and NPL regulation. Interpretation is made simpler this way: taking capitalization as an example, the relative risk ratio for acquirers is 0.9, which means that, all else constant, a 1 p.p. increase to the equity-to-assets ratio will increase the likelihood of a bank becoming an acquiror by 10%, relative to the baseline scenario of not being involved in M&A. This said, the focus of the analysis is mostly on the sign, rather than on the size of the coefficient.

Among bank-specific characteristics, size exhibits a significantly positive effect for both acquirers and targets, as expected. Capitalization has a negative impact on the probability of a bank becoming involved in M&A, as found by Lanine and Vander Vennet (2007) and Pasiouras et al. (2011), giving evidence for the '*efficient management*' hypothesis even in times of crisis. The impact of capitalization seems to be slightly greater for acquirers (-10%) than for targets (-5%).

[7] Following McFadden (1973) and taking into account the notation in section 3, a certain coefficient $\beta_j \in B$, for an explanatory variable $X_j \in X_t$, will not only measure the marginal impact in the log odds of a given category i with respect to X_j but will also include another component related to other categories (a probability-weighted average of β_j of all other X_j for category i). Intuitively, this means that a coefficient will not only consist of the specific contribution of a certain variable to the likelihood of a certain event (e.g.: becoming an acquirer) as it also depends on the probabilities of all other categories (e.g.: becoming a target).

Table 1: Multinomial logistic model results

	Estimated model		Relative-risk ratios (adjusted)	
	Acquirers	Targets	Acquirers	Targets
Size	0.345***	0.348***	1.412***	1.416***
	[0.06]	[0.055]	[0.061]	[0.057]
Profitability	22.356**	-2.611	1.251**	0.974
	[10.934]	[6.473]	[0.116]	[0.067]
Cost efficiency	3.377	3.146*	1.034	1.032*
	[2.489]	[1.866]	[0.025]	[0.019]
Asset growth	0.428	-0.805	1.004	0.992
	[0.364]	[0.757]	[0.004]	[0.008]
Capitalization	-10.567***	-5.901**	0.900***	0.943**
	[3.087]	[2.365]	[0.031]	[0.024]
Liquidity	-1.957*	-0.848	0.981*	0.992
	[1.154]	[1.006]	[0.012]	[0.010]
Loan specialization	-0.002**	0.000	1.000**	1.000
	[0.001]	[0.000]	[0.000]	[0.000]
NPL	-1.043	3.397**	0.990	1.035**
	[2.434]	[1.458]	[0.025]	[0.015]
GDP growth	-3.539	2.587	0.965	1.026
	[5.121]	[3.220]	[0.053]	[0.033]
Unemployment rate	14.13***	6.126**	1.152***	1.063**
	[2.646]	[2.534]	[0.027]	[0.026]
SSM	-0.615**	-0.473**	0.541**	0.623**
	[0.243]	[0.223]	[0.275]	[0.250]
NPL regulation	-0.130*	0.014	0.878*	1.014
	[0.074]	[0.072]	[0.077]	[0.074]
Market profitability	26.000*	-3.312	1.297*	0.967
	[14.201]	[8.058]	[0.153]	[0.084]
Market liquidity	-0.261	4.713***	0.997	1.048***
	[2.405]	[1.778]	[0.024]	[0.018]
Market credit risk	-4.588**	1.971	0.955**	1.020
	[2.353]	[1.765]	[0.024]	[0.018]
HHI	-4.585*	3.198**	0.955*	1.032**
	[2.577]	[1.497]	[0.026]	[0.015]
Constant	-6.29***	-6.988***	0.002***	0.001***
	[0.542]	[0.465]	[0.719]	[0.592]
McFadden R^2	9.74%			
Likelihood ratio-test	227.02 (34) ***			
Number of obs.	9872			

Robust st. dev. in brackets. *** Significant at 1% level, ** Significant at the 5% level, * Significant at the 10% level

On performance, results are in line with the theory and are extremely strong: higher profitability drives banks to become acquirers, whilst higher cost inefficiency increases the likelihood of becoming a target, as found by Focarelli and Pozzolo (2001) and Beccalli and Frantz (2013).

Bank growth has no significant relation for targets, in line with the findings of Hernando et al. (2009). The '*attractive growth*' hypothesis of Hannah and Rhoades (1987) seems to be significant for the US, whereas it is inconsistent for the EA: when macro variables are included, no evidence is found for the positive relation (suggested by Beccalli and Frantz (2013)) between asset growth and higher probability of becoming an acquirer.

Liquidity has the expected negative impact on acquirers, as well as **loan specialization**, although both variables have faint and barely significant effects. This means that idiosyncratic differences in liquidity and in banks' business models seem to have played a fairly small role in driving acquisitions in the EA, as found by Caiazza et al. (2012) before the crisis. No relevant effects are found for targets.

The **NPL ratio** does not affect the decision to acquire in the base model, yet it has a significantly positive impact in increasing the likelihood of becoming a target. Controlling for macroeconomic factors and systemic risk, an increase in credit risk compared to the mean of the market can be attractive to investors if, for example, they expect to profit from buying a (possibly valuable) bank which is being sold at discount due to NPLs in the target's balance sheet[8].

Looking at macroeconomic variables, albeit **GDP growth** is found to be irrelevant, which is common in the literature, the **unemployment rate** is not, exhibiting a positive impact on the likelihood of being engaged in M&A for both acquirers (+15%) and targets (+6%). This seems to suggest that economic distress played an important part in driving bank M&A. The scale of this impact is in line with the findings of Hernando et al. (2009).

The **SSM dummy** has a negative relation with the probability of being engaged in M&A as an acquirer and as a target, compared to previous years. Although designed to achieve a common level playing

[8] An alternative explanation may be that foreclosure on the underlying assets provides collateral ownership that is valuable for the investor, at a cheaper price, which is a strategy common to investment funds investing in distressed assets.

field, the additional stringency it has brought seems to have negatively impacted M&A, consubstantiating the argument of Pasiouras et al. (2011), who state that tougher supervision and requirements may curb the full exploitation of potential gains from M&A. The hypothesis of Deluiso (2013) seems not to be valid and, despite the recent improvement in macro/micro performance, the inception of the SSM seems not to have brought any substantial improvements to banking sector consolidation in the short-run.

Changes in **regulation affecting NPLs** have not stimulated M&A: instead they weakly reduced the likelihood of banks becoming acquirers, while producing no effect for targets. As described in ECB (2017a), whilst these regulations provided guidance to banks to improve NPL management, at the same time they imposed more standards and tougher rules on provisioning, write-offs and financial recognition. This weak, fairly irrelevant effect may be caused by the fact that benefits from better NPL disposal may be counterbalanced by higher efforts to satisfy new regulations. Moreover, the absence of significance puts the question on whether these regulations were successful in tackling NPLs – if so, a significant relation would be expected since the level of M&A is seen to be driven by loan quality, which is not the case.

Market conditions impact M&A decisively. Overall profitability favors expansion decisions, as found in the literature. Also, banks in more liquid markets are more attractive for acquirers (+4.8%). Furthermore, **market concentration** has a relevant impact in decreasing the likelihood of becoming an acquirer, in line with Pasiouras et al. (2011), whereas it increases that of becoming a target, which is intuitive since there is "less chance for survival" in more concentrated markets.

While an individual increase of the NPL ratio augments the probability of acquisition, a wide-spread credit risk is negatively linked with the probability of acquisition. The systemic dimension of this increase causes banks to suspend investment decisions, as the opacity of banks' asset quality generates widespread uncertainty. Investors are not confident in assessing the risk-return trade-off in the presence of pervasive NPL increases, deterring further consolidation even if returns are foregone, as defended by Nouy

(2017a, 2017b). The heterogeneity of NPL levels across countries naturally contributes to the lack of cross-border M&A, especially if this country-wide risk increase can channel into sovereign risk, adding even more risk and uncertainty to investment decisions taken by foreign banks. This seems to be the case given the findings of Erce (2015), who documents significant pass-through rates from bank risk into sovereign risk under specific macroeconomic conditions (e.g. crisis) and for countries with higher NPLs.

Yet, the optimality of the decision to not invest needs to be questioned at the light of Altunbas and Ibañez (2004), who identify gains in performance the more diverse credit risk is between merging banks – cross-border M&A might entail profit opportunities currently curbed due to the existence of a too large '*ambiguity premium*', as suggested by Izhakian and Benninga (2011), attached to M&A investments. To reduce this premium, a simultaneous effort must be made by banks to reduce their NPL exposures.

ii) Robustness tests

One of the main concerns in estimating multinomial logit models lies in satisfying the independence of irrelevant alternatives (IIA) assumption. Theoretically, this assumption is, *a priori*, problematic, since it would mean, for instance, that an additional bank in the pool of possible targets would not impact the choice to acquire a bank. Yet the literature on bank M&A does not seem concerned with this problem when estimating multinomial logit models and empirical tests are rare. This is a worrisome fact that the current paper highlights and that future studies should consider more in depth, as not satisfying IIA can make estimators to become invalid.

For the current sample, the results of the McFadden-Train-Tye test indeed reject IIA, as shown in Appendix D.1. Although Cheng and Long (2007) criticize the implementation of IIA tests, a possible solution would be to use a nested logit model and compare results with the simple multinomial model, but nesting acquirers/targets when they are so little in number within the sample is also seen to produce biased

estimates. To tackle this issue, this paper follows Koetter et al. (2005) and relaxes the IIA assumption. The model is hence always estimated using robust standard-errors to account for eventual distortions, abnormalities in error distribution and heteroscedasticity[9].

Recognizing possible modelling limitations, robustness checks focus on fit/predictive accuracy and on testing the model specification. In terms of prediction accuracy, the estimated model predicts 173 acquirers (vs. 175) and 162 targets (vs. 157) throughout the period studied. The final model significantly improves on more simple specifications – the pseudo-R^2 does not imply a measure of fit, as stated by McFadden (1973), but instead compares a given model to the null model.

All explanatory variable inclusions are seen to be significant, as seen in Appendix D.2, where several specifications are tried out. The signs and significance of variables across specifications remain constant, with the exception of two determinants. Variable significance[10] only changes for profitability, which only becomes relevant once market profitability is included. The same occurs with liquidity, which is relevant in determining the likelihood for targets only when market liquidity is not included. Yet, comparing coefficients for a multinomial model under different specifications might not be enough since unobserved heterogeneity may vary across models, as argued by Mood (2010), so coefficients for different subperiods/subsamples should be compared, which is a robustness check according to Buis (2017).

High vs. low NPLs. The sample is divided in two groups, one including banks in countries with high levels of NPLs[11] and another group for banks in all other EA countries, which are considered to have low NPLs. As seen in Appendices D.3.i and D.3.ii, with only one third of sample banks, high NPL countries account for 65% of acquirers and 55% of targets, showing relatively high M&A activity.

[9] One could estimate the heteroscedastic multinomial model of Bhat (1995), yet this would require again IIA.
[10] The inclusion of dummies for NPL regulation instead of the categorical variable in the estimation of the base model was overall irrelevant. As seen ahead, this variable is not consistently significant.
[11] Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain, above the 4.9% EA average (2016) and as identified in ECB (2017a).

Results in Appendix D.3.v show performance is fundamentally relevant in determining M&A for banks in high NPL countries, while not being so in low NPL countries. Increases in individual NPLs imply a higher probability of becoming a target across the EA and M&A activity seems to have been stirred by less favorable economic conditions. This is especially true for low NPL countries, validating the hypothesis of M&A being driven by financial distress for the EA. Nonetheless, acquisitions by banks in low NPL counties appear to be much more sensible to systemic increases in NPLs and to market liquidity[12].

Acquisitions for banks in high NPL countries are also reduced by overall increases in NPLs but at a smaller extent compared to the other group of banks, being more sensible to shifts in market concentration. NPL regulation and the SSM dummy cease to be relevant, however, for both groups of countries.

It should be highlighted that this approach yielded overall similar results to splitting the sample between banks in more vs. less profitable countries, as well as splitting for banks above vs. below average individual profitability, cost efficiency and NPL ratios. For the sake of brevity and given the interest of studying loan quality in detail, results are only reported for this subsampling approach.

Pre vs. post sovereign debt crisis. The period between 2010 and 2012 marks a time of troubles for the EA: Greece and Ireland are bailed-out (2010), followed by Portugal and a second bailout for Greece (2011) and in response, the ECB initiates the Quantitative Easing program (Dec 2011). In 2012, when Mario Draghi announces that the ECB will do "*whatever it takes*" to save the EA, an inflexion point in NPLs is observed. 2011 marks a pivotal point in the middle point of the period under study and, as such, banks are split in two subsamples for 2005-2011 and 2012-2016 to check if the impacts of determinants on M&A changed across years. From summary statistics in Appendix D.4.i and D.4.ii, it is possible to see a

[12] 1 p.p. increase in market credit risk in a given year reduces the likelihood of a bank becoming an acquirer that year by 6% and 58% for banks in high and low NPL countries respectively; moreover, it impacts negatively the likelihood of becoming a target by 22% for the latter group. Higher liquidity promotes M&A for both acquirers and targets alike in banks in countries with low NPLs.

deterioration of macroeconomic conditions and profitability, for instance, which might be affecting the results of the base estimation.

However, overall results, as found in Appendix D.4.iii, are in consonance with the base estimation. M&A activity during the crisis is driven by pro-cyclicality for both subperiods. The impacts of market credit risk and profitability are considerably larger for the 2005-2011 period compared to the overall results[13]. Target likelihood determinants exhibit similar impacts although some determinants (e.g.: capitalization) are no longer significant. For the 2012-2016 subperiod, idiosyncratic credit risk increases for banks are seen to be deterring investment, in parallel to widespread ones, for which the effect on the decision to acquire is substantially smaller. While market concentration seems to lose relevance in determining M&A after 2011, the positive of overall market liquidity on the likelihood of becoming a target is substantially significant both before and after the sovereign debt crisis. Finally, yet again, NPL regulation seems to be insignificant across groups.

Appendix D.5 summarizes the outputs for all robustness estimations in relative risk ratio terms, for a better perception and comparison of the impact of each variable across specifications.

6. Conclusion

This study gives evidence of the importance of the business cycle and market conditions in driving acquisitions in the banking sector during the crisis years. Results are consistent with previous studies, although some determinants in the literature seem to lose relevance during the crisis period. Overall market conditions, such as profitability and liquidity, as well as uncertainty on asset quality at a systemic level seem to have played a fundamental role in effectively dissuading potential acquirers from investing, especially for banks in better-off countries. After drastically plummeting in comparison to pre-crisis years and

[13] 1 p.p. increase in the market NPL ratio in a given year reduces the likelihood of a bank becoming an acquirer that year by 20%, 5 times the impact for the base model.

withdrawing within country borders, M&A activity was most intense in countries facing unfavorable economic conditions, driven by performance and with NPLs increasing banks' chances to be in distress – and become targets.

Findings on previous efforts at country level to improve asset quality are inconclusive, raising two questions: i) whether these regulations had an impact at all on NPLs and ii) if future actions on NPLs will indeed have the desired effect on M&A. If effective in reducing NPLs at a systemic level, these may promote M&A; yet the cost of stringency, as seen with the creation of the SSM, may be high. Supervisors and regulators must carefully consider the trade-off between tackling NPLs and adding pressure on banks to cope with their demands.

Results appear to be robust under different specifications and subsamples. Some limitations are identified regarding both data and methodology. Employing more sophisticated techniques should improve on the current model, yet, as a starting point to analyze the period in question, the simplicity of using a multinomial logit model is favored. Added value would come from having more and better data on NPLs and M&A deals, as well as on relevant regulatory/supervisory actions during the crisis period. Further improvements could be undertaken by applying mixed multinomial logit models, which are challenging to implement for panel data, and by discerning between distressed vs. non-distressed deals and cross-border vs. domestic deals, to grasp the dynamics of the crisis and better capture the drivers of cross-border M&A.

While not being attempting to be prescriptive, the current study intended to better understand the drivers of M&A in the past years in the perspective of withdrawing some policy implications. Rather than on suppositions, these should be based on facts, such as simple ones which are find in this paper: although distress can be a source of M&A, too much uncertainty on asset quality (NPLs) inhibits investment; banks' investment decisions are mostly driven by the desire to maximize profit (especially in times of crisis) and authorities must be effectively without being too stringent and, most of all, act in a systematic way.

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APPENDIX A

Appendix A – Summary of the relevant literature on the determinants of M&A

Authors	Period of study	Geography	Study focus on determinants	Methodology
Hannah and Rhoades (1987)	1970-1982	US	In-market vs out-market acquisition	Multinomial logit model
Moore (1996)	1993-1996	US	In-market vs out-market acquisition	Multinomial logit model
Wheelock and Wilson (2000)	1984-1993	US	Likelihood of bank being an acquirer vs. being a target	Multinomial logit model Cox proportional hazard duration model
Focarelli and Pozzolo (2001)	1990-1999	OECD	Likelihood of bank being a target	Panel regression Binary choice model
Focarelli et al. (2002)	1984-1996	Italy	Likelihood of bank being an acquirer vs. being a target	Multinomial logit model
Buch and DeLong (2004)	1978-2001	OECD	Likelihood of bank being a target	Panel regression Binary choice model
Koetter et al. (2005)	1995-2001	Germany	Likelihood of bank being an acquirer vs. a target vs. a distressed acquirer vs. a distressed target	Multinomial logit model
Hannah and Piloff (2006)	1996-2005	US	Likelihood of bank being a target	Cox proportional hazard duration model
Lanine and Vander Vennet (2007)	1995-2002	13 EU countries	Determinants of a bank being acquired (or fail)	Multinomial logit model
Hernando et al. (2009)	1997-2004	EU-25	Cross-border vs domestic acquisition (target)	Multinomial logit model
Köhler (2009)	1997-2006	EU-25	Cross-border vs domestic acquisition (target)	Multinomial logit model
Pasiouras et al. (2011)	1997-2002	EU-15	Likelihood of bank being an acquirer vs. being a target	Multinomial logit model
Caiazza et al. (2012)	1992-2006	154 countries, EU-15	Cross-border vs domestic acquisition (target)	Binomial/Multinomial probit model
Beccalli and Frantz (2013)	1991-2006	23 European countries + 16 foreign targeted by EU banks	Likelihood of bank being an acquirer vs. being a target	Multinomial logit model Cox proportional hazard duration model

APPENDIX B

Appendix B – Description of independent variables

Type of Variable	Variable	Description	Source
Bank variable	Size	$Size = \ln(Total\ Assets)$ Total Assets: the amount of all gross investments, cash and equivalents, receivables, and other assets as they are presented on the balance sheet at the end of fiscal year t.	SNL
Bank variable	Profitability	$\frac{Pre-tax\ Profit}{Total\ Assets}$ Pre-tax profit: the balance left after deducting operating expenses, interest charges, and dividends on the preference shares, used interchangeably with net income, before taking into account taxes, at the end of fiscal year t.	SNL
Bank variable	Cost efficiency	$\frac{Operating\ Expenses}{Total\ Assets}$ Operating expenses: costs associated to the bank's operations undertaken during a given year, at the end of fiscal year t.	SNL
Bank variable	Asset growth	$\frac{Total\ Assets_t - Total\ Assets_{t-1}}{Total\ Assets_{t-1}}$	SNL
Bank variable	Capitalization	$\frac{Total\ Equity}{Total\ Assets}$ Equity: difference between total assets and total liabilities, which corresponds to the sum of all financial obligations of including all creditor claims on assets, at the end of fiscal year t	SNL
Bank variable	Liquidity	$\frac{Cash\ and\ Cash\ Equivalents}{Total\ Assets}$ Cash and cash convertibles: assets that are cash or can be converted into cash immediately under IAS39, at the end of fiscal year t.	SNL

Type of Variable	Variable	Description	Source
Bank variable	Loan specialization	$\frac{Total\ Loans}{Total\ Deposits}$ Total loans: total loans to customers, reduced by possible default losses and unearned interest income at the end of fiscal year t. Total deposits: total customer and bank deposits in an institution at the end of fiscal year t.	SNL
Bank variable	NPL	$\frac{Non-Performing\ Loans}{Total\ Assets}$ Following the ECB definition: a bank loan is considered non-performing when more than 90 days pass without the borrower paying the agreed instalments or interest.	SNL FRED
Macro variable	GDP growth	Real growth rate of the domestic growth product for each country	Eurostat
Macro variable	Unemployment rate	Percentage of labor force that is jobless to total labor force for each country	World Bank
Regulatory variable	SSM	Dummy taking the value of 1 after 2014, year of the creation of the SSM	Own construction
Regulatory variable	NPL regulation	Categorical variable for the number of binding NPL regulations as described in Appendix C.4.	ECB (2017a), own construction
Market control	Market profitability	Average return on assets for the banking sector of each country	SNL, own construction
Market control	Market liquidity	Average cash and cash equivalents to total assets ratio for the banking sector of each country	SNL, own construction
Market control	Market credit risk	Average NPL ratio for the banking sector of each country	SNL, own construction
Market control	HHI	Herfindahl-Hirschman Index for the banking sector of each country	European Data Warehouse

APPENDIX C

Appendix C.1 – Total number and value of bank acquisitions in the EA

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	%
Austria	3	3	2	5	2	3	3	2	2	8	5	9	47	9%
	63	*15,236*	*1,625*	*N/A*	*N/A*	*N/A*	*505*	*N/A*	*66*	*200*	*N/A*	*915*	*18,609*	*7%*
Belgium	2	0	0	2	0	3	3	1	1	3	0	1	16	3%
	N/A	*0*	*0*	*10,360*	*0*	*N/A*	*4,751*	*22*	*N/A*	*606*	*0*	*1,170*	*16,909*	*6%*
Cyprus	0	2	0	1	1	0	2	0	0	0	1	2	9	2%
	0	*12*	*0*	*75*	*N/A*	*0*	*62*	*0*	*0*	*0*	*N/A*	*30*	*178*	*0%*
Estonia	0	0	0	0	0	0	1	0	0	0	0	0	1	0%
	0	*0*	*0*	*0*	*0*	*0*	*7*	*0*	*0*	*0*	*0*	*0*	*7*	*0%*
Finland	1	1	0	2	3	5	7	0	6	0	0	0	25	5%
	324	*4,023*	*0*	*N/A*	*37*	*N/A*	*N/A*	*0*	*33*	*0*	*0*	*0*	*4,418*	*2%*
France	4	9	7	4	3	5	0	0	1	1	0	3	37	7%
	N/A	*542*	*643*	*2,382*	*N/A*	*1,022*	*0*	*0*	*N/A*	*N/A*	*0*	*255*	*4,844*	*2%*
Germany	9	9	8	10	11	5	10	7	5	10	14	17	115	21%
	21,734	*1,127*	*4,949*	*9,999*	*32*	*130*	*1,318*	*791*	*N/A*	*354*	*350*	*N/A*	*40,785*	*15%*
Greece	0	5	1	0	0	1	3	2	6	0	0	1	19	4%
	0	*2,951*	*N/A*	*0*	*0*	*N/A*	*N/A*	*321*	*1,129*	*0*	*0*	*12*	*4,413*	*2%*
Ireland	0	0	2	1	0	1	2	1	2	2	1	0	12	2%
	0	*0*	*5,681*	*251*	*0*	*N/A*	*N/A*	*1,300*	*60*	*2*	*N/A*	*0*	*7,294*	*3%*
Italy	8	9	8	10	6	13	6	3	4	8	9	13	97	18%
	1,670	*43,553*	*26,749*	*202*	*336*	*1,006*	*91*	*209*	*0*	*39*	*2,150*	*382*	*76,387*	*28%*
Latvia	1	4	0	2	0	1	4	0	2	1	0	0	15	3%
	23	*76*	*0*	*N/A*	*0*	*N/A*	*35*	*0*	*N/A*	*75*	*0*	*0*	*209*	*0%*
Lithuania	0	0	1	0	1	0	1	0	0	0	1	0	4	1%
	0	*0*	*N/A*	*0*	*N/A*	*0*	*N/A*	*0*	*0*	*0*	*6*	*0*	*6*	*0%*
Luxembourg	1	1	0	0	4	3	2	1	0	0	3	0	15	3%
	N/A	*N/A*	*0*	*0*	*1,321*	*N/A*	*1,052*	*730*	*0*	*0*	*100*	*0*	*3,202*	*1%*
Malta	0	0	0	1	0	0	0	0	0	2	3	1	7	1%
	0	*0*	*0*	*N/A*	*0*	*0*	*0*	*0*	*0*	*35*	*109*	*N/A*	*145*	*0%*

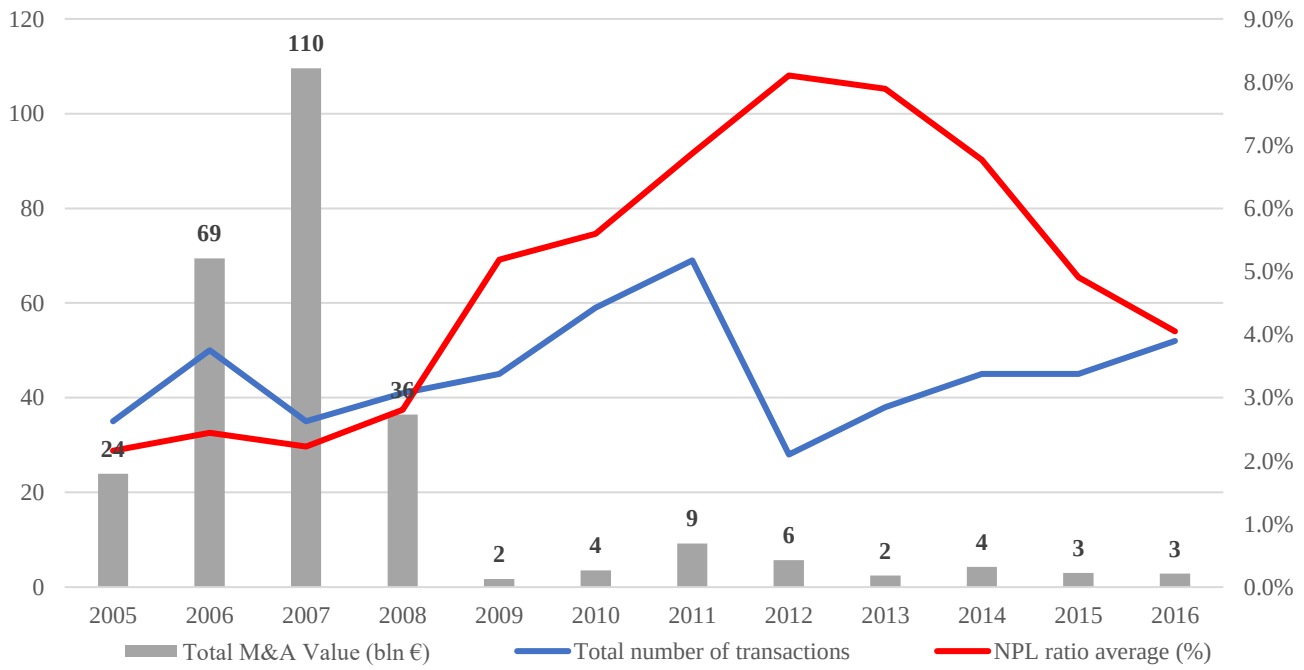
(Continued)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	%
Netherlands	1	4	2	1	1	0	1	1	1	0	0	1	13	2%
	N/A	*1,108*	*69,898*	*12,800*	*N/A*	*0*	*N/A*	*N/A*	*N/A*	*0*	*0*	*69*	*83,875*	*31%*
Portugal	2	0	1	0	0	1	1	1	0	1	1	0	8	1%
	110	*0*	*N/A*	*0*	*0*	*336*	*40*	*N/A*	*0*	*400*	*N/A*	*0*	*886*	*0%*
Slovakia	0	1	1	1	0	1	0	1	0	0	1	0	6	1%
	0	*N/A*	*N/A*	*350*	*0*	*N/A*	*0*	*N/A*	*0*	*0*	*N/A*	*0*	*350*	*0%*
Slovenia	0	0	0	0	1	0	1	1	0	0	3	3	9	2%
	0	*0*	*0*	*0*	*N/A*	*0*	*N/A*	*N/A*	*0*	*0*	*250*	*N/A*	*250*	*0%*
Spain	3	2	2	1	12	17	22	7	8	9	3	1	87	16%
	23	*762*	*N/A*	*N/A*	*N/A*	*1,044*	*1,363*	*2,306*	*1,157*	*2,578*	*N/A*	*3*	*9,235*	*3%*
Total	35	50	35	41	45	59	69	28	38	45	45	52	542	100%
	23,947	*69,392*	*109,545*	*36,419*	*1,726*	*3,537*	*9,223*	*5,679*	*2,444*	*4,288*	*2,965*	*2,835*	*272,001*	*100%*

Source: SNL

Note: Total transactions are reported first, followed by aggregate deal notional in italic.

Appendix C.2 – Aggregate M&A vs. NPL ratio 2005-2016



Source: SNL, FRED

Appendix C.3 – Banks in sample by country, involvement in M&A and year

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Austria	Acquirers	1	0	0	0	0	0	0	0	0	0	0	1	2
	Targets	1	0	0	1	1	0	0	2	1	0	0	1	7
	Non-involved	33	35	35	34	34	35	35	33	34	35	35	33	411
Belgium	Acquirers	1	1	0	0	1	0	1	0	0	0	0	0	4
	Targets	0	0	0	2	1	0	1	0	1	0	1	0	6
	Non-involved	11	11	12	10	10	12	10	12	11	12	11	12	134
Cyprus	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	0	0	3	1	0	2	1	1	0	0	1	0	9
	Non-involved	9	9	6	8	9	7	8	8	9	9	8	9	99
Estonia	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	3	0	0	0	0	0	0	0	0	0	0	0	3
	Non-involved	5	8	8	8	8	8	8	8	8	8	8	8	93
Finland	Acquirers	0	0	0	0	0	0	1	0	0	2	0	0	3
	Targets	0	0	1	0	0	0	2	0	0	1	0	0	4
	Non-involved	70	70	69	70	70	70	67	70	70	67	70	70	833
France	Acquirers	0	2	1	4	3	5	0	2	2	1	1	3	24
	Targets	0	0	0	1	3	1	1	2	2	0	0	0	10
	Non-involved	121	119	120	116	115	115	120	117	117	120	120	118	1418
Germany	Acquirers	1	3	3	2	6	3	1	2	0	0	3	2	26
	Targets	2	4	1	6	3	3	2	1	0	2	1	4	29
	Non-involved	762	758	761	757	756	759	762	762	765	763	761	759	9125
Greece	Acquirers	1	0	0	0	0	0	0	1	4	1	1	0	8
	Targets	0	0	0	0	0	0	1	0	1	0	1	1	4
	Non-involved	8	9	9	9	9	9	8	8	4	8	7	8	96
Ireland	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	0	1	1	0	0	0	2	0	0	1	2	0	7
	Non-involved	14	13	13	14	14	14	12	14	14	13	12	14	161
Italy	Acquirers	3	6	5	19	7	4	6	1	3	3	8	7	72
	Targets	1	2	8	3	2	1	5	3	2	4	4	8	43

	Non-involved	405	401	396	387	400	404	398	405	404	402	397	394	4793
Lithuania	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non-involved	2	2	2	2	2	2	2	2	2	2	2	2	24
Latvia	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non-involved	0	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	0	0	0	1	1	0	0	2	0	0	0	0	4
	Non-involved	16	16	16	15	15	16	16	14	16	16	16	16	188
Malta	Acquirers	0	0	0	0	0	0	0	0	0	1	0	0	1
	Targets	0	0	0	1	0	0	0	0	0	0	1	1	3
	Non-involved	12	12	12	11	12	12	12	12	12	11	11	11	140
Netherlands	Acquirers	0	0	1	0	0	0	0	0	0	0	0	0	1
	Targets	0	0	1	0	0	1	0	0	0	0	0	1	3
	Non-involved	18	18	16	18	18	17	18	18	18	18	18	17	212
Portugal	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	1	0	0	0	1	0	1	1	0	0	0	1	5
	Non-involved	19	20	20	20	19	20	19	19	20	20	20	19	235
Slovenia	Acquirers	0	0	0	0	2	0	0	0	0	0	1	0	3
	Targets	0	0	2	0	0	0	2	0	1	0	0	0	5
	Non-involved	7	7	5	7	5	7	5	7	6	7	6	7	76
Slovakia	Acquirers	0	0	0	0	0	0	0	0	0	0	0	0	0
	Targets	0	0	0	0	0	0	1	0	0	0	0	0	1
	Non-involved	7	7	7	7	7	7	6	7	7	7	7	7	83
Spain	Acquirers	0	2	1	2	2	3	3	7	5	3	2	1	31
	Targets	0	1	2	1	0	2	1	0	1	2	1	3	14
	Non-involved	54	51	51	51	52	49	50	47	48	49	51	50	603
Total	Acquirers	7	14	11	27	21	15	12	13	14	11	16	14	175
	Targets	8	8	19	17	12	10	20	12	9	10	12	20	157
	Non-involved	1,573	1,566	1,558	1,544	1,555	1,563	1,556	1,563	1,565	1,567	1,560	1,554	18,724

Source: SNL

Appendix C.4 – Regulatory actions on NPLs by country and year

Country	Date	Type	Topic	Summary
Austria	2005	Standard	Credit risk management	FMA Minimum Standards for the Credit Business and other Transactions entailing Counterparty Risks
	2013	Standard	Credit risk management	FMA-Minimum Standards for the Risk Management and Granting of Foreign Currency Loans and Loans with Repayment Vehicles (FMA-FXTT).
	2014	Regulation	Credit risk management	Credit Institution Risk Management Regulation
	2015	Regulation	Recovery plans and credit risk recognition	FMA Regulation: Bank Recovery Plan Regulation
	2016	Law	Contract design and processing	Austrian Federal Mortgage and Real Estate Loan Act
Belgium	2012	Regulation	Broad reform	Regulation of the NBB on Collateral Valuation and Legal regime for Covered Bonds and Banking Act on the legal status and supervision of credit institutions
Cyprus	2008	Law	Management of credit risk	Guidelines to banks on the management of credit risk
	2013	Directive	Broad reform	Directives on loan origination and review of existing loans, loan impairment and provisioning procedures and arrears management
	2015	Law	Sale of loans	Law on sale of loans and loan portfolios
Estonia	2005	Regulation	Credit risk management	Regulation on Credit institution credit granting, and write-down of receivables regarded as doubtful
	2008	Guideline	Credit risk management	Guidelines on reporting and consumer rights protection
	2011	Guideline	Credit risk management	Guidelines on reporting, credit risk management and consumer rights protection
	2014	Regulation	Credit risk management	Regulation on Limits on granting housing loans and maximum loan maturity established by Eesti Pank, Credit risk management

(Continued)

Country	Date	Type	Topic	Summary
Finland	2014	Regulation	Broad reform	General Banking Act of Finland
	2016	Guidelines	Financial recognition and collateral valuation	Regulations on LTV and management of credit risk
Germany	2005	Regulation	Credit risk management	Minimum Requirements for Risk Management
	2006	Regulation	Collateral valuation	Regulation on the determination of the mortgage lending value (Beleihungswertermittlungsverordnung)
	2013	Regulation	National specificities and requirements	Solvency regulation (Solvabilitätsverordnung)
	2014	Regulation	Reporting and financial recognition	Reporting reform (FinaRisikoV) and details on risk-bearing capacity
Greece	2014	Regulation	Management of NPLs	Executive Committee Act (ECA) on loan management, governance, resolution, NPL monitoring and reporting framework
	2015	Regulation	Management of NPLs	Changes to the ECA on reporting and forbearance
	2016	Regulation	Management of NPLs	Changes to the ECA on NPL incorporation
Ireland	2005	Regulation	Risk management, provisioning and reporting	Regulatory Document – Impairment Provisions for Credit Exposure
	2011	Guidelines	Valuation, procedures and disclosures	Valuation Processes in the Banking Crisis and Impairment Provisioning and Disclosure Guidelines
	2013	Framework	Mortgage arrears	Mortgage Arrears Resolution Targets framework on workout strategies and Internal Guidelines
	2015	Regulation	Mortgage lending	Restrictions on Residential Mortgage Lending

(Continued)

Country	Date	Type	Topic	Summary
Italy	2005	Circular	Reporting and financial recognition	Balance sheet reporting on disclosure requirements
	2008	Circular	Credit risk management	Provisions for the assessment of credit risk management processes (supervisory manual of the Bank of Italy)
	2013	Circular	Credit risk management	Provisions on credit risk management on governance, valuation and risk assessment
Latvia	2009	Regulation	Valuation and provisioning	FCMC Regulation on Valuation of Assets and Supervisory Provisioning
	2010	Regulation	Credit risk management	FCMC Regulations on Credit Risk Management and on the Preparation and Submission of Information on Loan Portfolio Structure of Banks
	2013	Regulation	Reporting and financial recognition	Revised version of the FCMC Regulation on Credit Risk Management
Lithuania	2005	Regulation	Loan assessment requirements	Minimum loan assessment requirements on identification of impaired loans and loan loss provisioning
	2008	Regulation	Management of risk assessment and internal controls	Risk Management regulation
	2011	Regulation	Credit risk management	Responsible lending requirements applicable to retail lending
Luxembourg	2012	Circular	Internal governance and risk management	Risk Management regulation to improve transparency and consistency
	2014	Circular	Reporting and financial recognition	Supervisory reporting requirements for credit institutions
Malta	2013	Banking rule	Credit risk management	Regulation on risk mitigation, guidance on forbearance and NPLs
	2016	Banking rule	Credit risk management	Amendment to the 2013 rule

(Continued)

Country	Date	Type	Topic	Summary
Netherlands	2006	Law	Reporting and financial recognition	Credit register (Bureau Krediet Registratie)
	2013	Regulation and Guidelines	Reporting and regulation	Reporting reform on distressed loans and limit imposition on residential mortgage loan concession
Portugal	2008	Binding opinion	Credit risk management	Minimum requirements on credit risk management and control
	2009	Circular	Foreclosed assets	Guidance on foreclosed assets and guidance
	2014	Instruction and circular	Credit risk management, reporting and financial recognition	Criteria for problem loans identification and recording. Procedures and guidance on collateral and provisioning. Reporting requirements on asset quality and credit risk management.
Slovakia	2015	Decree	Risk management	Details of risk management function, branches and interest rate shocks
Slovenia	2007	Regulation	Risk management, impairments and restructured exposures	Regulation on risk management, requirements and ICAAP implementation; regulation on assessment of credit risk losses, impairment, reporting and financial recognition
	2014	Guidelines	NPL management	Guidelines on impairment and provisioning for restructured clients
	2015	Guidelines	NPL management	Guidelines on customer monitoring, early warning systems for increased credit risk and management of doubtful claims
Spain	2005	Circular	Credit risk management	Requirements on credit risk analysis, allowances and provision; criteria for documenting, monitoring and reviewing refinanced and restructured loans

Source: ECB (2017a)

Appendix C.5 – Summary statistics by category of bank in sample

Appendix C.5.i – Number of banks by category and year

	Acquirers		Targets		Non-involved	
	Mean	StDev	Mean	StDev	Mean	StDev
Log (Total Assets)	18.103	2.022	17.352	1.989	14.392	2.277
Return on Assets	0.002	0.024	0.000	0.020	0.006	0.051
Operating Expenses to Total Assets	0.017	0.007	0.016	0.010	0.026	0.112
Asset growth	0.130	0.222	0.002	0.157	0.047	0.201
Equity to Total Assets	0.070	0.076	0.060	0.036	0.091	0.252
Liquid Assets to Total Assets	0.101	0.076	0.128	0.101	0.146	0.162
Loans to Deposits	1.365	1.022	4.714	22.88	18.97	988.83
NPL to Total Assets	0.057	0.059	0.082	0.107	0.053	1.010
GDP growth	0.012	0.030	0.030	0.051	0.024	0.029
Unemployment rate	0.113	0.065	0.094	0.049	0.082	0.033
# Regulatory actions on NPLs	1.533	0.442	1.555	0.459	2.040	0.462
HHI	0.061	0.058	0.078	0.079	0.052	0.064

Appendix C.5.ii – Test statistics for in-sample differences

	Acquirers vs. Targets	Acquirers vs. Non-involved	Targets vs. Non-involved
Log (Total Assets)	**3.479**	**24.623**	**18.963**
Return on Assets	0.880	**-2.157**	**-3.685**
Operating Expenses to Total Assets	0.130	**-9.680**	**-8.134**
Asset growth	**6.245**	**4.999**	**-3.693**
Equity to Total Assets	**1.516**	**-3.619**	**-9.298**
Liquid Assets to Total Assets	**-2.749**	**-7.660**	**-2.179**
Loans to Deposits	-1.873	**-2.536**	**-1.989**
NPL to Total Assets	**-2.699**	0.436	**2.657**
GDP growth	**-3.990**	**-5.361**	1.541
Unemployment rate	**3.041**	**6.478**	**3.262**
# Regulatory actions on NPLs	-0.451	**-15.420**	**-13.49**
HHI	**-2.261**	**2.082**	**4.204**

Note: Significant differences at 95% level in bold

Appendix C.6 – Correlation matrix

		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Size	*1*	**1.00**															
Profitability	*2*	-0.02	**1.00**														
Cost efficiency	*3*	**-0.18**	**-0.09**	**1.00**													
Asset growth	*4*	**-0.05**	**-0.11**	**0.13**	**1.00**												
Capitalization	*5*	**-0.13**	**-0.26**	**0.04**	**-0.03**	**1.00**											
Liquidity	*6*	0.01	**0.06**	**0.08**	**0.06**	**0.04**	**1.00**										
Loan specialization	*7*	**0.03**	0.01	-0.01	-0.01	-0.02	0.01	**1.00**									
NPL	*8*	-0.01	**-0.10**	**-0.02**	**-0.07**	0.02	**-0.19**	-0.01	**1.00**								
GDP growth	*9*	**-0.06**	**0.06**	-0.02	0.01	0.01	**0.05**	-0.01	**-0.23**	**1.00**							
Unemployment rate	*10*	**0.11**	**-0.06**	**0.02**	0.01	-0.01	0.02	0.01	**0.37**	**-0.30**	**1.00**						
SSM	*11*	**-0.03**	0.01	-0.01	**-0.07**	0.02	**-0.04**	0.02	**0.03**	**0.11**	**0.05**	**1.00**					
NPL regulation	*12*	**-0.09**	-0.02	0.01	0.01	-0.01	**0.02**	0.01	**-0.07**	**0.04**	**-0.06**	**0.03**	**1.00**				
Market profitability	*13*	**0.09**	**0.30**	**-0.08**	**-0.06**	**0.03**	**0.13**	0.01	**-0.17**	**0.19**	**-0.19**	**0.03**	-0.01	**1.00**			
Market liquidity	*14*	**0.31**	**0.11**	-0.01	-0.02	-0.01	**0.37**	**0.02**	**-0.11**	**0.15**	**0.04**	**-0.11**	**-0.05**	**0.36**	**1.00**		
Market credit risk	*15*	**-0.07**	**-0.05**	**0.03**	**0.09**	**0.03**	**-0.06**	-0.01	**0.47**	**-0.42**	**0.42**	**-0.06**	**-0.05**	**-0.17**	**-0.16**	**1.00**	
HHI	*16*	0.01	-0.01	-0.01	**0.04**	**0.05**	**0.03**	0.01	**-0.03**	**0.06**	**0.11**	**-0.02**	-0.02	**-0.03**	**0.07**	**-0.06**	**1.00**

Note: In bold are correlations significant at a 5% significance level

APPENDIX D

Appendix D.1 – Mc-Fadden-Train-Tye test specification and results

Appendix D.1.i – Test description

The Mc-Fadden-Train-Tye likelihood ratio test compares the log-likelihood of the full (base) model to that of restricted estimations, where outcomes are dropped. Applying the notation in McFadden (1977) and Cheng and Long (2007), which we follow in detail, to the model employed in this study, the full model is given, as in section 3, by:

$$P(Y_t = i|X_{t-1}) = \frac{e^{\alpha+\beta^{f\prime}X}}{1+e^{\alpha+\beta^{f\prime}X}}, i = 0,1 \quad (3)$$

While the restricted models $j = 1,2,3$ for different restrictions of i are given by:

$$j = 1: \quad P(Y_t = i|X_{t-1}) = \frac{e^{\alpha+\beta^{r1\prime}X}}{1+e^{\alpha+\beta^{r1\prime}X}}, i = 0,1 \quad (4)$$

$$j = 2: \quad P(Y_t = i|X_{t-1}) = \frac{e^{\alpha+\beta^{r2\prime}X}}{1+e^{\alpha+\beta^{r2\prime}X}}, i = 0,2 \quad (5)$$

$$j = 3: \quad P(Y_t = i|X_{t-1}) = \frac{e^{\alpha+\beta^{r3\prime}X}}{1+e^{\alpha+\beta^{r3\prime}X}}, i = 1,2 \quad (6)$$

Under IIA, $\widehat{\beta_i^{rj}}$ for $j = 1,2,3$ are consistent yet inefficient, while the estimated $\widehat{\beta_i^{f}}$ in the full (base) model are consistent as well as efficient. Under H_0, both models are The Mc-Fadden-Train-Tye test is thus given, for each restricted model j, by: $MTT = -2\left[L_r\left(\widehat{\beta_i^{f}}\right) - L_r\left(\widehat{\beta_i^{rj}}\right)\right]$, where L_r is the log-likelihood for each estimation. If IIA holds, MTT ~ $\chi^2(t)$ where t corresponds to the degrees of freedom of each restricted model (which is not the case).

Appendix D.1.ii – Results of the MTT test

Restricted model	Log likelihood	Test-statistic $\chi^2(17)$
$j = 1$	-1150.3784	-195.91***
$j = 2$	-1192.0991	-279.35***
$j = 3$	-1115.0705	-125.29***

*** Significant at 1% level, ** Significant at the 5% level, * Significant at the 10% level

Appendix D.2 – Alternative specifications for the multinomial logit model

	Base regression		(1)		(2)	
	Acquirers	Targets	Acquirers	Targets	Acquirers	Targets
Size	0.345***	0.348***	0.375***	0.342***	0.363***	0.334***
	[0.06]	[0.055]	[0.059]	[0.055]	[0.058]	[0.055]
Profitability	22.356**	-2.611	9.619*	8.36	3.744	5.987
	[10.934]	[6.473]	[5.636]	[5.183]	[5.993]	[5.059]
Cost efficiency	3.377	3.146*	2.959	1.490	3.002	1.938
	[2.489]	[1.866]	[2.33]	[5.356]	[2.100]	[4.548]
Asset growth	0.428	-0.805	0.533	-1.065	0.516	-1.148
	[0.364]	[0.757]	[0.345]	[0.826]	[0.349]	[0.813]
Capitalization	-10.57***	-5.901**	-7.056***	-8.51***	-5.536**	-7.77***
	[3.087]	[2.365]	[2.589]	[2.29]	[2.526]	[2.247]
Liquidity	-1.957*	-0.848	-2.366**	-2.459**	-1.970*	-2.16**
	[1.154]	[1.006]	[1.165]	[1.128]	[1.108]	[1.095]
Loan specialization	-0.002**	0.000	-0.001**	0.000	-0.001*	0.000
	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]
NPL	-1.043	3.397**	0.507	4.105***	0.530	3.513**
	[2.434]	[1.458]	[1.524]	[1.506]	[1.415]	[1.452]
GDP growth	-3.539	2.587			-3.739	2.324
	[5.121]	[3.220]			[4.514]	[3.300]
Unemployment rate	14.13***	6.126**			9.173***	7.029***
	[2.646]	[2.534]			[2.349]	[2.200]
SSM	-0.615**	-0.473**				
	[0.243]	[0.223]				
NPL regulation	-0.130*	0.014				
	[0.074]	[0.072]				
Market profitability	26.000*	-3.312				
	[14.201]	[8.058]				
Market liquidity	-0.261	4.713***				
	[2.405]	[1.778]				
Market credit risk	-4.588**	1.971				
	[2.353]	[1.765]				
HHI	-4.585*	3.198**				
	[2.577]	[1.497]				
Constant	-6.29***	-6.99***	-6.16***	-5.72***	-6.64***	-6.29***
	[0.542]	[0.465]	[0.277]	[0.25]	[0.379]	[0.335]
McFadden R^2	9.7%		5.9%		7.1%	
$\chi 2$	227.02 (34) ***		138.71 (18) ***		166.53 (22) ***	
Number of obs.	9872		9919		9919	

Robust st. dev. in brackets. *** Significant at 1% level, ** Significant at the 5% level, * Significant at the 10% level

(Continued)

	(3)		(4)	
	Acquirers	Targets	Acquirers	Targets
Size	0.359***	0.336***	0.35***	0.346***
	[0.058]	[0.054]	[0.06]	[0.055]
Profitability	3.925	6.166	21.945**	-3.358
	[5.777]	[4.917]	[10.781]	[6.522]
Cost efficiency	3.034	2.107	3.4	3.133*
	[2.007]	[4.103]	[2.559]	[1.87]
Asset growth	0.496	-1.028	0.42	-0.894
	[0.335]	[0.79]	[0.382]	[0.773]
Capitalization	-5.586**	-7.70***	-10.53***	-5.789**
	[2.489]	[2.216]	[3.06]	[2.355]
Liquidity	-1.719	-2.051*	-2.043*	-0.832
	[1.107]	[1.086]	[1.129]	[0.998]
Loan specialization	-0.002**	0.000	-0.001*	0.000
	[0.001]	[0.001]	[0.001]	[0.000]
NPL	1.044	3.919***	-1.954	2.93**
	[1.411]	[1.441]	[2.461]	[1.47]
GDP growth	0.9	4.424	-8.486*	0.931
	[4.357]	[3.227]	[5.029]	[3.236]
Unemployment rate	11.013***	8.085***	12.729***	5.258**
	[2.391]	[2.208]	[2.612]	[2.543]
SSM	-0.732***	-0.58***		
	[0.237]	[0.219]		
NPL regulation	-0.116*	0.004		
	[0.07]	[0.071]		
Market profitability			23.575*	-4.365
			[13.731]	[7.998]
Market liquidity			0.739	5.211***
			[2.326]	[1.739]
Market credit risk			-5.443**	1.723
			[2.559]	[1.799]
HHI			-4.625*	3.371**
			[2.605]	[1.512]
Constant	-6.37***	-6.16***	-6.68***	-7.12***
	[0.396]	[0.369]	[0.522]	[0.43]
McFadden R^2	8.0%		8.3%	
$\chi 2$	185.94 (26) ***		193.57 (30) ***	
Number of obs.	9919		9872	

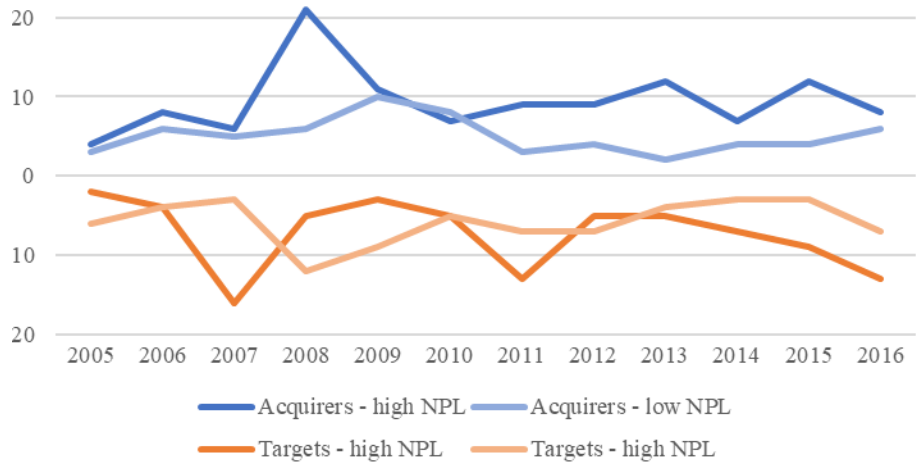
Robust st. dev. in brackets. *** Significant at 1% level, ** Significant at the 5% level,
* Significant at the 10% level

Appendix D.3 – M&A in high vs. low NPL countries

Appendix D.3.i – Number of banks by category and type of country by year

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
High NPL countries	Acquirers	4	8	6	21	11	7	9	9	12	7	12	8	114
	Targets	2	4	16	5	3	5	13	5	5	7	9	13	87
	Non-involved	516	510	500	496	508	510	500	508	505	508	501	501	6,063
Low NPL countries	Acquirers	3	6	5	6	10	8	3	4	2	4	4	6	61
	Targets	6	4	3	12	9	5	7	7	4	3	3	7	70
	Non-involved	1,057	1,056	1,058	1,048	1,047	1,053	1,056	1,055	1,060	1,059	1,059	1,053	12,661

Appendix D.3.ii – Number of deals by type of country by year



Appendix D.3.iii – Summary statistics by category of bank in sample for High NPL countries

	Acquirers		Targets		Non-involved	
	Mean	StDev	Mean	StDev	Mean	StDev
Log (Total Assets)	17.58	1.817	16.96	1.820	14.29	2.194
Return on Assets	0.001	0.029	-0.002	0.026	0.004	0.046
Operating Expenses to Total Assets	0.019	0.006	0.019	0.010	0.029	0.174
Asset growth	0.127	0.174	0.032	0.169	0.055	0.195
Equity to Total Assets	0.084	0.089	0.069	0.033	0.101	0.092
Liquid Assets to Total Assets	0.076	0.054	0.109	0.114	0.129	0.152
Loans to Deposits	1.298	0.336	2.405	6.327	9.013	81.98
NPL to Total Assets	0.078	0.063	0.117	0.125	0.115	1.756
GDP growth	0.007	0.029	0.030	0.060	0.015	0.031
Unemployment rate	0.130	0.073	0.112	0.057	0.102	0.041
# Regulatory actions on NPLs	1.733	0.448	1.750	0.485	2.014	0.461
HHI	0.056	0.044	0.069	0.044	0.046	0.027

Appendix D.3.iv – Summary statistics by category of bank in sample for Low NPL countries

	Acquirers		Targets		Non-involved	
	Mean	StDev	Mean	StDev	Mean	StDev
Log (Total Assets)	19.10	2.034	17.78	2.088	14.44	2.312
Return on Assets	0.004	0.004	0.002	0.009	0.007	0.054
Operating Expenses to Total Assets	0.013	0.006	0.014	0.010	0.024	0.067
Asset growth	0.134	0.294	-0.029	0.137	0.044	0.204
Equity to Total Assets	0.042	0.019	0.051	0.036	0.087	0.298
Liquid Assets to Total Assets	0.152	0.089	0.150	0.081	0.153	0.165
Loans to Deposits	1.492	1.677	7.279	32.51	23.69	1199.2
NPL to Total Assets	0.016	0.011	0.040	0.056	0.023	0.040
GDP growth	0.023	0.030	0.031	0.039	0.029	0.027
Unemployment rate	0.080	0.019	0.072	0.022	0.072	0.022
# Regulatory actions on NPLs	1.145	0.432	1.306	0.409	2.053	0.462
HHI	0.070	0.078	0.089	0.107	0.055	0.075

Appendix D.3.v – Multinomial logit model results for high vs. low NPL countries

	High NPL countries		Low NPL countries	
	Acquirers	Targets	Acquirers	Targets
Size	0.356***	0.328***	0.478***	0.364***
	[0.075]	[0.074]	[0.096]	[0.079]
Profitability	28.853**	-0.412	23.123**	-25.69
	[13.418]	[8.748]	[11.680]	[16.705]
Cost efficiency	12.169*	19.274***	3.672	2.410
	[6.490]	[6.455]	[3.19]	[3.783]
Asset growth	0.663	-0.457	-0.147	-0.635
	[0.408]	[1.006]	[0.933]	[1.021]
Capitalization	-13.645**	-9.651**	-16.229***	-8.054**
	[5.915]	[4.748]	[5.086]	[3.698]
Liquidity	-4.835***	-1.376	1.243	-0.483
	[1.367]	[1.539]	[1.508]	[1.506]
Loan specialization	-0.001*	0.000	-0.001*	0.000
	[0.001]	[0.001]	[0.001]	[0.000]
NPL	-0.848	2.457*	-12.19	5.954*
	[2.036]	[1.445]	[14.939]	[3.656]
GDP growth	-0.860	-0.743	-7.892	11.930
	[4.187]	[3.768]	[8.739]	[7.401]
Unemployment rate	6.447**	-0.135	46.433***	23.368***
	[2.996]	[3.366]	[9.928]	[8.703]
SSM	-0.548*	-0.223	-0.457	-0.392
	[0.338]	[0.309]	[0.447]	[0.34]
NPL regulation	-0.056	0.099	-0.055	-0.079
	[0.078]	[0.099]	[0.127]	[0.105]
Market profitability	5.160**	14.529	29.761**	-79.204***
	[2.593]	[17.519]	[12.633]	[21.475]
Market liquidity	4.869	0.744	6.450*	8.679***
	[3.906]	[3.081]	[3.771]	[2.519]
Market credit risk	-6.635**	0.356	-86.57***	-25.472*
	[2.785]	[1.990]	[33.317]	[13.125]
HHI	-19.797*	11.036***	-7.657**	1.389
	[11.480]	[4.079]	[3.570]	[2.13]
Constant	-4.189***	-5.74***	-7.852***	-8.028***
	[0.495]	[0.617]	[1.192]	[0.800]
McFadden R^2	18.6%		21.9%	
$\chi 2$	254.35 (32) ***		242.93 (32) ***	
Number of obs.	3325		6539	

Robust st. dev. in brackets. *** Significant at 1% level, ** Significant at the 5% level, * Significant at the 10% level

Appendix D.4 – M&A pre and post-sovereign debt crisis

Appendix D.4.i – Summary statistics by category of bank in sample pre-sovereign crisis

	Acquirers		Targets		Non-involved	
	Mean	StDev	Mean	StDev	Mean	StDev
Log (Total Assets)	18.629	1.682	17.716	1.977	15.283	2.461
Return on Assets	0.006	0.011	0.006	0.010	0.006	0.052
Operating Expenses to Total Assets	0.017	0.007	0.014	0.010	0.021	0.050
Asset growth	0.126	0.241	0.039	0.210	0.072	0.179
Equity to Total Assets	0.061	0.035	0.055	0.040	0.081	0.143
Liquid Assets to Total Assets	0.116	0.076	0.143	0.091	0.159	0.160
Loans to Deposits	1.469	0.849	8.778	34.453	9.312	155.54
NPL to Total Assets	0.037	0.036	0.054	0.073	0.037	0.057
GDP growth	0.016	0.032	0.036	0.044	0.024	0.035
Unemployment rate	0.083	0.029	0.074	0.028	0.082	0.020
# Regulatory actions on NPLs	1.274	0.000	1.000	0.000	1.336	0.000
HHI	0.046	0.038	0.075	0.086	0.049	0.065

Appendix D.4.ii – Summary statistics by category of bank in sample post-sovereign crisis

	Acquirers		Targets		Non-involved	
	Mean	StDev	Mean	StDev	Mean	StDev
Log (Total Assets)	17.624	2.191	17.082	1.981	14.074	2.117
Return on Assets	-0.002	0.031	-0.004	0.024	0.006	0.052
Operating Expenses to Total Assets	0.016	0.006	0.018	0.010	0.027	0.126
Asset growth	0.135	0.209	-0.021	0.098	0.043	0.199
Equity to Total Assets	0.077	0.100	0.064	0.032	0.093	0.280
Liquid Assets to Total Assets	0.088	0.075	0.118	0.108	0.141	0.160
Loans to Deposits	1.280	1.168	1.674	3.627	20.407	1124.86
NPL to Total Assets	0.075	0.070	0.101	0.122	0.057	1.139
GDP growth	0.008	0.028	0.026	0.057	0.024	0.022
Unemployment rate	0.148	0.077	0.112	0.056	0.081	0.042
# Regulatory actions on NPLs	1.663	0.503	1.831	0.503	2.412	0.500
HHI	0.078	0.072	0.082	0.072	0.056	0.062

Appendix D.4.iii – Multinomial logit model results for pre vs. post-sovereign debt crisis

	Pre-sovereign debt crisis		Post-sovereign debt crisis	
	Acquirers	Targets	Acquirers	Targets
Size	0.340***	0.322***	0.553***	0.443***
	[0.080]	[0.073]	[0.079]	[0.074]
Profitability	32.693**	-6.099	36.500***	-3.035
	[15.657]	[11.893]	[13.636]	[8.862]
Cost efficiency	3.604	2.371	-9.285	4.828**
	[5.325]	[4.927]	[15.481]	[2.454]
Asset growth	0.172	-0.152	0.710	-2.785**
	[0.717]	[0.778]	[0.543]	[1.299]
Capitalization	-8.712*	-1.318	-8.69**	-12.07***
	[4.648]	[2.978]	[4.373]	[3.735]
Liquidity	-0.562	-1.093	-3.948**	-0.806
	[1.426]	[1.357]	[1.912]	[1.289]
Loan specialization	-0.003	0.000	-0.002**	0.000
	[0.006]	[0.002]	[0.001]	[0.000]
NPL	9.261	4.466*	-3.226**	2.077
	[3.808]	[2.454]	[1.633]	[1.956]
GDP growth	-11.902*	-6.287	-23.745*	0.009
	[6.127]	[5.043]	[12.938]	[4.233]
Unemployment rate	12.55***	-0.906	13.38***	11.02***
	[4.696]	[4.800]	[3.378]	[2.731]
SSM	*n.a.*	*n.a.*	-0.936**	-0.770**
	n.a.	*n.a.*	[0.464]	[0.348]
NPL regulation	-0.165	-0.022	-0.018	0.068
	[0.105]	[0.097]	[0.108]	[0.104]
Market profitability	91.33***	-7.094	6.592**	5.224
	[22.889]	[14.587]	[3.263]	[11.796]
Market liquidity	-5.797	6.831***	-2.212	2.470**
	[3.610]	[2.307]	[3.709]	[1.244]
Market credit risk	-22.171***	-0.790	-2.817**	3.739*
	[7.234]	[3.923]	[1.401]	[2.152]
HHI	-9.715**	5.322***	-4.370	-0.436
	[4.704]	[1.766]	[3.220]	[2.548]
Constant	-4.699***	-5.879***	-4.699***	-5.879***
	[0.823]	[0.722]	[0.823]	[0.722]
McFadden R^2	15.5%		24.8%	
$\chi 2$	-211.76 (30) ***		-288.34 (30) ***	
Number of obs.	3963		5909	

Robust st. dev. in brackets. *** Significant at 1% level, ** Significant at the 5% level, * Significant at the 10% level

Note: The SSM dummy is automatically dropped for the pre-crisis model as it is always 0.

Appendix D.5 – Relative risk ratios for all specifications

	Base model		High NPL		Low NPL		Pre-crisis		Post-crisis	
	Acq.	Tar.	Acq.	Tar.	Acq.	Tar.	Acq.	Tar.	Acq.	Tar.
Size	1.412	1.416	1.428	1.389	1.613	1.440	1.405	1.380	1.739	1.558
	[0.061]	[0.057]	[0.078]	[0.077]	[0.101]	[0.083]	[0.084]	[0.076]	[0.083]	[0.077]
Profitability	1.251	0.974	1.335	0.996	1.261	0.774	1.387	0.941	1.441	0.971
	[0.116]	[0.067]	[0.144]	[0.092]	[0.308]	[0.182]	[0.17]	[0.127]	[0.147]	[0.093]
Cost efficiency	1.034	1.032	1.130	1.213	1.038	1.025	1.037	1.024	0.912	1.050
	[0.025]	[0.019]	[0.068]	[0.067]	[0.033]	[0.039]	[0.055]	[0.051]	[0.168]	[0.025]
Asset growth	1.004	0.992	1.007	0.996	0.999	0.994	1.002	0.999	1.008	0.973
	[0.004]	[0.008]	[0.005]	[0.011]	[0.01]	[0.011]	[0.008]	[0.008]	[0.006]	[0.014]
Capitalization	0.900	0.943	0.873	0.909	0.851	0.923	0.917	0.987	0.917	0.887
	[0.031]	[0.024]	[0.061]	[0.049]	[0.053]	[0.038]	[0.048]	[0.031]	[0.045]	[0.039]
Liquidity	0.981	0.992	0.953	0.987	1.013	0.996	0.995	0.990	0.962	0.992
	[0.012]	[0.010]	[0.014]	[0.016]	[0.016]	[0.016]	[0.015]	[0.014]	[0.02]	[0.013]
Loan specialization	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0]	[0.001]	[0.001]	[0.001]	[0.000]
NPL	0.990	1.035	0.992	1.025	0.886	1.062	1.098	1.046	0.969	1.021
	[0.025]	[0.015]	[0.021]	[0.015]	[0.162]	[0.038]	[0.039]	[0.025]	[0.017]	[0.02]
GDP growth	0.965	1.026	0.992	0.993	0.925	1.127	0.888	0.940	0.789	1.001
	[0.053]	[0.033]	[0.043]	[0.039]	[0.092]	[0.077]	[0.064]	[0.052]	[0.139]	[0.044]
Unemployment rate	1.152	1.063	1.067	0.999	1.591	1.264	1.134	0.991	1.144	1.117
	[0.027]	[0.026]	[0.031]	[0.035]	[0.105]	[0.091]	[0.049]	[0.05]	[0.035]	[0.028]
SSM	0.541	0.623	0.579	0.801	0.634	0.676	n.a.	n.a.	0.393	0.464
	[0.275]	[0.250]	[0.403]	[0.363]	[0.564]	[0.405]	n.a.	n.a.	[0.591]	[0.417]
NPL regulation	0.878	1.014	0.946	1.105	0.947	0.925	0.848	0.979	0.983	1.071
	[0.077]	[0.074]	[0.082]	[0.105]	[0.136]	[0.111]	[0.111]	[0.102]	[0.115]	[0.11]
Market profitability	1.297	0.967	1.050	1.008	1.067	1.091	0.944	1.071	0.979	1.026
	[0.153]	[0.084]	[0.04]	[0.032]	[0.039]	[0.026]	[0.037]	[0.024]	[0.038]	[0.027]
Market liquidity	0.997	1.048	0.936	1.004	0.421	0.776	0.802	0.993	0.973	1.039
	[0.024]	[0.018]	[0.029]	[0.021]	[0.396]	[0.141]	[0.076]	[0.041]	[0.015]	[0.022]
Market credit risk	0.955	1.02	0.821	1.117	0.927	1.014	0.908	1.055	0.958	0.996
	[0.024]	[0.018]	[0.122]	[0.042]	[0.037]	[0.022]	[0.049]	[0.018]	[0.033]	[0.026]
HHI	0.955	1.032	1.053	1.157	1.347	0.453	2.493	0.932	1.069	1.054
	[0.026]	[0.015]	[0.231]	[0.192]	[0.411]	[0.24]	[0.258]	[0.158]	[0.17]	[0.126]
Constant	0.002	0.001	0.016	0.004	0.001	0.001	0.010	0.003	0.010	0.003
	[0.72]	[0.59]	[0.641]	[0.854]	[2.294]	[1.226]	[1.278]	[1.059]	[1.278]	[1.059]

Robust st. dev. in relative risk ratio form in brackets