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The prevalence of Zombie Banks:

The case of the EU during 2008-2014.

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Introduction

The recent financial crisis of 2008 put in the spotlight not only banks' balance sheets and behaviour, but also the government aid that they received. Critics of this government intervention into the financial sector argue that taxpayers' money spent in aiding banks either was not necessary, was spent inappropriately, or gave rise to inappropriate incentives from the part of the banks. The "lender of last resort" debate, which has accompanied us for as long as the modern financial system has been in place, seems to have shifted from the aid that central banks provided to the banks into the aid that the state provides to the banks. It seems rational that if a bank was to reach the state where it would fail, the government would allow it to do so. Instead, what we have noticed in the past is the government's willingness to be a "lender of last resort". This means not only that taxpayers' money is spent on rescuing banks instead of being spent on other social projects, but also that banks lose all incentives to be more careful in risk-taking in the hope of government bailouts. The result of this government support is that banks that should be bankrupt, i.e. whose assets would be smaller than their liabilities if it were not for the government support, are still existent. These banks, whose equity would be negative if it were not for the government support, are what we call zombie banks.

The research questions

This research intends to answer three important questions that arise when discussing zombie banks.

1. First, have zombie banks been prevalent in the European Union (EU) during the 2008-2014 period? Our first hypothesis is that zombie banks have indeed been prevalent in the EU.
2. The second question is whether the existing identification methods of zombie banks used in academic literature are consistent, i.e. whether a bank that is identified as zombie in a certain year by one identification method is still identified as zombie in the

same year by other identification methods. Our second hypothesis is that existing identification methods of zombie banks are indeed inconsistent.

3. The third research question is whether government support in the form of capital injections that was given to banks during the crisis was given only to solvent but financially distressed banks or to insolvent banks as well. Our third hypothesis is that the government recapitalisation of banks was used for both solvent and insolvent banks.

Liquidity, Solvency, and Zombie Banks

Solvency is defined by Oxford Dictionaries as "*the possession of assets in excess of liabilities*" or the "*ability to pay debts*" (Oxford Dictionaries, 2016), as demonstrated in the below equation. By comparison, an insolvent bank is one whose liabilities exceed the assets and thereby cannot pay all its debts in the long run. Any insolvent institution should be liquidated. This involves a sale of its assets in order to repay debtholders in order of seniority (from the most senior to the subordinated debtholders).

Solvent bank if: Total Assets > Total Liabilities

Solvency risk is therefore the risk that a bank will not be able to meet its obligations because its assets are smaller than its liabilities. A bank can be in a situation of insolvency if it incurs significant losses from impaired assets and if these losses are higher than its equity buffer. Given that the impaired assets have to be written down to correctly reflect their value, the bank's equity serves as a buffer that can compensate this write-down before the assets eventually become lower than the liabilities. Therefore, if the equity buffer is lower than the write-down of impaired assets, the bank will become insolvent (Almarzoqi, Naceur, & Scopelliti, 2015, p. 11).

"*Liquidity is the speed and ease with which a financial asset can be converted into cash or used to settle liabilities*" (European Central Bank, 2016a). Therefore, liquidity risk is a risk that a financial institution will not meet its short-term obligations, either because it does not have

enough liquid assets or because it cannot transform its financial assets fast enough into cash for a reasonable price (Almarzoqi et al., 2015, p.12).

Solvent banks with liquidity problems can become insolvent if the cost of funding is too high or the price for their financial assets is too low during a liquidity crisis. During the financial crisis of 2008, government support of financial institutions was seen as necessary. Government support was undertaken in a large scale in the non-eastern part of the European Union (EU). This government support was supposed to go to "healthy" banks that were under short-term financial distress and liquidity problems, and not to insolvent banks (Official Journal of European Union, 2008). The term zombie banks is related closely to insolvency as opposed to liquidity, as explained below.

"As a bank's net worth declines through zero, it becomes a ''zombie'' institution. A zombie is an insolvent institution whose ability to renew its deposit funding and its foreign debt depends entirely on the continuing credibility of the explicit and implicit government guarantees that the government's banking policies attach to its obligations. As long as the government guarantees remain credible, its creditors have little reason to force the zombie into a corporate grave" (Kane, 2000, p. 163).

Existing identification methods of Zombie Banks

Theoretically, we can easily detect zombie banks, as we only need to know which are the negative capital banks that still exist or which would be the negative capital banks if it would not be for government support. In practice, however, it is difficult to identify zombie banks for two reasons. First, there can hardly be negative capital banks that still exist. Second, the zombie banks that exist just because of government support cannot be easily identified as the effect of the government support is already reflected in the banks' balance sheets. That is why researchers have tried to find different ways of identifying zombie banks. There are three existing identification methods of zombie banks; each of them uses either market data, balance sheet data, or a combination of both to arrive at the identification of zombie banks.

The first identification method uses Tobin's q, which is a measure of the market value to the book value of assets. The proponents of this method define a zombie bank as a bank whose Tobin's q is lower than one, i.e. whose market value is lower than its book value of assets. The second identification method uses a comparison of intangible assets and the book value of equity. The proponents of this method define a zombie bank as a bank whose intangible assets are bigger than the book value of common equity. The third identification method uses a comparison of the book value of liabilities and the market value of common and preferred shares. The proponents of this method define a zombie bank as a bank whose book value of total liabilities is bigger than the market value of common and preferred shares. In our study we discuss all three definitions, identify zombie banks in each year only for the first two definitions (due to a lack of data to build the third definition) and compare the consistency of the results.

New proposed identification method

In this paper, we present a new way of identifying zombie banks, which is especially useful and meaningful in times of financial crises characterized by heavy government support, such as the latest financial crisis in Europe. Given that zombie banks exist as a consequence of government support of any type, our identification method uses one kind of government support to arrive at the conclusion of which banks are zombie. Since government capital injections have the clearest effect on banks' balance sheets compared to others type of government support, we propose to identify zombie banks using government injection as a variable. Our proposed identification method of zombie banks consists in identifying a bank as zombie if the book value of its total shareholders' equity is less than the value of the government injection it received. Government injections are directly reflected into the equity part of the balance sheet. Therefore, we conclude that if the value of equity at the balance sheet date is less than the value of the government injection, the bank is a zombie, i.e. it would have had negative equity if it would not be for the injection of capital from the government.

Regulators' response to the crisis

The importance of zombie banks is clearly seen in the necessity of the initiatives that the European Commission pursued in response to the financial crisis of 2008. These initiatives, which form the Single Rulebook, are the foundation of the Banking Union in the EU. Given the interdependencies of the countries in the euro area and the integration of the banking system, the only large-scale solution to dealing effectively with a financial crisis and bank bankruptcies was the establishment of the Banking Union. Its initiatives were pursued in the hope of creating a safer and sounder financial sector, while in the same time decreasing government costs and involvement in failing banks. In this paper, we analyse the Single Rulebook, the Banking Union and the stress testing of EU banks.

Structure of the paper

The research is divided into two major parts.

Part 1 is the Literature Review. In the literature review we first present the history of zombie banks. Then, we discuss current identification methods of zombie banks. Third, we present all types of government support and choose the type of government support that we will use for our new identification method of zombie banks. Fourth, we present a literature review on the effects of zombie banks in the economy, the costs of bank failures, and the resolution methods of insolvent banks.

Part 2 is the Case Study. In the case study we first explain banks' financial statements. Then, we analyse the cost of government intervention into the "financially distressed" banks in non-Eastern EU. Third, we conduct data analysis. In the data analysis, we (1) analyse the prevalence of zombie banks in non-Eastern EU using both existing and new proposed identification method of zombie banks, (2) we compare the number of zombie banks identified under each definition and conclude on the consistency of the identification results, and (3) draw conclusion on whether government support in the form of capital injections was given only to solvent but financially distressed banks or also to insolvent banks. Lastly, we highlight the

measures that the EU authorities have undertaken to prevent and deal with both solvent but financially distressed and insolvent banks.

Towards the end, we present our conclusions, limitations of our findings, and open the way for future research.

Part I. Literature review

Given the extensiveness of the topics related to our research, we classify literature review in the following subtopics.

Chapter 1. History of Zombie Banks

1.1 Savings & Loans in the US

The term "zombie" was first applied to financial institutions by Edward J. Kane, a research professor of finance and a prolific writer on banking, in 1987 during the Savings and Loan (S&L) debacle in the US (Kane, 1987, p. 77). Kane describes the S&L institutions (the thrifts) as the "living dead" due to regulatory forbearance. Regulatory forbearance, or capital forbearance, is a regulatory behaviour (implemented by central banks and other regulatory authorities) that permits financial institutions to continue operating even when their capital is below an acceptable level or even fully depleted. Regulatory forbearance consists in giving financial institutions extended periods of time to allow them to comply with regulatory requirements, i.e. capital requirements, instead of taking disciplinary action against those financial institutions.

The S&L crisis was the result of several factors, among which regulatory forbearance (Ely, 1993). First, the roots of the crisis lay in the faulty Federal Deposit Insurance, which charged the same insurance premium rate regardless of the riskiness of the S&L institutions. Second, borrowing short and lending long created a "maturity mismatch" that was higher than optimal even for S&L institutions. Third, the policymakers' decisions to curb money supply spurred an increase in interest rates, which intensified the maturity mismatch problem as the short-term liabilities that had to be rolled forward were rolled forward at interest rates that were much higher than those being received by the assets. Fourth, deregulation incentivized an increased risk taking by S&Ls. Fifth, reduced capital standards through inept accounting rules allowed S&Ls to hide their insolvency. Sixth, incompetent supervision of these institutions allowed them to continue functioning in a dysfunctional way. Finally, taxpayer losses absorbed by the Federal Savings and Loan Insurance Corporation (FSLIC) dramatically increased through the

postponed closure of insolvent S&L institutions, until FSLIC became insolvent in 1989 even after several attempts to recapitalise it with taxpayer money.

Kane and Yu (1996, p. 271) argued that policymakers in the US allowed insolvent (negative net worth) government-insured S&L institutions to continue functioning without trying to preserve their actual values. This attitude of regulators encouraged high-risk taking from the part of S&Ls, through lending to risky borrowers in the hope of getting higher returns and improving their financial position. The cost of the regulatory forbearance that allowed the zombie S&Ls to continue operating may represent a large part of the total cost of the S&L crisis, which was over USD 150 billion (United States General Accounting Office, 1995).

1.2 The case of Japan

Japan was the second large-scale instance of the prevalence of zombie banks in an economy (Kane, 2000, pp. 166-170). The Japanese financial crisis, typically known in economic literature as the Japanese Lost Decade, started with a collapse of asset prices in the beginning of 1990s. This marked the start of trouble for many Japanese banks, which later spilled over to the real economy. In order to aid distressed banks, regulators used different policy measures: (1) recapitalization and (2) asset management companies. Japanese policymakers started buying preferred shares and subordinated debt from supposedly solvent financial institutions. Massive and multiple injections of capital into Japanese banks demonstrate that these measures were unable to create sustainable, long-term solvency for these banks. For example, Long-Term Credit Bank of Japan (LTCB) - the 9th largest company in the world by asset value in 1989 - and Nippon Credit Bank (NCB) received state aid through the issuance of preferred shares but still failed later on. However, some argue that the recapitalisation package was not large enough, implying that had it been large enough, long term solvency might have been guaranteed (Hoshi & Kashyap 2010, pp. 406-410).

The importance of the Japanese case extends beyond the financial sector. Japanese zombie banks negatively influenced the rest of the economy through the effects of “zombie lending” (Caballero, Hoshi, & Kashyap, 2006, p. 1943). The argument is that Japanese zombie banks,

afraid to fall even shorter of capital, rolled over credits to zombie (insolvent) borrowers. This is called “zombie lending”. The rationale behind “zombie lending” is the following: zombie banks were hoping that the zombie corporates were going to repay them back, and if that would not be possible, the regulators would bail them out. Public pressure on providing more loans to Small and Medium Enterprises (SMEs) in order to stimulate economy also played a role on the increase in zombie lending, which only worsened the situation. Thereby, we see how the existence of zombie banks not only decreased the profitability and equity buffers of solvent Japanese banks but also influenced competition in other sectors, where unprofitable companies that should have disappeared still existed.

1.3 The current crisis

The financial crisis that started in 2007 in the US and 2008 in Europe caused an economic recession in many countries. Boudghene, Maes and Scheicher (2010, p. 3) summarise the causes of the financial crisis in the following way: (1) macroeconomic reasons such as risk mispricing and loose monetary policy, (2) complex products and high risk-taking in shadow banking, (3) excessive remunerations schemes focused on short-term return, (4) questionable independency of credit rating agencies, and (5) the lack of a mechanism to prevent pro-cyclicality. Though the causes of the crisis were multiple, its effect could have been minimised had the financial sector been more resilient, i.e. had the banks held more capital buffers and therefore been less affected by contagion.

The roots of the crisis lay in the slump of subprime mortgages and securitized financial products in 2007, preceded by an excessive credit boom that was partially caused by excessively loose credit standards. Thanks to the pre-crisis loose monetary policy, poor credit standards, and low capital requirements, financial institutions could dramatically increase their balance sheets without having to worry about increasing their capital proportionally. Even before the collapse of Lehman Brothers, these financial institutions experienced funding problems and drops in share prices. The Lehman Brothers bankruptcy only added more fuel to the fire by giving rise to a global-wide distrust in interbank lending and thereby worsening the liquidity problems of financial institutions. Institutional investors perceived high risks in

buying from banks securitized financial products, which prohibited banks from creating securitised assets and putting them off balance sheet. Financial institutions were therefore stuck with “toxic” and illiquid assets while funding costs were only becoming higher.

These “toxic”, or deeply impaired, assets on banks’ balance sheets started raising concerns about the banks’ solvency. As US residential housing prices started declining and mortgage borrowers started defaulting ever more, the structured assets that a few months before had triple A ratings were now significantly downgraded. Following the downgrades, banks’ capital ratios also fell proportionally, as they are directly linked to the riskiness of the banks’ assets and counterparties. The dropping prices of securitized products backed by mortgages and the necessity to set aside more capital for these exposures, forced banks to write their assets down. In the face of consumer uncertainty and distrust about the real risks that banks were trying to hide, banks’ counterparties demanded even higher capital buffers than the regulatory capital requirements of Basel agreements. These liquidity and solvency problems put pressure on the governments whose financial sectors were under distress to help distressed banks.

European banks were affected by the crisis mainly through exposures to US securitized products. It was this financial crisis that gave rise to European zombie banks. In contrast to the S&L crisis and Japan’s lost decade, the latest financial crisis was characterised by a rapid global spillover effect and therefore called for an unprecedented level of government and central bank interventions.

Chapter 2. Identification methods of zombie banks

Theoretically, all would agree that zombie banks are negative capital (or negative equity) banks that continue to exist. In practice, however, one would almost never see a negative shareholders' equity in a bank's balance sheet. That is why researchers have come up with different proxies on how to identify zombie banks, which from now on we will call identification methods of zombie banks. Below we discuss the identification methods of zombie banks that currently exist in academic literature.

2.1 Tobin's q definition

Laeven and Huizinga (2009, p. 8) define a zombie bank as a bank with a Tobin's q less than 1[1]. They calculate Tobin's q as the ratio of market value (M.V.) to the book value (B.V.) of assets. More specifically, as shown in the formula below, the numerator is the sum of the market value of common equity, the book value of preferred equity, and the book value of liabilities. The denominator is the book value of assets.

$$Tobin's\ q = \frac{M.V.\ common\ equity + B.V.\ preferred\ equity + B.V.\ total\ liabilities}{B.\ V.\ total\ assets}$$

$$Zombie\ bank\ if\ \ Tobin's\ q < 1$$

Rearranging the above formula, we arrive to the conclusion that zombie banks are those whose sum of market value of common equity and book value of preferred equity is lower than the book value of shareholders' equity. This identification method of zombie banks is the only identification method that uses both the market and the book value of equity and therefore it is the least likely identification method to provide a biased result that would

[1] Tobin's q was first time introduced by Brainard and Tobin in 1968 and Tobin in 1969. This ratio become a very popular in assessing performance of firms. The first Tobin's q metric was defined as the ratio of market value of liabilities on the cost of replacement of company's assets (Lewellen & Badrinath, 1997, pp. 78-79).

depend either solely on the market value of equity or solely on the book value of equity. Using this methodology, the authors classify 60% of US banks as zombie at the end of 2008.

2.2. Tangible capital definition

Calderon & Schaeck (2014, pp. 29-31) use two different identification methods of zombie banks. The first one, which we will name the "tangible capital" definition for convenience throughout the text, is calculated as the book value of common equity minus intangible assets. This difference is considered to give the tangible capital value. The intangible assets consist of goodwill, other intangibles, and deferred tax assets. The below formula shows that the authors classify a bank as zombie if the tangible capital is negative, i.e. if the book value of common equity is less than the value of intangible assets.

Zombie: Book value of common equity - Intangible assets <0

2.3. Market capitalisation definition

The second identification method of zombie banks that Calderon & Schaeck (2014, pp. 29-31) use, which is the third existing identification method of zombie banks, is the "market capitalisation" definition. This identification method is based on the market value of equity as opposed to book value. The authors classify a bank as zombie if its book value of liabilities is higher than the market value of its equity, which includes common and preferred shares.

Zombie: Market Capitalization - B. V. of liabilities <0

Chapter 3. Types of government support

According to Kane (1992, p. 4), zombie banks are able to survive only because of government interventions that financially support them. These interventions can be divided into two groups, namely as support to the entire financial system and as support to specific financial institutions (Hryckiewicz, 2014, p. 248). The first group of interventions consists of measures such as a decrease in interest rates. The second group of interventions consists of policymakers' instruments that assist individual distressed financial institutions, such as guarantees on bank's liabilities and liquidity supply at the beginning of the crisis, capital injections in the following stage, and restructuring of debts through ''Asset Management Companies'' in the last phase (Hryckiewicz, 2014, p. 248). Besides government support, the European financial crisis was also characterised by central bank support. The European Central Bank (ECB) undertook the following measures in hopes of easing the burden of financial institutions: (1) decreasing the ECB rates (European Central Bank, 2016b), (2) accepting a wider list of assets for the funding from central bank (3) prolonging to 36 months the maturity of ECB funding, (4) increasing asset purchase programme (European Central Bank, 2015).

Throughout the European financial crisis, European authorities tried to tackle solvency and liquidity problems in the financial sector. During the chosen sample period of 2008 until 2014, the European Commission took more than 450 decisions through which it authorized Member States (governments) to aid their financial sectors through the following four categories of State aid, presented in order of magnitude (European Commission, 2016c).

3.1 Blanket guarantees

According to Laeven and Valencia (2012, p. 1221), blanket guarantees are an explicit or implicit government guarantee on an important fraction of bank liabilities. These guarantees can cover not only deposit but also non-deposit liabilities and therefore offer a higher degree of protection than deposit insurance.

The scope of guarantees on bank liabilities varies from country to country (Laeven & Valencia, 2012, p. 1224). EU policymakers limited the scope of blanket guarantees to retail deposits and certain types of wholesale deposits (Official Journal of European Union, 2008). The exclusion of subordinated debt from the guarantee coverage is justified by the unwillingness of the authorities to protect the interests of shareholders, which are supposedly aware of the risks they take and should therefore accept the losses.

The goal of deposit guarantee schemes during a banking crisis is to prevent bank runs. Significant bank runs can contribute to bank failure either through acute liquidity shortage, or through provoking fire sales of banks' assets, which result in banks selling their assets at a discount and therefore reduce their short-term profit and liquidity, and in the longer term contribute to their insolvency.

Between 2008 and 2014, a period consistent with the timeline of our sample, the European Commission authorised a total aid of almost EUR 3.9 trillion, which constitutes 23% of EU's GDP of 2014, to be used by Member States to guarantee their banks' liabilities (European Commission, 2016c). However, the amount of guarantees that were actually used has only amounted to almost EUR 1.2 trillion (European Commission, 2016c).

In addition to explicit guarantees, policymakers might provide distressed banks with implicit guarantees. The main difference between the two types of guarantees is that for the implicit ones the policymakers have neither explicitly committed ex-ante to guarantee something nor have disclosed the amount of the guarantee to the public (Toader, 2015, p. 137).

3.2 Recapitalisation

The second largest instrument used during the European financial crisis to support individual banks was recapitalisation. The recapitalization process consists either in directly injecting public funds into distressed banks or in creating favourable conditions for private capital injections (European Commission, 2009). In the case of the European financial crisis, the aid offered from Member States to their banks falls into the first category of directly injecting public money into the banks. In order to minimise the potential loss of public funds injected

in the banks and to minimize the effect of these interventions in banks' incentives to undertake risk in the hopes of government bailouts, European policymakers tried to limit recapitalization to financially distressed but solvent banks only, as opposed to both solvent and insolvent banks. Our proposed way of identifying zombie banks takes into account the amount of the recapitalisation (capital injection) from the part of the government into the banks. Our definition aims to shed some light into the question on how solvent were the banks that received capital injections during the crisis.

The immediate effect of recapitalisations is to increase the equity (capital) of banks, which serves as a buffer against unfavourable market conditions. Montgomery and Shimizutani (2009, p. 2) categorise the possible effects of recapitalisation into the following four categories: an increase in capital ratios of recapitalised banks, a boost in the lending by the recapitalised banks, a promotion of restructuring, and a stimuli on banks to write off their non-performing loans.

During the 2008-2014 period, the European Commission authorized a total of EUR 802 billion (5.7% of EU's 2014 GDP) to be used from Member States in recapitalizing their banks. From this amount, EUR 453 billion (3.2% of EU's 2014 GDP) was actually used by the Member States (European Commission, 2016c).

3.3 Impaired asset relief measures

Impaired asset relief measures are a type of government aid that allows distressed financial institutions to remove impaired assets from their balance sheets. Impaired assets are assets whose value in the banks' balance sheets is higher than the assets' actual market value, and which therefore will have to be written down to reflect the market price. In the period 2008-2014, the European Commission approved a total aid of EUR 603 billion (4.3% of EU's 2014 GDP) to be used by Member States for asset relief measures. The actual amount used for asset relief measures was around EUR 188 billion (1.4% of EU's 2014 GDP).

The objectives of these asset relief measures are the following: to stabilize the situation in the banking sector, to improve the solvency of the supported financial institutions, to boost

lending from the supported financial institutions, to reduce the fiscal costs of the crisis, to increase the transparency of the financial sector, and to stimulate interbank lending (Boudghene & Maes, 2012, p. 5). These objectives can be achieved in two ways, namely by an asset purchase mechanism and/ or by an asset guarantee mechanism. The asset purchases consist in the government buying impaired assets from banks in financial distress. Those impaired assets are subsequently removed from the banks' balance sheets and put into special purpose vehicles (SPVs), which are partially or completely funded by the government. The beneficiary bank receives cash considerations for the transferred impaired assets. The asset guarantees consist in the government guaranteeing the losses of a portfolio (or tranche of a portfolio) of toxic assets. This mechanism leaves the portfolio in the bank's balance sheet, but guarantees the bank that the government will reimburse it in case the portfolio suffers losses. However, the losses from the first tranche will usually be absorbed by the bank, and only the losses of subsequent tranches will be reimbursed by the government (Boudghene, Maes, & Scheicher, 2010, p. 12). Regardless of the differences of these two mechanisms, both of them enable banks to reduce losses from impaired portfolios.

3.4 Direct short term liquidity support

Direct short-term liquidity support is the fourth type of Member State intervention. It consists in the provision of public funds, including funds from the central banks. Since 2008, the European Commission has approved aid amounting to EUR 230 billion (1.6% of EU's 2014 GDP) for liquidity measures. However, only EUR 105 billion were used by EU member states.

The most prevalent policy measure undertaken when managing the financial system's liquidity during a systemic crisis is based on the theory of Bagehot (Kane & Klingebiel, 2004, pp. 37-38). The theory states that the right policy response to a shortage in liquidity during a systemic crisis is a large-scale affluent lending by the central bank to solvent banks, at a penalty interest rate and against good collateral only. This policy would both encourage prompt repayment when the bank recovers and limit the higher costs of emergency lending and bank runs. However, if the large-scale affluent lending were to be given to insolvent banks, the effects would be destructive. Collateralised government or central bank loans to insolvent banks

would result in a lower amount and quality of assets left to repay other creditors of the banks that already do not have enough assets to cover their liabilities. Furthermore, these collateralised loans can incentivise the insolvent banks to invest the funds they have gotten in risky ways in hopes of higher returns. This discussion begs the question whether the Member State aids to the banks were given only to solvent or also to insolvent banks.

Chapter 4. The effects of zombie banks on the economy

Creating and keeping zombie banks in the economy gives rise to severe negative effects on credit supply, risk taking, competition, and government budget.

4.1 Credit supply

Several researchers have documented evidence of zombie lending during Japan's lost decade. Zombie lending consists in lending provided by zombie banks to insolvent ("zombie") corporates. Caballero et al. (2006, p. 1943) analyse how zombie lending delayed the economic recovery of Japan. As Japanese insolvent banks were ever more worried about complying with capital ratios, they knew that only substantial profits would be enough to make them comply with capital requirements. Therefore, they chose to take higher risks and thereby rolled over credit to insolvent borrowers in hope of being paid and not having to write down their assets. This behaviour had two effects. First, zombie lending misallocated lending from healthy corporates that should have received it to zombie corporates (Hoshi, 2006, p. 30). Second, zombie corporates took "undeserved" market share from their solvent competitors, thereby reducing the profits and investment of their financially sounder competitors. Caballero et al. (2006, p. 1943) confirm that sectors with zombie firms create less jobs and provide poorer output. However, supporters of government intervention suggest that sufficient capital injections may increase the supply of credit and create incentives for investment (Giannetti & Simonov, 2011, p. 1).

4.2 Risk taking

When analysing the S&L crisis, moral hazard is put in the spotlight. The moral hazard problem arises when governments provide guarantees for the creditors of the banks and choose to bail out troubled banks (Bodenhorn, 1996, p. 21). If the creditors are guaranteed against the losses, they lose their interest in controlling risk taking by the part of banks. Additionally, being seen as "protected" by government or as "too big to fail", banks are not penalised by the market through high interest premium for the additional risk they take. Kane and Yu (1996, pp. 276-275) confirm that allowing insolvent institutions to function creates incentives for

high-risk taking through lending to risky borrowers. Similarly, Onaran (2011, p. 9) writes that zombie banks will rather give loans to those borrowers who can pay higher premium, who most probably are the borrowers with the highest risk.

4.3 Competition

Keeping zombie banks alive distorts competition in the banking sector. In a free, "fair" economy, banks that take on too much risks either get higher returns or incur higher losses, fail, and make room for more cautious banks (Onaran, 2011, p. 9). Government interventions incentivise the risk-taking of competitor banks (Gropp, Hakenes, & Schnabel, 2011, p. 2085). Hakenes & Schnabel (2010) confirm that bailout policies encourage higher risk-taking by competitors of the bailed out financial institutions. Additionally, Calderon and Schaeck (2014, pp. 34-35) identify a stronger increase in competition when zombie banks have larger shares of the market.

4.4 Government budget

Saving zombie banks requires a large amount of government money almost immediately. Offering this money to zombie banks significantly affects a country's budget and subsequently the interest rates at which the government can fund itself in the market. This effect is especially detrimental in times of rising government deficits, as was the case in the Eurozone. The European sovereign debt crisis was closely related to the banking crisis. From 2008 to 2014, all state aid measures by the 28 EU countries amounted to EUR 1.9 trillion, which constituted almost 14% of EU's GDP in 2014. During the 2008-2009 period, 22 EU countries had a deficit of more than 3 % (Tartar, 2016).

Chapter 5. The costs of bank failures

Failures of financial institutions are very different from failures of corporates. While the costs of a corporate failure usually comprise only direct costs of a single failure, the failure of a financial institution gives rise to a "domino effect" or contagion. First, the banking sector plays an important role not only for the financial sector but also for the real economy. Banks provide investment and financing opportunities to both individuals and corporations. Second, a bank's structure is usually fragile by construction: banks' business model is built on "borrowing short and lending long". This means that banks pay less interest in short term borrowings such as deposits and receive more income from longer-term assets such as loans, given that risk and maturity are positively correlated. However, in times of liquidity problems and rising interest rates this business model is programmed to fail if banks have not accumulated enough equity buffers. Third, banks are sometimes very complex and lack transparency (White & Yorulmazer, 2014, p. 9). These characteristics of the banking sector make it difficult to decide on the best approach when it comes to resolving an insolvent bank.

There are four major categories of costs that bank failures may produce: (1) fiscal costs, (2) moral hazard, (3) contagion on other financial institutions, and (4) disturbances to the clients of the bank (White & Yorulmazer, 2014, pp. 8-12).

5.1 Fiscal costs

Bank failures are costly for governments. During a bank's liquidation, if its assets are not enough to cover the deposits, the government will have to pay the deposit insurance. Furthermore, the recapitalisation of failing banks and administrative costs related to the liquidation of banks can require government funds. The urgency in providing these funds can provoke a government deficit and therefore a possible currency devaluation and increase in tax rates. As banks usually fail together, the fiscal cost may be too high for one country. In the past, banking system crises in the developing markets were frequently accompanied by currency devaluations (White & Yorulmazer, 2014, pp. 10-11).

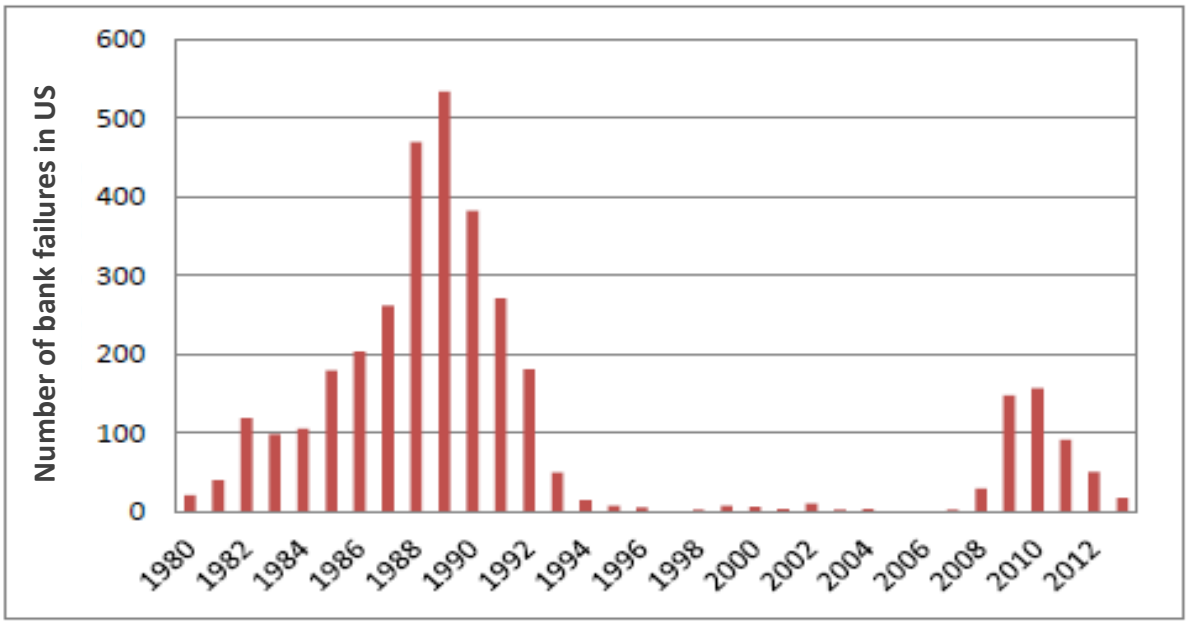
5.2 Moral hazard

Governments' explicit and/or implicit support for financially unsound banks may create a moral hazard problem. Resting assured that government will step in to bail out the bank can encourage or tolerate excessive risk taking in hopes of higher returns. The consequences of moral hazard require careful considerations from the part of governments, as excessive risk taking may increase the fiscal cost of saving these banks.

5.3 Contagion of other financial institutions

Due to the interconnections among financial institutions, a single bank bankruptcy can provoke serious financial trouble for related banks and cause a "domino effect" of bank failures (illustrated in Figure 1). Financial institutions depend on one another either through direct or indirect exposures via lending and borrowing activities. If the exposures towards a failing bank are very high, its counterparties might incur severe losses and therefore may not be able to withstand the bankruptcy.

Figure 1: Contagion effect of bank failures, the case of the US.



Source: White & Yorulmazer (2004, p. 7)

The information channel is an important channel of contagion. In case of failure of a big financial institution, speculation about the viability of other banks is called into question by market participants. This information contagion may provoke other banks from lending to one another, therefore reducing liquidity and creating panic in the market (Ladley, 2013, p. 1401). This usually results in bank runs unless the government steps in to calm and reassure investors.

Another channel of contagion is through asset prices and firesales. Banks in distress and need for liquidity will start selling assets, which may trigger a decrease in asset prices on the market due to supply and demand forces. In the fear of even further price decrease, banks undertake fire sales that make the price go even further down, thereby causing losses on the sale of these assets.

One of the biggest examples of contagion during the recent financial crisis was the bankruptcy of Lehman Brothers. Its bankruptcy put in risk the American International Group (AIG) due to its Credit Default Swaps on the former. The result of this contagion was a government financial assistance of USD 40 billion for AIG.

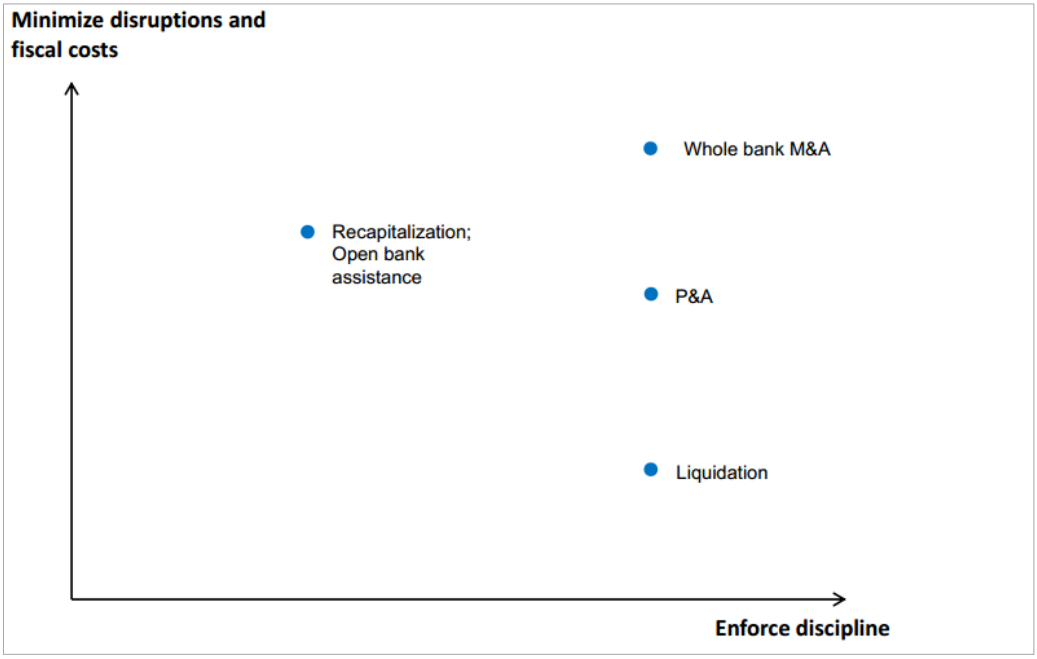
5.4 Disruptions to the clients

A bank's failure can be a major worry for its customers. First, creditors and depositors that rely on this source of investment may lose their investments if the bank files for bankruptcy (Kahn & Santos, 2005, p. 2110). Second, banks provide loans to its customers and open credit lines for corporations or credit cards for individuals. Failing banks may create trouble for its customers to find adequate institutions for their funding needs, especially if the bankruptcy is sudden.

Chapter 6. Resolution methods

Resolution methods are important to our discussion on insolvent and zombie banks, as they directly affect the cost of resolving an insolvent bank as opposed to keeping it a zombie. During the recent financial crisis, different resolution methods were used on insolvent banks. Below we discuss four main strategies of resolving failing banks, namely liquidation, recapitalization, merger & acquisition, and purchase & assumption (White & Yorulmazer, 2014, pp. 12-14). This chapter focuses on the pros and cons of different resolution methods of insolvent banks, based on a "financial cost" and "market discipline" matrix. These two axes of the matrix (the financial cost and the market discipline) reflect the fact that the choice between resolution methods is usually undertaken in light of a discussion on whether a certain resolution method has (1) high or low costs (in the form of fiscal cost or market disruption) and (2) whether it enforces market discipline or it promotes risk taking and moral hazard.

Figure 2: Evaluating resolution methods



Source: Yorulmazer (2015).
Note: Enforced disciple means reduced moral hazard.

6.1 Liquidation

The liquidation method of bank resolution consists in selling the insolvent bank's assets in order to reimburse the bank's creditors, with the government as a last resort to repay insured deposits if the amount from the liquidation is not enough to pay them back. Liquidation may create severe disruptions to customers, to the entire financial system of the country, and to the government if the latter has to pay insured deposit claims. However, liquidation is a natural solution for a bankrupt company and saves the costs associated with moral hazard from the part of banks. In practice, liquidation is used in cases where the insolvent bank's effects on the economy are not substantial and therefore the disruptions related to its failure are limited.

6.2 Recapitalization

Recapitalization as a resolution method consists in the government buying shares of the bank. This method keeps "alive" banks that would, without recapitalisation, be insolvent and therefore fail. It also involves a dilution of the holdings of current shareholders of the banks. The dilution can be a "dilution of voting power" for the shareholders that have voting shares and/ or a "dilution of interest", which is an economic dilution that results from the fall in share price when the bank decides to issue new shares. The arguments in favour of recapitalisation as a resolution method rest on the claim that it saves the financial system and the wider economy from any disturbance or shock. The arguments against recapitalisation as a resolution method rest on the grounds of high public costs and moral hazard costs. The use of recapitalisation as a resolution method is the core of our new proposed definition of zombie banks.

6.3 Merger and acquisition

The merger and acquisition (M&A) resolution method is a private solution to a bank failure. This resolution method is entirely dependent on the appetite of a competitor bank for the business of the failing bank. Therefore, it is not a method that the government can decide to

use if there is no demand from other banks. Specific capabilities such as experience in a range of products, a wide client database, or even the geographic location of its offices can incentivise a competitor to buy a failing bank. The M&A resolution method represents an ideal solution to an insolvent bank and the economy, given that there is no need for fiscal costs, there is no risk to the financial stability of the banking sector, and no moral hazard is encouraged.

6.4 Purchase and assumption

The purchase and assumption (P&A) mechanism consists in a healthy bank purchasing some of the assets and assuming some of the liabilities of a distressed bank. The assets in excess of those purchased by the purchasing bank are liquidated. Sometimes, the P&A resolution method may require public assistance such as government commitment to share losses on a part of the assets. This resolution mechanism allows for only limited public costs and banking sector disruptions.

In conclusion, and as shown in Figure 2, the M&A is the preferred choice both in terms of minimizing financial sector disruptions and fiscal costs, and enforcing market discipline. While the P&A method and the liquidation method both enforce the same level of discipline as the M&A does, they result in high financial sector disruptions and fiscal costs. While liquidation has the highest disruption potential, bank recapitalisation is the least preferred method in terms of enforcing market discipline. This is the result of the moral hazard problem that is caused by recapitalising failing banks and can also give rise to the zombie bank problem.

Part II. Case study

Chapter 7. Bank Financial statements

In order to understand how banks become zombie, one has to have a good understanding of a bank's financial statements. For this reason, below we discuss a simplified version of a typical bank's balance sheet and income statement. There are significant differences in accounting operations between financial sector and other industries. Banks' accounting affects reporting of financial institutions and their ability to come in line with capital requirements (Beatty & Liao 2014, p. 340).

7.1 Simplified balance sheet

Table 1: A bank's simplified balance sheet

Assets	Liabilities & Equity
- Cash - Loans - Securities - Interest Receivables - Allowance for loan losses	**Liabilities** - Deposits (including remuneration) - Securities **Equity** - Capital: Common & Preferred Equity - Retained Earnings

Source: Page & Hooper (2013, pp. 46-48)

Table 1 presents a simplified version of a bank's balance sheet. On the asset side of the bank's balance sheet, we usually find (1) available cash, which is vital for liquidity and necessary especially in times of runs on deposits, (2) loans provided by the bank to its clients, for example mortgages, (3) investment in securities such as government bonds, asset backed securities and equities, (4) interest receivables from investments in loans and securities, and (5) allowance for loan losses in order to cover expected impairments of assets.

The right side of the balance sheet consists of liabilities, which include deposits and securities issued by the bank, and equity, which includes common and preferred equity and retained earnings.

7.2 Simplified income statement

Table 2 presents a simplified version of a bank's income statement. Typically, the income statement includes (1) interest income, (2) interest expense, (3) provision for loan impairment/ losses, (4) non-interest income, (5) non-interest expense, and (6) income tax.

The sum of the above-mentioned entries gives the profit or loss for the fiscal year.

Table 2: A bank's simplified income statement

Income statement
1) Interest Income
2) (Interest Expense)
=**Net Interest Income/ Expense**
3) (Provision for loan Impairment) Provision for Loan Losses
=**Net Interest Income/ Expense after Provision for loan Impairment**
4) Non-interest income
5) (Non-interest expense)
=**Profit / (Loss) before tax**
6) Income tax or (expense)
=Profit or (loss) for the year

Source: Page & Hooper (2013, pp. 46-48)

7.3 How do banks become zombie?

In general, loans represent 60-70% of the bank's total assets (Hashim, O'Hanlon, & Li, 2015, p. 9). This makes the quality of loans extremely important to the financial wellbeing of the bank. Loans are "promises" that companies or individuals make to the bank to reimburse it the face value and incurred interests of the loan. If a loan is not reimbursed, the issuing bank will book a loss on that investment. Aware of the fact that some of the loans will not be reimbursed; banks create a loan loss provision in the income statements. If the real losses are higher than the loan loss provision and revenues, banks will report a loss for that year. After the closure of the income statement, the net loss will be incorporated into the balance sheet under the retained earnings section. This will lead to a decrease in the equity capital, which is the buffer that the bank has against losses. The losses on mortgages kick-started the 2008 financial crisis in the US, which later spilled over into Europe.

During a financial crisis, besides losses on loans, financial institutions may also experience difficulties in obtaining necessary liquidity. This is the consequence of both distrust in interbank lending and of banks trying to hoard cash that they do not need because of the uncertainty of the future. In their efforts to obtain liquidity, some banks may be forced to sell immediately some of their assets. If the assets are not very liquid, and/ or if the sales are too big, market prices for those assets go further down and oblige the banks to report further losses. These losses further decrease the equity buffer of a bank.

What is problematic and adds to the distrust in the market, is the banks' incentives to hide the real losses on their assets in order to present a financially stronger position. One of the approaches adopted by these banks is called "extend and pretend", and consists in delaying the recognition of losses. Even when aware of the fact that certain clients will most probably not pay back their obligations, banks continue to roll over existing loans to these clients, pretending that these borrowers will one day pay back (Page & Hooper, 2013, p. 51). This is what we previously named "zombie lending", and is one of the main negative consequences of keeping alive insolvent banks. Several researchers have confirmed the important role of banks' accounting discretion in the recognition of losses and in the estimation of capital

ratios. Bushman (2014) noticed that financial institutions usually delay write-downs of impaired assets if compared with the benchmark indices. He also argues that the delay of write-downs changes from bank to bank. Harry Huizinga and Luc Laeven (2009, p. 22) analyse mortgage-backed securities (MBS) on the balance sheet of US banks and find that banks overstate the value of these distressed assets when compared to the assets' market values. They also discover that the higher the exposure actually was, the lower the provisions for those losses were. One explanation for this finding is presented by Bushman (2014, p. 389), who argues that regulators during the financial crisis closed their eyes and engaged in regulatory forbearance.

In conclusion, if the bank's equity is not large enough to cover the losses, the bank will either be resolved through a resolution mechanism or will try to hide its insolvency using accounting discretion. Therefore, a zombie bank would appear in either of these two cases:

- The equity of the bank is not enough to cover capital losses and would result in a negative net worth of the bank if the government would not provide capital injections. This is the basis for our new proposed definition of zombie banks.
- The equity of the bank is not able to cover capital losses and would result in a negative net worth of the bank if the management would not hide the losses.

Policymakers try to prevent the appearance of zombie banks by requiring financial institutions to comply with both stricter accounting requirements and higher capital requirements, as described in the below paragraphs.

While during all times banks book a loan loss provision for asset impairment from credit losses, this provision is pro-cyclical. Loan loss provisions are usually relatively small during a period of stable growth of the economy, but increase during a crisis period. During the 2008-2009 financial crisis, the loan loss provisions were up to 9 times from the value in previous years (Beatty & Liao, 2014, p. 352). The financial crisis demonstrated weaknesses of accounting standards, in that the standards were not able to provide reliable information on banks' real losses. As an example, the incurred loss approach in International Accounting Standard (IAS) 39 was criticised for being "too little and too late" in terms of recognizing impairment losses

(Gaston & Song, 2014, p. 5). Under the incurred loss based model, IAS 39 permits recognition of impairments only if credit loss has been incurred or is probable (Hashim et al., 2015, p. 10). The effective implementation of IFRS 9 (International Financial Reporting Standard- Financial instruments) in January 2018 will require all European banks to use a new approach for impairment losses. The new impairment model will require the recognition of expected credit losses at all times and the reporting on them every year. This is intended to provide stakeholders with a better insight on the expected credit losses of a certain financial institution.

With respect to the capital requirements, regulators have introduced Basel III (the Third Basel Accord). Basel III outlines more stringent requirements on leverage, liquidity, and solvency of the banks compared to Basel II. As the capacity to absorb losses is dependent on the size of the equity capital, Basel III imposes higher capital ratios for banks. Besides capital, liquidity is an important factor considered in Basel III, as the lack of liquidity may also increase the losses of the banks through the firesale of assets. Lastly, the leverage ratio introduced by Basel III is intended to force banks to reduce their balance sheet size or decrease their liabilities (increase their proportion of equity in the balance sheet).

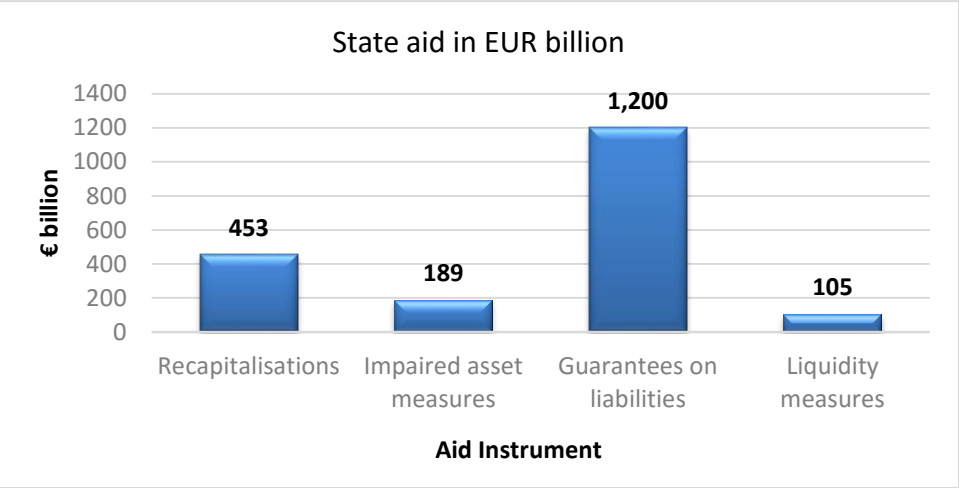
Chapter 8. Cost of government interventions for EU countries

Our sample period (2008-2014) is specifically chosen as a period characterised by an unprecedented amount of government interventions in the financial sector. These interventions were undertaken with the purpose of strengthening the financial position of financial institutions in the hopes of both lower spillover effects among banks and an increase in consumer confidence, which would be expected to boost the economy. We dedicate this section to the magnitude of government interventions in the EU, in order to establish grounds for our new definition of zombie banks, which is based on government intervention and specifically recapitalisation as a way of government intervention.

Figure 3 presents the magnitude of the types of government aid used during the European financial crisis under consideration. In the 2008-2014 period, EU countries provided EUR 1.9 trillion (13.9% of EU's 2014 GDP) to their financial institutions. Guarantees on liabilities of the banks amounted for 61% of the all measures (EUR 1.2 trillion). Recapitalizations were the second largest measure, amounting to 24% of all measures (EUR 453 billion). Impaired asset relief measures represent 10% of the magnitude of all measures (EUR 189 billion). Liquidity measures, other than guarantees on liabilities, represent 5% of the total state aid during this period.

It is important to note that the total amount of state aid used over the 2008-2014 period, as shown in figure 3, is calculated differently depending on the type of aid instrument used. To show the cumulative amount spent, the amounts of recapitalisation measures and impaired asset relief measures are simply summed up over each year in the sample. However, for the calculation of total amount of guarantees on banks' liabilities and liquidity support measures, the year with the highest amount is taken.

Figure 3: Total amounts of State aid used per type of aid instrument by all EU countries during 2008-2014.

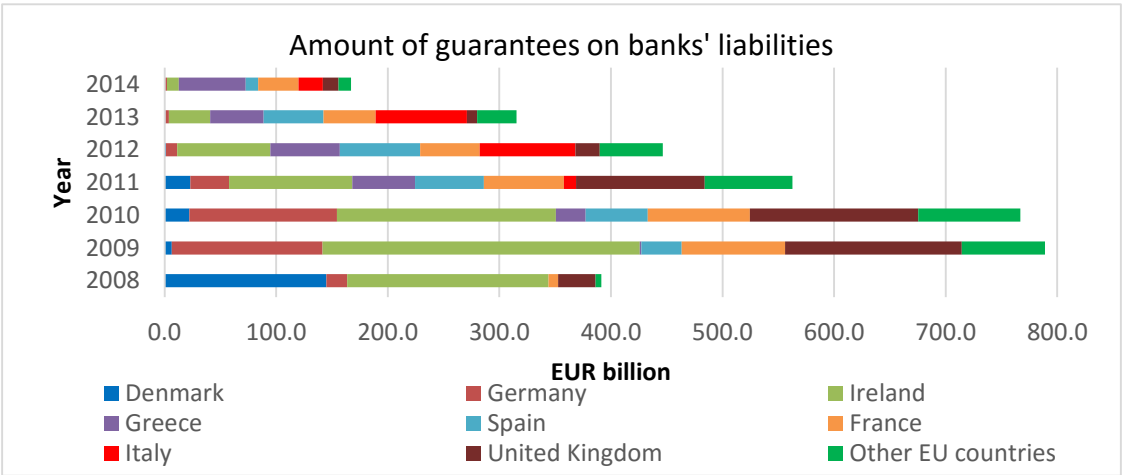


Source: European Commission (2016c).

8.1 Guarantees on banks' liabilities

During the period 2008-2014, 18 EU countries[1] provided their banks with guarantees on their liabilities. As shown in figure 4, the peak usage of these guarantees was registered in 2009 and 2010. Ireland (EUR 284 billion), United Kingdom (EUR 158 billion), Denmark (EUR 145 billion) and Germany (EUR 135 billion) are the countries that provided the highest amount of blanket guarantees to their banks.

Figure 4: Guarantees on banks' liabilities provided by EU countries during 2008-2014



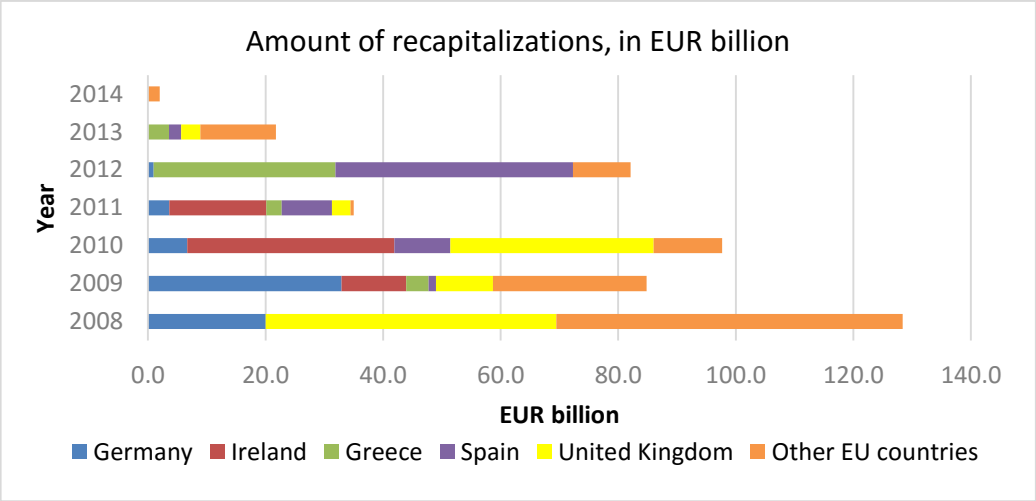
Source: European Commission (2016c)

[1] Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Luxembourg, Netherlands, Austria, Portugal, Slovenia, Finland, Sweden, and United Kingdom

8.2 Recapitalization measures

Figure 5 shows the magnitude of recapitalisation measures (capital injections) undertaken by EU governments in favour of their banks during the period 2008-2014. State aid through capital injection was provided to banks in 19 EU countries[1]. United Kingdom (EUR 100 billion), Germany (EUR 64 billion) and Ireland (EUR 62 billion) are the countries that provided the highest amount of capital to their financial institutions during the 7 years in our sample period.

Figure 5: Recapitalisations provided by EU countries during 2008- 2014



Source: European Commission (2016c)

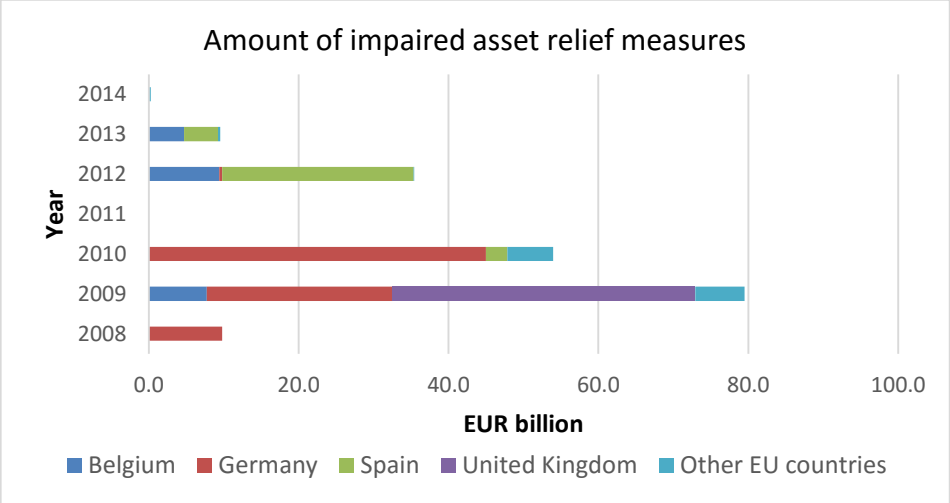
8.3 Impaired asset relief measures

Policymakers from only 12 countries[2] implemented impaired asset relief measures for distressed banks. Figure 6 shows the distribution of the funds. The highest amounts to cover impaired assets were offered to banks in Germany (EUR 80 billion), United Kingdom (EUR 40 billion) and Spain (EUR 33 billion).

[1] Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Netherlands, Austria, Portugal, Slovenia, Sweden, and United Kingdom.

[2] Belgium, Denmark, Germany, Ireland, Spain, France, Latvia, Netherlands, Austria, Portugal, Slovenia, and United Kingdom

Figure 6: Impaired asset relief measures implemented by EU countries during 2008-2014

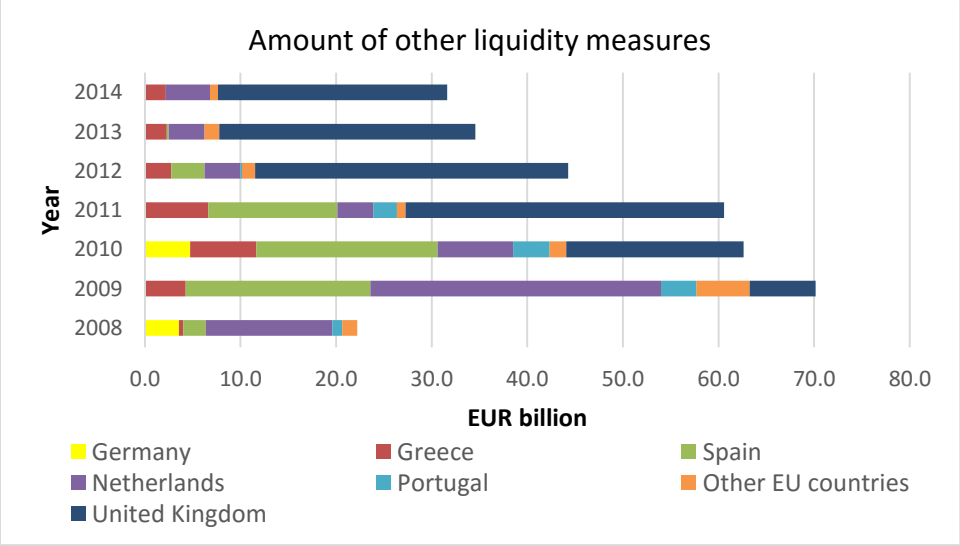


Source: European Commission (2016c)

8.4 Other liquidity measures

Figure 7 presents the distribution of other liquidity measures for the period 2008-2014. 11 EU countries[1] offered additional liquidity to some of their banks. The policymakers from the United Kingdom, the Netherlands and Spain provided their banks with the largest amount of liquidity support.

Figure 7: Other liquidity measures provided by EU countries during 2008-2014



Source: European Commission (2016c)

[1] Denmark, Germany, Ireland, Greece, Spain, Latvia, Luxembourg, Hungary, Netherlands, Portugal and United Kingdom.

8.5 State aid-related fiscal revenues

Some measures not only created costs to the government but also brought revenues to the country's budget in the form of fees, interests and dividends (European Commission, 2016c). Impaired asset measures and recapitalizations generated EUR 15 billion of revenues in the form of dividends. Liquidity measures were provided against interests, which amounted to EUR 67 billion in state revenues. Finally, guarantees on liabilities generated EUR 40 billion in the form of guarantee fees. In total, the EUR 122 billion in revenues represents only 6% of total aid (EUR 1934 billion) provided to banks. It is important to note that there is no comprehensive information on how much of the initial state investment has been paid back by banks. Therefore, the above-mentioned figures represent revenues from investments and not net profit or cost from the original investment.

Chapter 9. Data analysis

9.1 Data source

This research uses data extracted from the Compustat[1] database, for the period 2008-2014. This period is chosen in line with the start of the financial distress that banks in the EU experienced and the duration of the distress for at least a few years after 2008. We extend our analysis until 2014 in order to search for any existing trends in the recovery or worsening of the banks' financial situation. In order to analyze the banks headquartered in the European Union only, we filtered the search on EU countries and specifically on non-eastern EU countries[2], given that there was no large-scale government support on banks in the eastern part of the EU. Given that we want to compare the current identification methods of zombie banks with the new identification method that we propose, which uses a variable on government support (specifically recapitalisation), we choose to leave in the sample of banks only those banks that are big enough for the government to consider supporting them. With this in mind, we choose to leave in the sample only banks whose total assets are equal to or greater than EUR 1 billion and which therefore have enough systemic importance to attract government support in case of need.

In order to choose all relevant financial institutions (banks), we filtered the database based on the Global Industry Classification Standard (GICS) (Standard & Poor's, 2008). In GICS, we chose the Sector 40 (Financials), and inside this sector we chose the Industry Group 4010 (Banks) and 4020 (Diversified Financials). We included all industries that are part of the Industry Group 4010, namely Industry 401010 (Commercial Banks) and Industry 401020 (Thrifts & Mortgage Finance). Industry 401010 is further divided into the following sub-industries: diversified banks and regional banks. In the Industry Group 4020 (Diversified Financials), we included only

[1] We access the Compustat database through The Wharton School, University of Pennsylvania (2016). *Wharton Research Data Services.* https://wrds-web.wharton.upenn.edu/wrds/query_forms/navigation.cfm?navId=60 (retrieved on 08/05/2016).

[2] The scope of the sample include the following countries: Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Cyprus, Luxembourg, Netherlands, Austria, Poland, Portugal, Finland, Sweden, and United Kingdom.

one industry, namely Industry 402030 (Capital Markets), as the other industries were not in the scope of this research. Industry 402030 is further divided into the following sub-industries: Asset Management & Custody Banks, Investment Banking & Brokerage, and Diversified Capital Markets. From this category, we select only groups that have banking as primary activity.

9.2 Variables

In "Compustat Global- Annual fundamental data" we found bank fundamental information in annual frequency. The data used in this research comprises the following variables.

1. The book value of total assets.
2. The book value of total liabilities.
3. The book value of intangible assets.
4. The book value of total common equity. This variable is the sum of the book value of common shares, capital surplus, and retained earnings, less treasury stock.
5. The book value of preferred stock.
6. The book value of total equity. This variable is manually calculated by adding items (4) book value of total common equity and (5) book value of preferred stock. The book value of total equity excludes non-redeemable non-controlling Interest.

In "Compustat Global - Securities daily" we found daily security prices and number of shares outstanding. The variables extracted and calculated from this database are the following.

7. The price of common shares in the market
8. The number of common shares outstanding
9. Market capitalization of common equity. This variable is manually calculated by multiplying variables (7) and (8).

The "common shares outstanding" variable represents the total number of shares outstanding net of treasury stock. The "price" variable represents the price at the close of the business day on the date of the fiscal year end. In case that price is missing because the share did not trade on that day, we use the price at the close of the previous day.

The matching of the information from “Compustat Global- Annual fundamental data” and “Compustat Global- Securities daily” has been done using the SEDOL and GVKEY identifiers. Needless to say, the data has been modified to reflect the denomination of different currencies and is converted to EUR based on the exchange rate prevalent on the last day of the fiscal year.

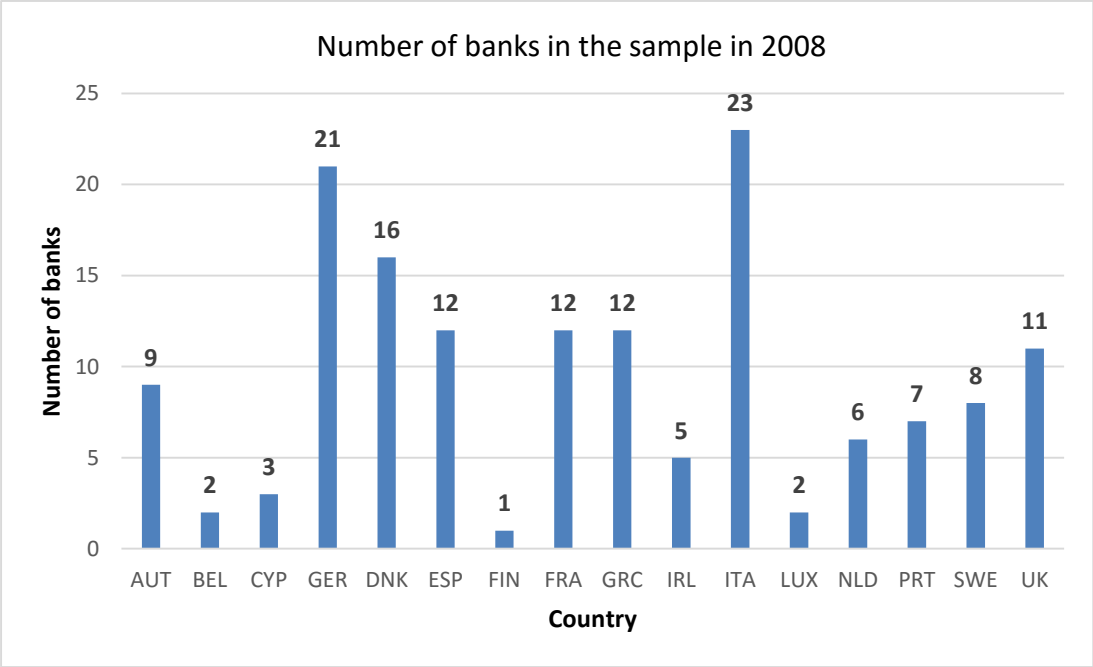
The data regarding government support is primarily extracted manually from the official European Commission website titled “European Commission Competition cases” (European Commission, 2016b). For the cases in which the European Commission information is not available, other public information sources such as Bloomberg or Reuters have been used as data sources.

9.3 Sample statistics

After applying all criteria mentioned above, the sample is comprised of 165 banks[1]. However, in each year under consideration the number of banks changes, as some banks leave the sample when they become bankrupt, merge with other banks, or new banks join the sample. In year 2008 the sample size is 150, in year 2009 149, in year 2010 152, in year 2011 148, in year 2012 140, in year 2013 134, and in year 2014 128. Figure 8 presents the number of banks under consideration per each country in year 2008, which is our base year. As we see, the sample is dominated by Italian, German, Danish, Spanish, French and Greek banks. The countries with the lowest number of banks in our sample are Finland, Luxembourg, Belgium, and Cyprus.

[1] The full list of banks is available in the Table 4, in the annexe 1.

Figure 8: Number of banks in the sample per country in 2008.



Source: Own estimation based on data from Compustat database

Table 3 gives a short statistical overview of the data for the sample of banks used in this research. Given the change in the number of banks under consideration in each year, and the high influence of extreme values in the mean, we base our subsequent analysis mostly on the median value of our variables and on the evolution of the median during the sample period of 2008-2014.

Table 3: Variable statistics in 2008

Variables	No. of Banks	Mean (in million)	Median (in million)	St. Dev. (in million)	Min. (in million)	Max. (in million)
(1) Book Value of Total Assets	150	€ 220.257	€ 31.862	€ 477.460	€ 41	€ 2.658.893
(2) Book Value of Total Liabilities	150	€ 210.977	€ 30.041	€ 461.610	€ 75	€ 2.544.809
(3) Book Value of Intangible Assets	150	€ 3.158	€ 87	€13.959	-	€ 159.521
(4) Book Value of Common Equity	150	€ 6.635	€ 1.230	€ 12.819	-	€ 61.940
(5) Book Value of Preferred Equity	150	€ 92	-	€ 732	-	€ 8.643
(6) Book Value of Total Equity	150	€ 6.594	€ 1.312	€ 12.763	-	€ 63.870
(8) Number of Common Shares	150	1.166	160	4.026	-	39.456
(9) Market Cap. of Common Shares	150	€ 3.711	€ 886	€ 7.485	-	€ 53.960
Variable	**No. of Banks**	**Mean**	**Median**	**St. Dev.**	**Min.**	**Max.**
(7) Market Price of Common Shares	150	€ 23	€ 6	€ 69	-	€ 717

Source: Own estimation based on data from Compustat database.

Note: The table presents statistics of all variables used to identify zombie banks per each definition for the base year (2008). The amounts for each variable except the share price are in millions. The amounts for each variable except the number of common shares outstanding are in euros.

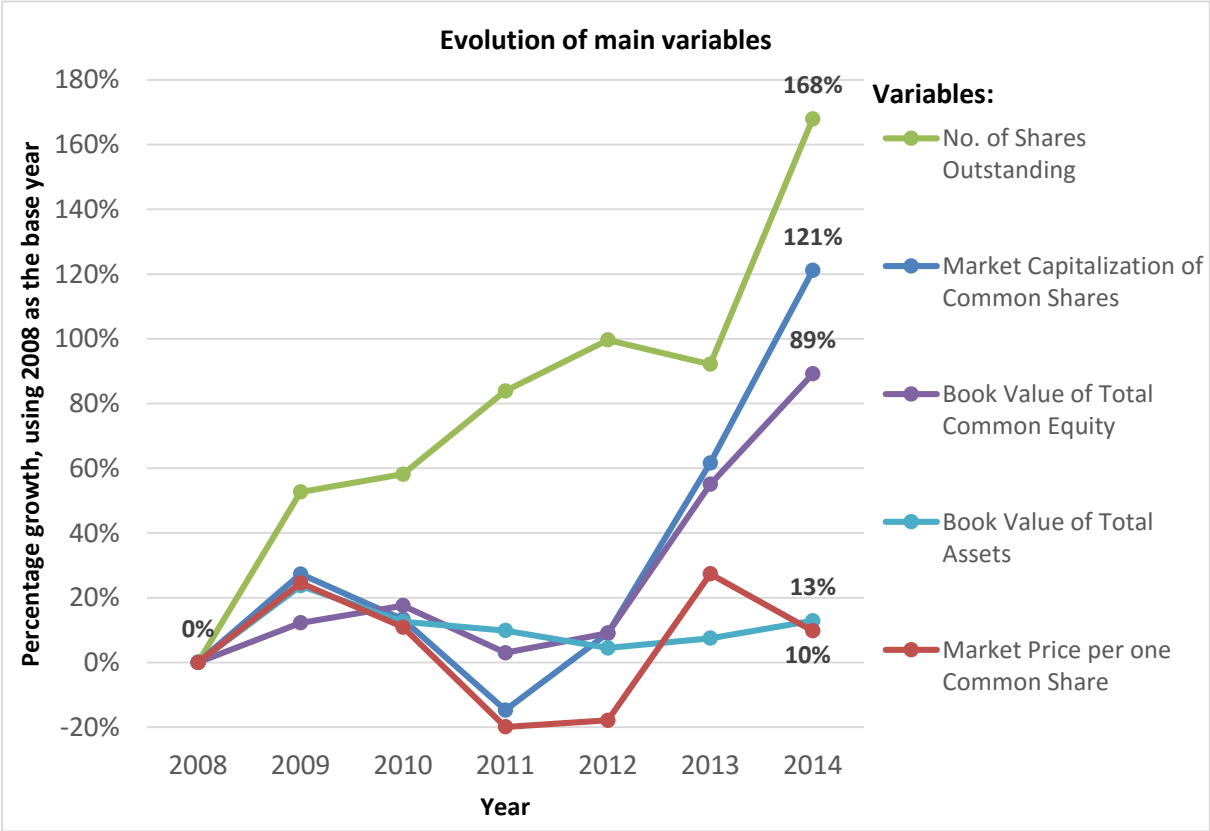
As 2008 is the first year in the sample, we use it as a base year when we compare the evolution of the variables and the evolution of the number of zombie banks identified per each definition of zombie banks. The mean of total assets in our sample is EUR 220 billion. However, this mean is biased towards the larger banks in the sample, with the largest bank having assets of EUR 2,7 trillion. Therefore, the median of EUR 32 billion is the best representative measure of the amount of total assets of the typical bank in our sample. The median of the total liability measure is EUR 30 billion, which constitutes 94.2% of the median of total assets. This means that the median bank in our sample has a leverage ratio, measured as total equity over total assets, of 5.8%. The median of the book value of common equity in the sample is EUR 1.230 million, while the median of the book value of preferred equity is zero. The fact that the median of the preferred shares is zero reflects the fact that the majority of the banks in the sample do not have preferred shares. The median of the book value of total equity is EUR 1.312 million.

In absence of the market information on preferred shares, we chose to scope out of our calculations the “market capitalisation” definition as explained in section 2.3. In 2008, the median market value of common shares, calculated as the price times the number of common shares outstanding, is EUR 886 million. The highest market value of common shares in the sample is EUR 54 billion. The median share price in our sample is EUR 6 and the median number of common shares outstanding is 160 million.

Besides the importance of the statistical information for each variable in the base year, it is beneficial to the analysis of our results if we understand the trends of the variables in our sample period and the drivers of those trends. For the purposes of studying the trend or evolution of the variables, we use the median as the best representation of the typical variable in our sample. The below analysis, based on the results of figure 9, attempts to answer three important questions that relate to the common equity, which is the “first line of defence” against losses and therefore the buffer that can protect the bank from becoming a zombie in the presence of losses.

1. Has the book value of common equity increased or decreased during our sample period? If so, what was the driver of that variable?
2. Is the movement in the book value of common equity in line with the movement in total assets of the company?
3. Is the movement in the book value of common equity in line with the market capitalization of common shares?

Figure 9: Evolution of main variables from 2008 to 2014



Source: Compustat database, Victor Sorokin estimation.

Note: The lines represent the percentage growth in median in each year, using 2008 as the base year.

Figure 9 intends to visualise the trend of the number of common shares Outstanding, market capitalization of common shares, market price of common shares, book value of total assets and book value of common equity. The year 2008 is used as a base year from which we calculate the percentage growth of the median of each variable. As expected, the share price

has had ups and downs during the period, finishing almost exactly where it started in 2008. This means that, on average, the price has been constant. Meanwhile, we notice a steep increase of the number of common shares outstanding, which in 2014 represents close to 1.7 times the number of common shares outstanding in 2008. This increase is also expected, as the regulators have encouraged and also forced the banks to issue more shares in order to increase their buffers, i.e. their capital. The increase is in line with the phased-in approach of Basel III capital regulations in 2013 and 2014 and the preparation that was done in earlier years in order to achieve the capital adequacy ratios. The market capitalization of common shares is simply the number of common shares outstanding times the price per share. From the graph, it is clear that the increase in the market capitalization of common shares from 2011 to 2014 is driven by the increase in the number of common shares outstanding, which has been high enough to compensate for the decrease in 2014 in the market price of common shares. Similarly, the increase in the number of common shares has also driven the book value of common equity.

Interestingly, both the market capitalization of common shares and the book value of common equity have outperformed the increase in total assets by far. The increase book value of common equity from 2008 to 2014 is expected and clearly reflects the capital adequacy requirements that Basel III imposed on banks. From the graph, it looks as if the equity proportion of the balance sheet (as calculated from common equity over total assets) has increased over the 2008-2010 period, which could be an indication that the number of zombie banks in the sample will most probably decrease on average from 2008-2014.

9.4 New proposed identification method of zombie banks

The foundation of the new identification method for zombie banks rests on the effect that bank recapitalisations from the part of the government have on the banks' balance sheets. Therefore, this definition is only relevant to use in times of financial crisis characterised by government intervention, and specifically recapitalisation, such as the latest financial crisis in Europe. Though it would be interesting to identify zombie banks using the other types of

government support mentioned in chapter 3, recapitalisations have the clearest effect in a bank's balance sheet and therefore make the identification of zombie banks relatively straightforward. This new identification method is consistent with the definition of a zombie bank as a bank that would not exist if it were not for government support of any type. Our proposed identification method of zombie banks consists in identifying a bank as zombie if its total shareholders' equity at the balance sheet date is less than the value of the government injection it received during that fiscal year. From now on, we will refer to this identification method as the "capital injection" method. This identification method is logical, if we consider that indeed government injections of capital are directly reflected into the equity part of the balance sheet. As an example, is a bank's total equity is equal to EUR 1 billion at the end of the fiscal year, and if we know that the bank received a capital injection (recapitalisation) of EUR 1,2 billion during that fiscal year, then we conclude that the bank is a zombie, given that it would have a negative total equity of EUR 0,2 billion if it would not be for the government support (recapitalisation).

Zombie bank if: (Book value of total equity - Capital injection) < 0

However, given that there is evidence of banks paying back to the government the capital injection amounts substantially only after 3 years from the reception of the capital injection, we have chosen to deduct the amount of capital injection from the banks' equity not only for the year in which it received the injection, but rather for three years (the year it received the injection and the next two years).

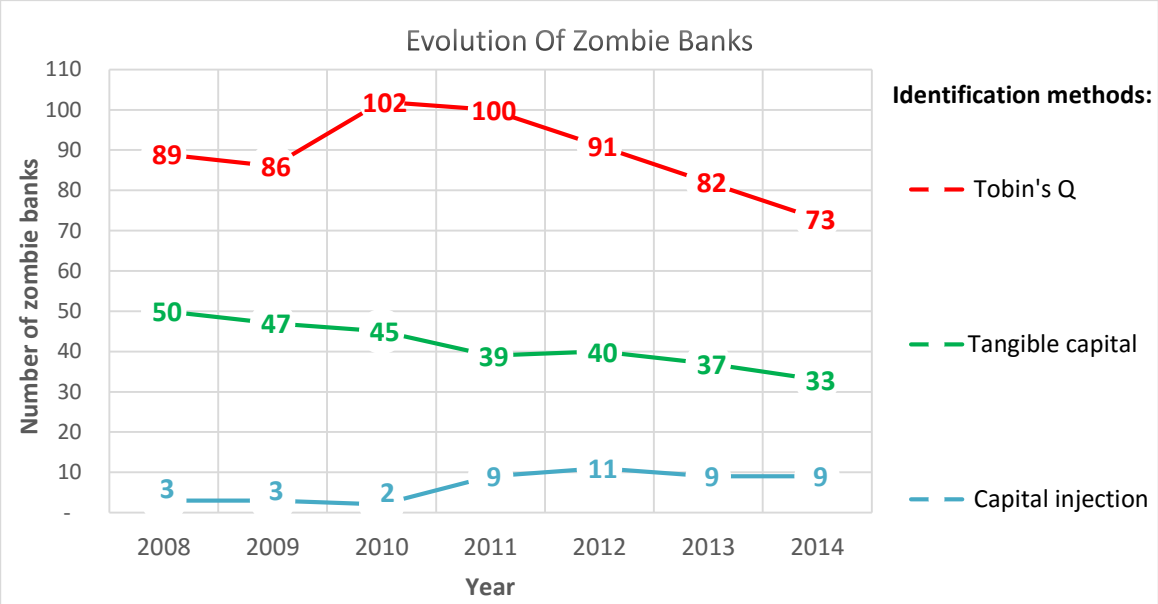
9.5 Results

9.5.1 First hypothesis

Our **first hypothesis** in this research is that zombie banks have been prevalent in the EU during the period 2008-2010. This hypothesis is closely related to the **second hypothesis**, which is that existing identification methods of zombie banks are not consistent in identifying the zombie banks, i.e. a bank that is identified as a zombie in a certain year by one method is not necessarily identified as a zombie in the same year by other methods. In order to answer both

of our hypothesis, we calculated the number of zombie banks per each of the two existing identification methods (the Tobin's q identification method and the Tangible capital identification method) in each year. We scoped out of our calculations the Market capitalisation identification method, given that we did not have the necessary market information (the market value of preferred shares) in the Compustat database. The results are presented in figure 10 as a trend over the years.

Figure 10: Number of zombie banks identified using different identification methods

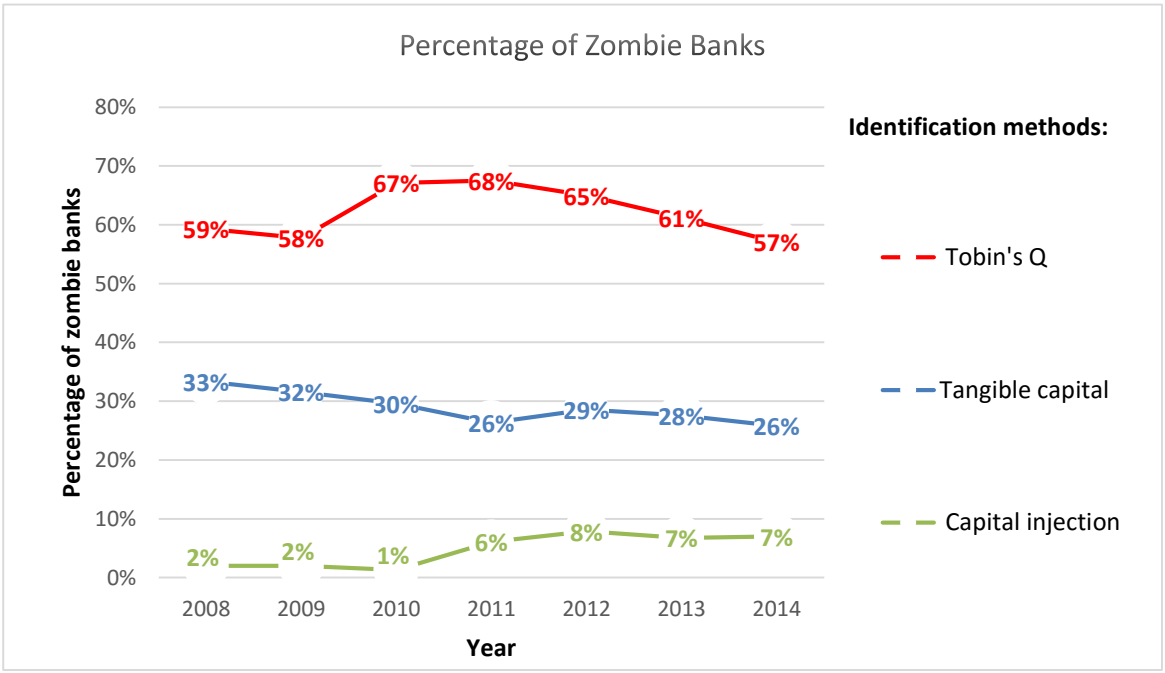


Source: Compustat database, Victor Sorokin estimation.
Note: The figure presents the number of zombie banks identified in each year per each identification method shown in the legend.

It is easily noticeable that the number of zombie banks identified by the two existing identification methods, namely the Tobin's q and the Tangible capital methods, is significant. In 2008, Tobin's q suggests that 89 out of 150 banks are zombie, while the Tangible capital identification method suggests that 50 out of 150 banks are zombie. Figure 10 shows an average decrease in the number of zombie banks for both existing identification methods over the sample period, to a minimum of 73 zombie banks identified from Tobin's q and 33 zombie banks identified by the Tangible capital identification method in 2014. However, we cannot conclude that the prevalence of zombie banks has decreased during the sample period. This

is the case because the number of banks in the sample has also decreased in the latest years of the sample. That is why in figure 11 we present a trend line of the number of zombie banks identified per each identification method as a percentage of the total number of banks in our sample in that year. The results do not exactly mirror the steep decrease noticed in figure 10. Still, the net movement in the number of zombie banks as a percentage of the total number of banks in our sample is a net decrease for both existing definitions. Figure 11 shows that 59% of the banks were zombie using Tobin's q definition in 2008. After a peak of 68% in 2011, the percentage of zombie banks decreases until a low of 57% in 2014. Using the Tangible capital definition, we see a more stable decrease in the number of zombie banks. The Tangible capital definition suggests that 33% of the banks in our sample were zombie in 2008, and 26% of the banks were zombie in 2014. Though both methods show an average decrease in the number of zombie banks, both of them suggest that zombie banks are indeed prevalent in the non-Eastern European countries during 2008-2014. Therefore, we can convincingly answer the **first hypothesis** regarding the prevalence of zombie banks during our sample period positively.

Figure 11: Number of zombie banks as a percentage of total banks from the sample



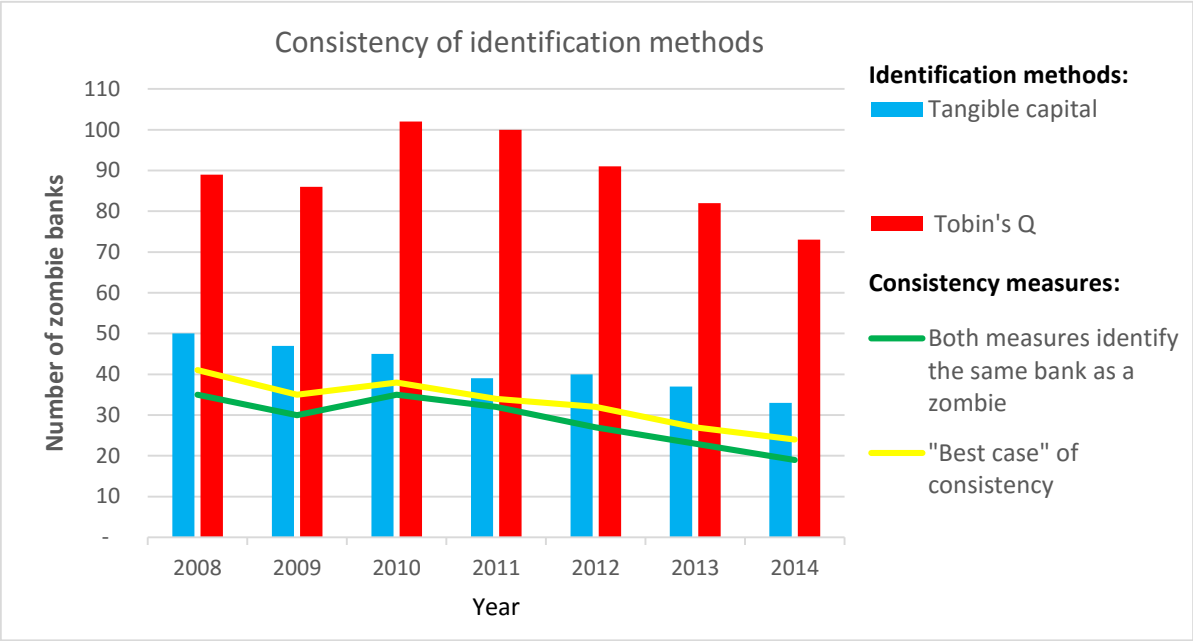
Source: Compustat database, Victor Sorokin estimation.

Note: The figure presents the percentage of the banks in the sample that are zombie banks in each year per each identification method shown in the legend.

9.5.2 Second hypothesis

Even though both the Tobin's q and the Tangible capital identification methods show a significant number of banks as zombie, these definitions do not seem to be fully consistent. Figure 12 is meant to show the exact consistency in these two definitions.

Figure 12: Consistency of the identification methods used to identify zombie banks



Source: Compustat database, Victor Sorokin estimation.

Note: The figure presents in columns the number of zombie banks identified for the Tangible capital and Tobin's q identification methods. The green line represents the number of banks that both of these methods identify as zombie at a given year, i.e. the consistency. The yellow line incorporates the green line with an addition for the banks for which there was no information available; it attempts to demonstrate the "best case" of consistency, assuming that zombie banks identified with the Tangible capital definition but for which we have no market data would be zombie also when using Tobin's q.

While columns in figure 12 show the number of zombie banks identified with each definition, the green line is meant to show the number of banks that both of them identify as zombie at a given year. Given that for a few banks, there was no price information available and thereby this could give rise to a small inconsistency, the yellow line of figure 12 incorporates the green line with an addition for the banks for which there was no information available. This yellow line attempts to demonstrate the "best case" of consistency of the two definitions, i.e. that

the zombie banks identified with the Tangible capital definition but for which we have no market data would also be zombie using the Tobin's q identification method. Figure 12 shows that the green and yellow line are very closely linked, indicating that the "best case" scenario does not significantly affect our findings. The height of the columns below the lines shows the consistency of the identification methods, while the part of the columns above the lines shows the inconsistency in identifying zombie banks with these two identification methods. On average, Tobin's q identifies double the number of banks that the Tangible capital method identifies. Therefore, we can conclude that our **second hypothesis** is true and that the existing definitions of zombie banks are inconsistent. The roots of this inconsistency lay in the fact that the Tangible capital identification method uses book value of equity, while Tobin's q identification method uses market value of equity. During our sample period, this inconsistency is heightened due to the market sentiment characterised by investors' distrust, which has driven down share prices of banks and thereby directly causing a lower Tobin's q, which results in a higher number of zombie banks identified through Tobin's q.

Our finding of the inconsistency of existing definitions has significant implications for research that has been conducted in an attempt to study the effects of zombie banks. Our finding suggests that the results of previous researches conducted using one of these identification methods are biased towards the identification method chosen and would probably produce different results if the researches were to analyse the same effects of zombie banks using another identification method of zombie banks.

9.5.3 Third hypothesis

Our **third hypothesis** revolves around our new proposed identification method of zombie banks. The third hypothesis stipulates that government support has been provided not only for distressed financial institutions that were solvent, but also for insolvent financial institutions. To test this hypothesis, we use the Capital injection identification method. Before analysing our findings, it is important to note that it is only normal that the number of zombie banks identified using the Capital injection method is much lower than the number of zombie banks identified using current definitions. The explanation for this lower number is that only

35 banks in our sample have received capital injections, i.e. have been recapitalised. Figure 10 shows that out of these 35 banks that received capital injections, 19 have been identified as zombie banks using the capital injection identification method. However, the graph shows that on average 7 banks are identified as zombie in a given year using the Capital injection identification method. This is primarily the result of our assumption of a three year significant payback of government funds, as explained in section 10.3. The finding that 19 banks out of 35 that received government injections are zombie banks (using the Capital injection identification method), allows us to provide an answer to the **third hypothesis**. Therefore, we conclude that government help not only went to insolvent banks as well as solvent ones, thereby making the insolvent banks zombie, but went *primarily* to insolvent banks (19 banks) more than it did to solvent ones (16 banks).

Chapter 10. EU initiatives to prevent banking crisis and resolve bank failures

The consequences of the 2008 financial crisis put pressure on policymakers around the world to take actions in order to prevent such crisis or reduce its effects on the economy. In this chapter, we focus on measures undertaken in the EU to prevent the appearance of zombie banks and/or facilitate their resolution. These measures are (1) the Single rulebook, (2) the Banking Union, and (3) the stress testing of EU banks.

10.1 Single rulebook

The single rulebook is the unified regulatory framework for the financial industry in the European Union. It consists of rules that banks and other financial institutions must abide by. The main focus of the single rulebook can be classified in three areas (1) capital requirements for financial institutions, (2) prevention and resolution of bank bankruptcies, and (3) protection of depositors.

10.1.1 Capital requirements for financial institutions

Rules on capital requirements for the banking sector consist of the CRR (the capital requirements regulation) and the CRD (the Capital Requirements Directive) (Council of the European Union, 2015). They both outline rules that aim to prevent bank failures mainly through the establishment of capital, liquidity and leverage requirements.

10.1.2 Prevention and resolution of bank bankruptcies

The prevention and resolution of bank bankruptcies is ensured through the implementation of the BRRD (Bank Recovery and Resolution Directive) (Council of the European Union, 2016a). The objectives of this directive are to regulate the prevention of bank failures and to make sure that the costs of resolving these banks are minimised. BRDD is divided into three levels: (1) preparation and presentation, (2) early intervention and (3) resolution.

The first, preparation and presentation, level requires from all banks to prepare their recovery plans with concrete measures that the financial institution would take if its stability would be undermined. It also includes a requirement to create a resolution fund in each EU country that may be used in resolving its failing banks. These funds should be equal to or larger than 1% of all covered deposits from all credit institutions in the country (Council of the European Union, 2016a).

The second, early intervention, level provides national policymakers with the right to take actions in order to make sure that the bank will continue to operate and that its recovery will be prompt. These actions include a requirement from a bank to restructure some of its debts, the appointment of a new management and the passing of imperative reforms.

The third level, the resolution, applies to those banks whose recovery is excessively expensive. In this situation, policymakers can decide to (1) sell a portion of the bank's activities, (2) separate performing assets from impaired ones that will be moved to a specific asset management company, (3) establish a bridge bank that will ensure the functioning of indispensable operations, and (4) implement bail-in resolution whereby shareholders and creditors will assume the losses resulting from the resolution of a failing bank.

10.1.3 Protection of depositors.

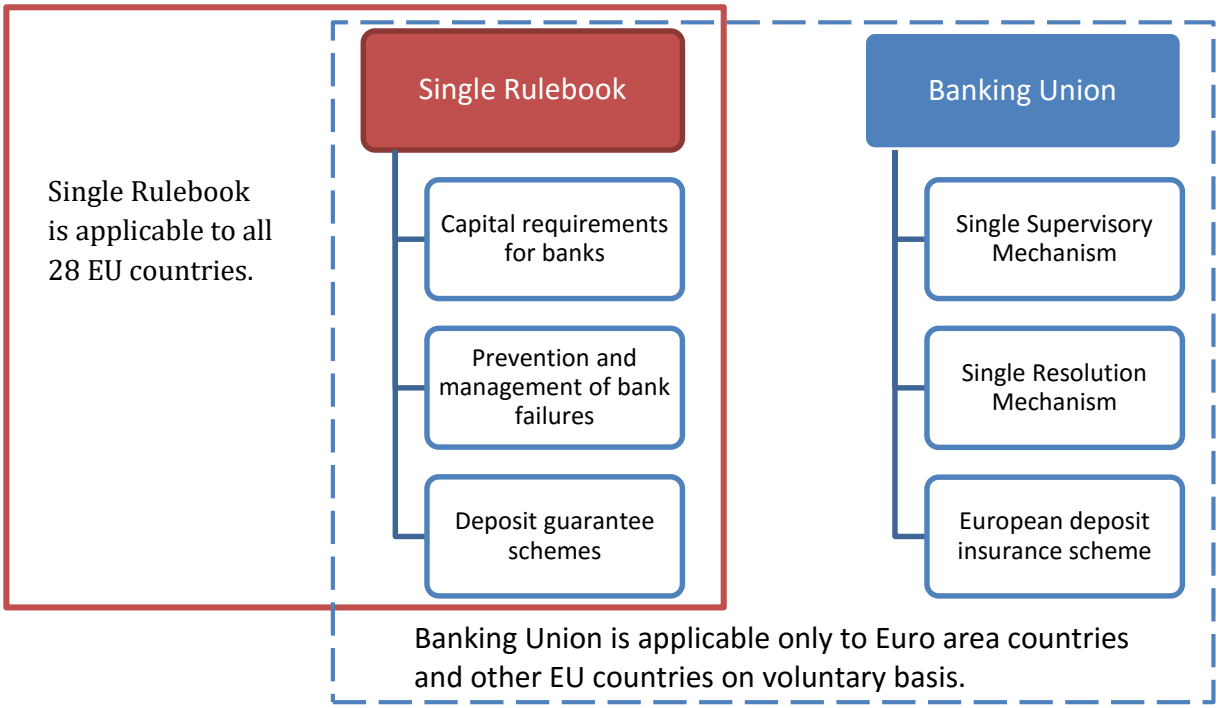
The protection of depositors in case of a bank bankruptcy is established in order to avoid bank runs in the entire financial system if a bank is failing. Each national authority should provide, through deposit guarantee schemes (DGS), guarantees up to a specified amount to reimburse deposits if a bank becomes insolvent. In the EU, this amount is limited to EUR 100,000 worth of deposits per bank.

10.2 Banking Union

EU's answer to the financial crisis of 2008 and to the European sovereign debt crisis was the creation of a Banking Union. As demonstrated in the figure 14, the Banking union is composed of three building blocks: (1) Single Supervisory Mechanism (SSM), (2) Single Resolution

Mechanism (SRM), and (3) European deposit insurance scheme (EDIS) (European Commission, 2016a). The Banking Union regulatory framework is applied to all Eurozone and non-Eurozone countries and is based on a voluntary participation. The Banking Union is not a replacement of the Single Rulebook, but a step further. The Banking Union aims to ensure that the banking industry is safe and reliable, and that if problems appear then banks will be resolved without having to spend taxpayer money.

Figure 13: EU framework to prevent banking crisis and resolve bank failures



Source: Council of the European Union, 2015.

10.2.1 Single Supervisory Mechanism (SSM)

An enhanced supervision of the banking industry in the Eurozone is a crucial pillar of the banking union. The Single Supervisory Mechanism is implemented through a tight collaboration between the European Central Bank (ECB), the European Banking Authority (EBA), and each member of the Eurozone group. Starting from the first of November 2014, ECB's role is to conduct tests with the aim to identify banks that do not fulfil the requirements of the single rulebook and some additional requirements. These tests include asset quality

reviews, stress testing, balance-sheet examinations, etc. Additionally, ECB is empowered to impose sanctions on credit institutions and even revoke their licences.

10.2.2 Single Resolution Mechanism (SRM)

Banking Union's Single Resolution Mechanism is established in order to guarantee that failing credit institutions will be resolved without creating significant outlays from the taxpayers and the economy in general. SRM is composed of the Single Resolution Board and the Single Resolution Fund. The Single Resolution Board plays the role of the unique resolution authority that decides on resolution measures for every failing credit institution in the Eurozone. The Single Resolution Fund is funded by pro-rata contributions from all banks in the Eurozone, which are based on the risk that the bank represents to the financial system, and is used when resolving failing credit institutions. The fund's capacity is intended to amount to at least 1% of all covered deposits (Council of the European Union, 2016b).

10.2.3 European deposit insurance scheme (EDIS)

This pillar of the Banking Union plays the same role as the Deposit Guarantee Scheme (DGS) required by the Single Rulebook, namely ensuring that depositors will be reimbursed for up to EUR 100,000 if their bank fails. However, EDIS will be responsible for reimbursing depositors and making sure that all depositors in the euro area are protected equally by protecting local DGS from strong shocks.

10.3 EU-wide stress testing

The European Banking Authority (EBA) conducts stress testing of EU major banks in order to assess banks' resilience to Baseline and Adverse scenarios. The aim of these stress tests is to provide banks and authorities with an understanding of the vulnerabilities in the banking sector. The main outcomes of the stress tests are estimations of the banks' capital ratios in case of adverse and baseline scenarios for the following 2 to 3 year periods. The capital ratio is calculated as Core Tier 1 capital (CT1) divided by the risk-weighted assets (RWA) of the bank.

The 2011 stress tests revealed that under the adverse scenario one bank would have negative capital ratios, while the 2014 stress tests revealed that under the adverse scenario six banks would have negative capital ratios. This means that those banks would have a negative CT1 capital, which is the most loss-absorbing type of capital. This would make those banks insolvent if the adverse scenario were to materialise, and zombie if authorities decide not to shut them down but keep them alive through capital injections or other forms of government support.

Conclusion

Our findings

This research has allowed us to analyse the prevalence of zombie banks in non-eastern European Union during the period of 2008 until 2014. Our results suggest that indeed zombie banks are prevalent during the whole sample period, even though they are more so in 2008 and less so in 2014. On average, using Tobin's q identification method of zombie banks, we classify 63% of all banks in our sample to be zombie. On average, using the Tangible capital identification method, we classify 28% of all banks in our sample to be zombie. While both of these existing identification methods point to the prevalence of zombie banks, we also conclude that these identification methods are widely inconsistent. Tobin's q identifies on average double the number of zombie banks that the Tangible capital identification method identifies. We believe that the higher number of zombie banks identified through Tobin's q identification method is the result of the financial market turbulence and investor distrust that has prevailed since 2008, which have caused a direct decrease in the share prices of banks and subsequently lower market values of banks, resulting in lower Tobin's q and therefore higher number of zombie banks identified through Tobin's q. This finding of inconsistency in identification methods has significant implications for previous research that has been conducted on the effects of zombie banks using one of these identification methods: those researches are biased towards the identification method chosen and would probably produce different results if they were to analyse the same effects of zombie banks using another identification method.

Our research has also introduced a new way of identifying zombie banks in times of financial crisis characterised by wide-scale government interventions, as was the case for the EU during the 2008-2014 period. The new identification method classifies a bank as zombie if its equity at the balance sheet date is less than the amount of recapitalisation (capital injection) from the government. We find that 19 out of 35 banks that have received government injections in our sample have a negative equity after deducting the amount of government injections of

capital. This allows us to conclude that government recapitalisations have usually been given to insolvent banks rather than solvent ones.

The initiatives taken by EU, namely Single Rulebook, Banking Union, and Banks Stress Testing will provide EU authorities with better tools to deal with similar crises in the future. The constant monitoring of banks' financial strength, the stress testing that has been implemented, and the higher capital requirements will make banks more robust, thereby making the financial system less prone to contagion or domino effects. Additionally, the establishment of a resolution authority and a special fund to resolve failing banks may avoid spending of taxpayers' money and lessen the burden of the governments.

Limitations of our research

Though this research has tried to be as comprehensive as possible with regards to the data and timelines, we are aware of its limitations. Our results for the consistency of the two existing definitions could be more representative of the whole financial sector if the sample of banks analysed included banks with total assets of less than EUR 1 billion as well. Furthermore, the identification of zombie banks could have been extended to include the pre-crisis period and analyse the prevalence of zombie banks during the pre-crisis period as well. However, we did not extend our research during the pre-crisis period given that the new identification method that uses recapitalisation as a variable would be meaningless in times of stability of the banking sector.

Future research

This research has paved the way for future research in the sphere of new identification methods of zombie banks using other types of government interventions such as blanket guarantees and asset relief measures. Furthermore, the consistency of the identification methods of zombie banks is still to be checked in times of financial market stability and stable economic growth.

Lastly, now that we are aware of the inconsistency of the identification methods of zombie banks, future research should try to empirically analyse the effect of zombie banks using more than one identification method of zombie banks and therefore making a robustness check of the results.

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Annexes

Annexe 1

Table 4: List of banks in the sample.

Country	Bank	Country	Bank
AUT	BK FUER TIROL VORARLBG	GBR	BARCLAYS PLC
AUT	BK FUR KARNTEN & STEIER	GBR	BGEO GROUP PLC
AUT	ERSTE GROUP BK AG	GBR	BLME HOLDINGS PLC
AUT	IMMIGON PORTFOLIOABBAU AG	GBR	BRADFORD & BINGLEY PLC
AUT	OBERBANK AG	GBR	CYBG PLC
AUT	RAIFFEISEN INTL BANK HLDG AG	GBR	HBOS PLC
AUT	UNICREDIT BANK AUSTRIA AG	GBR	HSBC HLDGS PLC
AUT	VORARLBERG LANDES & HYPO	GBR	LLOYDS BANKING GROUP PLC
AUT	VORARLBERGER VOLKS	GBR	NATL WESTMINSTER BANK
BEL	DEXIA SA	GBR	ONESAVINGS BANK PLC
BEL	KBC GROUP NV	GBR	PARAGON GROUP OF COS PLC
CYP	BANK OF CYPRUS PUBLIC CO LTD	GBR	ROYAL BANK OF SCOTLAND GROUP
CYP	CYPRUS POPULAR BANK PCL	GBR	SANTANDER UK PLC
CYP	HELLENIC BANK	GBR	SHAWBROOK GROUP PLC
CYP	TCS GROUP HLDG PLC	GBR	STANDARD CHARTERED PLC
DEU	AAREAL BANK AG	GBR	VIRGIN MONEY HOLDINGS
DEU	BAUSPARKASSE MAINZ AG	GRC	AGRICULTURAL BANK OF GREECE
DEU	BAYERISCHE HYPO- & VEREINSBK	GRC	ALPHA BANK SA
DEU	BERLIN-HANNOVERSCHE HYPOTHEK	GRC	ATTICA BANK SA
DEU	COMDIRECT BANK AG	GRC	EMPORIKI BANK OF GREECE SA
DEU	COMMERZBANK	GRC	EUROBANK ERGASIAS SA
DEU	DAB BANK AG	GRC	GEN HELLENIC BANK
DEU	DEUTSCHE BANK AG	GRC	GREEK POSTAL SAVINGS BANK
DEU	DEUTSCHE POSTBANK AG	GRC	MARFIN EGNATIA BANK SA
DEU	DT HYPOTHKBK HANNOVER/BERLIN	GRC	NATIONAL BANK OF GREECE
DEU	DVB BANK AG	GRC	PIRAEUS BANK SA
DEU	DZ BANK AG	GRC	PROTON BANK SA
DEU	EUROHYPO AG	GRC	T BANK SA
DEU	HSBC TRINKAUS & BURKHARDT	IRL	ALLIED IRISH BANKS
DEU	HYPO REAL ESTATE	IRL	ANGLO IRISH BANK CORP
DEU	IKB DEUTSCHE INDUSTRIEBANK	IRL	BANK OF IRELAND
DEU	LANDESBANK BERLIN	IRL	DEPFA BANK PLC

Country	Bank	Country	Bank
DEU	LANDESBANK BERLIN HOLDING AG	IRL	PERMANENT TSB GROUP HLDGS
DEU	MLP AG	ITA	BANCA CARIGE SPA GEN & IMPER
DEU	OLDENBURGISCHE LANDESBANK	ITA	BANCA CR FIRENZE
DEU	UMWELTBANK AG	ITA	BANCA GENERALI SPA
DNK	DANSKE BANK AS	ITA	BANCA INTERMOBIL INVEST GEST
DNK	FIONIA BANK A/S	ITA	BANCA MONTE DEI PASCHI SIENA
DNK	FORMUEPLEJE PENTA	ITA	BANCA POPOLARE DI MILANO
DNK	FORSTAEDERNES BANK	ITA	BANCA POPOLARE DI SONDRIO
DNK	JUTLANDER BANK AS	ITA	BANCA POPOLARE DI SPOLETO
DNK	JYSKE BANK	ITA	BANCA POPOLARE EMIL ROMAGNA
DNK	LAN & SPAR BANK AS	ITA	BANCA POPULARE ETRURIA LAZIO
DNK	NORDJYSKE BANK A/S	ITA	BANCA SISTEMA SPA
DNK	NORRESUNDBY BANK	ITA	BANCO DESIO DELLA BRIANZA
DNK	RINGKJOBING LANDBOBANK A/S	ITA	BANCO DI SARDEGNA
DNK	SPAR NORD BANK A/S	ITA	BANCO POPOLARE
DNK	SPARBANK A/S	ITA	BCA PROFILO SPA
DNK	SPAREKASSEN LOLLAND AS	ITA	CREDITO ARTIGIANO SPA
DNK	SYDBANK AS	ITA	CREDITO BERGAMASCO SPA
DNK	VESTJYSK BANK AS	ITA	CREDITO EMILIANO SPA
ESP	BANCA CIVICA SA	ITA	CREDITO VALTELLINESE
ESP	BANCO DE ANDALUCIA	ITA	FINECOBANK SPA
ESP	BANCO DE SABADELL SA	ITA	INTESA SANPAOLO SPA
ESP	BANCO DE VALENCIA SA	ITA	IWBANK SPA
ESP	BANCO ESP DE CREDITO	ITA	MEDIOBANCA SPA
ESP	BANCO GUIPUZCOANO	ITA	UNICREDIT SPA
ESP	BANCO PASTOR	ITA	UNIONE DI BANCHE ITALIANE
ESP	BANCO POPULAR ESPANOL	LUX	ESPIRITO SANTO FINANCIAL GRP
ESP	BANCO SANTANDER SA	LUX	QUILVEST SA
ESP	BANKIA SA	NLD	ABN-AMRO HOLDINGS NV
ESP	BANKINTER	NLD	BINCKBANK NV
ESP	BBVA	NLD	ING GROEP NV
ESP	CAIXABANK SA	NLD	KAS BANK NV
ESP	CAJA DE AHORROS DEL MEDITERR	NLD	VAN DER MOOLEN NV
ESP	LIBERBANK SA	NLD	VAN LANSCHOT NV
ESP	RENTA 4 BANCO SA	PRT	BANCO BPI SA
FIN	AKTIA BANK PLC	PRT	BANCO COMERCIAL PORTUGUES SA

Country	Bank	Country	Bank
FRA	AMUNDI SA	PRT	BANCO ESPIRITO SANTO SA
FRA	BANQUE DE LA REUNION SA	PRT	BANIF SA
FRA	BANQUE DE SAVOIE	PRT	BANIF SGPS SA
FRA	BANQUE TARNEAUD	PRT	CAIXA ECONOMICA MONTEPIO GEN
FRA	BNP PARIBAS	PRT	FINIBANCO HOLDING SGPS SA
FRA	BOURSORAMA	SWE	AVANZA BANK HOLDING AB
FRA	CAISSE REG DE CRE AGRI MUT	SWE	HQ AB
FRA	CFCAL-ALSACE LORRAINE BANQUE	SWE	MELKER SCHORLING AB
FRA	CIC (CREDIT INDUSTRIEL COMM)	SWE	NORDAX GROUP AB
FRA	CREDIT AGRICOLE SA	SWE	NORDEA BANK AB
FRA	CREDIT LYONNAIS SA	SWE	NORDNET AB
FRA	NATIXIS	SWE	SKANDINAVISKA ENSKILDA BANK
FRA	ROTHSCHILD AND CO SCA	SWE	SVENSKA HANDELSBANKEN
FRA	SOCIETE GENERALE GROUP	SWE	SWEDBANK AB
GBR	ALDERMORE GROUP PLC		